

GESTAR II FOURTH ANNUAL REPORT



NASA AWARD #
80NSSC22M0001

NASA Cooperative Agreement Goddard Earth
Sciences Technology and Research II (GESTAR II)



COVER COLLAGE PHOTOS GESTAR II FACULTY

From Top Left going clockwise:

Dr. Bridget Seegers aboard R/V Blissfully Bridget Seegers and with Gordon Ackland at the helm. Photo credit: Bridget Seegers.

Dr. Carl Malings (seated, farthest right) at the NASA ARSET workshop “Introduction to Geostationary Satellite Observations for Air Quality Applications in the Western US”, held in Fort Collins, Colorado, 5-7 Aug 2025. Photo credit: Shawn McClure.

Dr. Petya Campbell in the field installing a FLoX (Fluorescence box) at the Konza Prairie in Manhattan, KS. Photo credit: Dr. Fred Huemrich.

UMBC Atmospheric Physics graduate student Rachel Smith and Dr. Brent McBride (613/UMBC) test electrical connections on the AirHARP2 instrument inside the ER-2 superpod during PACE-PAX. Photo credit: Erica McNamee, NASA.

Center:

Dr. Priscilla Mohammed (first from the right) on the rooftop of GSFC’s Building 33 collecting data from the Hyperspectral Microwave Photonic Instrument (HyMPI). Photo credit: Victor Torres.

CONTENTS

04

MESSAGE
FROM THE
DIRECTOR

06

SCIENTIFIC
TASKS

137

STUDENT
PROGRAMS

141

AWARDS &
RECOGNITION

145

OUTREACH

157

GESTAR II
SEMINAR
SERIES

159

COMMUNI-
CATION
& MEDIA

164

REVIEWER
ACTIVITIES

174

MISCELLANEOUS

183

COURSES
TAUGHT

185

APPENDICES
(Publications,
Presentations
& Proposals)

256

ACRONYMS

MESSAGE FROM THE DIRECTOR



I am privileged to present the fourth annual report of the NASA Goddard Earth Sciences Technology and Research II (GESTAR II) cooperative agreement. This report provides a summary of the research activities and related accomplishments by GESTAR II scientists during the 2024-2025 reporting period from December 1, 2024, to November 30, 2025. This has been a challenging year for the scientific community due to funding uncertainty. Yet the resolve of our partnership and our NASA Goddard Earth Sciences Division (ESD) sponsors to diligently advance the science that supports NASA's mission objectives and national strategic goals has remained steadfast. Now in my third year as Director of GESTAR II, I continue to be amazed at the exceptional standards set and followed by both the ESD leadership and the consortium partnership in the implementation of this important cooperative agreement. The competency, problem-solving skills, efficiency, dedication, and teamwork of the GESTAR II administrative personnel continue to be outstanding. The GESTAR II researchers themselves, in partnership with their respective NASA sponsors, have consistently exemplified excellence through pioneering scientific research and demonstrated effective leadership across diverse collaborative initiatives at local, national, and international levels.

GESTAR II includes about 150 research personnel distributed practically across all research laboratories of the ESD (*i.e.*, Codes 610.1, 612, 613, 614, 615, 616, 617, 618, 61A). These scientists are involved (some with leadership roles) in a wide spectrum of scientific research activities that support NASA's strategic goals and Earth Science Mission objectives. This year, the activities that our scientists have been involved in encompass various existing and upcoming space missions (*e.g.*, TERRA, AQUA, AURA, CALIPSO, Landsat, GPM, OCO-2/3, JPSS, SMAP, DSCOVR, CYGNSS, ICESat-2, GRACE-FO, Sentinel-6 Michael Freilich, SWOT, TEMPO, PACE, TSIS-2, AOS, GLIMR, SBG, PolSIR, GeoXO), including those on the International Space Station (ISS) and those with international partnerships, as well as major field campaigns (*e.g.*, PACE-PAX). GESTAR II scientists also play crucial roles in the development and operations of major Earth-system models or data systems (*e.g.*, GEOS, JEDI, EIS) and ground-based networks (*e.g.*, AERONET, MPLNET, PANDONIA). Furthermore, our scientists are actively analyzing data from recent airborne campaigns (*e.g.*, CAMP2Ex, IMPACTS, ARCSIX, Asia-AQ), including those from collaborative engagements with other agencies (*e.g.*, GOTHAM led by NSF/NCAR), and several of our scientists also play active/leadership roles in conducting the annual NASA Student Airborne Research Program (SARP).

In addition to these and other major spaceborne and airborne missions and related programs, GESTAR II scientists also initiate, lead, and participate in multiple other cutting-edge research efforts, including innovative applications of machine learning (ML), deep learning (DL), and artificial intelligence (AI) techniques. Indeed, our scientists actively engage in activities that promote NASA's Earth Science to Action initiative, contributing from research and development to the delivery of actionable insights for decision-making. They have continued to be remarkably productive, publishing in high-ranking refereed journals, giving invited and contributed presentations at a wide variety of international conferences, workshops, and seminars, and leading and participating in science team meetings and working groups. Many of our scientists win competitive proposals and serve on proposal review panels for NASA and other funding agencies. A significant number of our scientists also regularly lead and participate in student and peer mentoring and training, media communication, and other public outreach activities. Many GESTAR II scientists received NASA individual and group achievement awards and those of their respective ESD laboratories, attesting to their remarkable dedication to NASA's missions and their outstanding performance.

I highly appreciate the wonderful efforts and accomplishments of all GESTAR II scientists and research associates, the leadership and administrative personnel at all GESTAR II member institutions and organizations, the NASA civil service sponsors of the GESTAR II faculty, and the leadership and management of the cooperative agreement at NASA Goddard ESD. I am honored to work alongside such a talented and dedicated team of professionals in our efforts to fulfill our common purpose of advancing NASA's Earth Science strategic goals and priorities. I look forward to our continued success and accomplishments as a team in the coming months and years.

**CHARLES ICHOKU,
DIRECTOR**

SCIENTIFIC TASKS

CODE 610: EARTH SCIENCES DIVISION

AMITA MEHTA

Sponsor Stephanie Schollaert Uz / Code 610 / Task 096

Dr. Mehta is a Science Team member in NASA's Western Waters Action Office ([WWAO](#)). Dr. Mehta facilitated a joint Applied Remote Sensing Training (ARSET)-WWAO training on 7 August 2025 focusing on the application of NASA snow cover and snow water equivalent data to predict water availability in selected rivers in the western US. She reviewed three proposals submitted in response to WWAO's Missouri River Basin Request for Information (RFI). Dr. Mehta also participated as a collaborator in a proposal submitted by Hazen and Sawyer (a private company), in response to this RFI. This proposal focuses on monitoring water quality in selected lakes in the western US using remote sensing observations from multiple satellite observations (Landsat 8 & 9, Sentinel-2, Sentinel-3, PACE).

Dr. Mehta attended several project presentations selected from WWAO's Rio Grande River basin initiative. She virtually attended WWAO's annual meeting on 13-15 May 2025. Dr. Mehta was invited to be a member of a panel on "Bridging NASA Research and Water Management Communities" and gave a presentation on the importance of trainings, designed specifically for water management communities in the western US, on availability and applications of NASA's Earth Observations for water quantity and quality management.

Dr. Mehta plans to prepare procedures (python scripts and APIs) to extract precipitation (rain and snow), and snow water equivalent data for the western US using NASA Global Modeling Assimilation Office (GMAO)- sub-seasonal to seasonal (S2S) predictions. She will present this information to WWAO stakeholder communities via an online training in 2026.

As a part of WWAO Science Team, Dr. Mehta will continue collaborating with Hazen and Sawyer personnel on a project to develop algorithms and an information dashboard for the detection and mapping of Harmful Algal Blooms in lakes in Colorado. Specifically, she will focus on selected reservoirs used by Denver Water (a water utility client of Hazen and Sawyer) for drinking water treatment. She will document seasonal and interannual characteristics (terrain, rainfall, snow cover, vegetation, soil moisture, and fires) of the watersheds of these reservoirs to understand their impacts on algal blooms in the reservoirs.

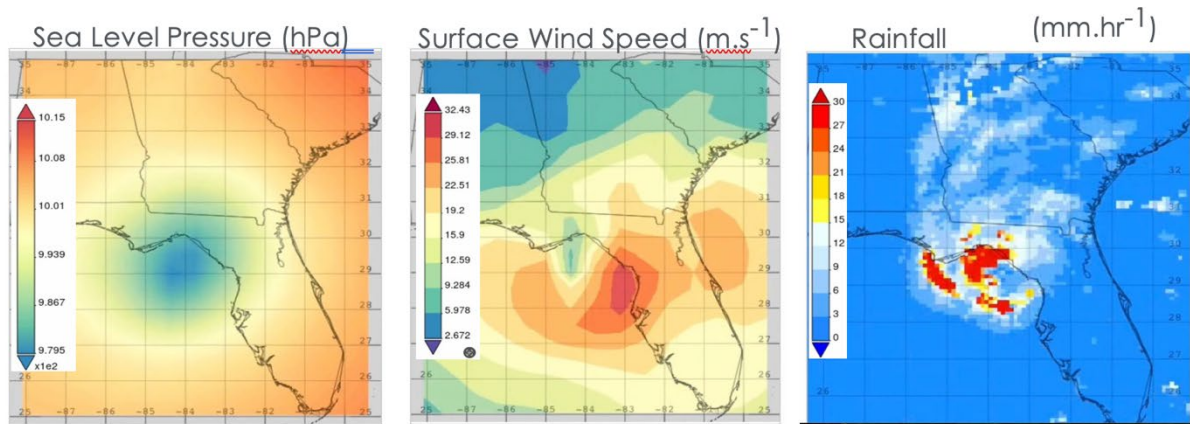


Image: Monitoring Hurricane Helene using NASA Earth Observations (9-27-2024, 0:30 UTC).

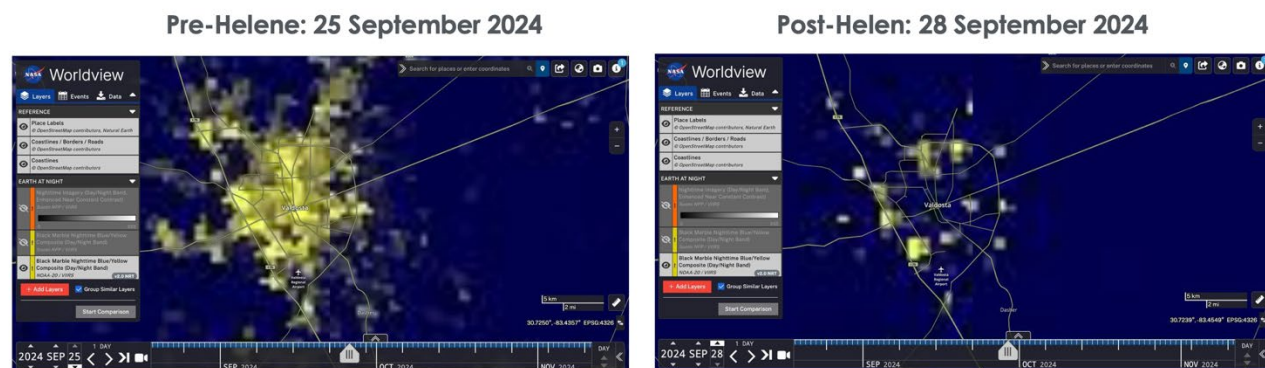


Image: Monitoring Post-hurricane Helene Power Outage VIIRS Night Light Imagery from NASA Worldview.

VISITING SCIENTISTS FOR SEMINAR SERIES

Sponsor Matthew McGill / Code 610 / Task 142

This task directly engages the external scientific community in GESTAR II research. The task established the GESTAR II seminar series (invited seminar talks) where world class scientists will present and discuss in depth their work, share insights and explore collaborative opportunities with GSFC and GESTAR II. This effort will be jointly sustained by the GESTAR-II Consortium and organizational elements within the Earth Sciences Division (ESD). Here are two of the seminars from this past year; a full list is available elsewhere in this annual report:

“Blowing snow over Arctic sea ice: Integrating modeling, field measurements, and satellite observations” by Dr. Lyatt Jaeglé from the University of Washington. This topic is highly relevant to cryospheric and atmospheric research, and it highlights the interdisciplinary approach of using various data sources. The abstract mentions using data from the ICESat-2 satellite, which is a key NASA mission.

“Transforming ICESat-2 Research through Collaboration and Learning” by Dr. Jessica Scheick from the University of New Hampshire. This talk emphasizes collaboration, which is a core goal of the GESTAR II seminar series, and focuses on a specific NASA mission (ICESat-2).

ASSAF ANYAMBA

Sponsor Stephanie Schollaert Uz / Code 610 / Task 221

Dr. Anyamba has been working to contribute to remote sensing data inventory needs for the study and modeling of vector-borne diseases in Prince George's County and Maryland at large. He conducted literature search and review of tick-borne disease threats in the mid-Atlantic region. Literature indicates that there is an increasing threat of many tickborne diseases countrywide due to the range expansion of and increasing presence of many invasive tick species. Dr. Anyamba also carried out an inventory of suitability mapping and machine learning method applications in vectorborne disease studies that can be applied to ongoing projects.

Dr. Anyamba is currently liaising with the Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) Data Production team to explore the possibility of long-term ingest of PACE normalized difference vegetation index (NDVI) data into the USDA/NASA GSFC Global Agricultural Monitoring System (GLAM). Dr. Anyamba was a co-author on five peer reviewed manuscripts, one manuscript as the lead author. Three of the manuscripts have been published during this performance period. Dr. Anyamba has presented at various conferences, moderated sessions, been invited to present at School of Marine and Atmospheric Science Stony Brook University, New York as well as presented to a group of high school students in the GLOBE - School of Earth and Environmental Sciences. Dr. Anyamba is presently a member of the AGU GeoHealth Editorial Board responsible for reviews on vectorborne diseases.

Future plans include Dr. Anyamba being the host and presenter for the upcoming NASA's Applied Remote Sensing Training Program (ARSET) on Remote Sensing for Climate-Sensitive Infectious Diseases. Dr. Anyamba will continue the work on tick-borne diseases through consultation with USDA Animal and Plant Health Inspection Service (APHIS) experts on the ecology of tickborne diseases. He will also evaluate the newly updated Global Agricultural Monitoring System (GLAM) database.

COMPTON TUCKER

Sponsor Matthew Rodell / Code 610 / Task 235

Dr. Tucker's research activities as an affiliated research scientist focused on providing expertise and continuity for his former team. He primarily serves as a mentor to the new lead, Dr. Rodell, guiding the team's research into vegetation, land cover, and carbon storage using high-resolution imagery and advanced modeling techniques. Dr. Tucker participates in team meetings, contributes to research planning and data analysis, and collaborates on manuscripts and the development of new studies to ensure a smooth leadership transition and continued scientific progress.

CODE 610.1: GLOBAL MODELING AND ASSIMILATION OFFICE

BRYAN KARPOWICZ

Sponsor Steven Pawson / Code 610.1 / Task 006

Recently, Eumetsat launched the meteosat third generation infrared sounder (MTG-IRS), a geostationary hyperspectral sounder. Dr. Karpowicz is leading an effort to prepare for utilizing future hyperspectral sounders, including MTG-IRS in the GEOS-ADAS. Given the high data volume of future GEO hyperspectral sounders, future missions will only transmit Principal

Component Scores (PCS), a form of lossy compression. The resulting radiance observation after reconstruction from PCS differs primarily by dropping noise from the observations. In doing so, the resulting channel variance decreases while increasing inter-channel correlation between the observation and estimate from the data assimilation system. An extensive set of experiments have been conducted using a principal component score product for CrIS developed by the University of Wisconsin. CrIS is ideally suited to prepare for MTG-IRS as it has a similar spectral resolution. Experiments using an optimized configuration for reconstructed radiances have shown neutral results compared with using standard CrIS L1B data. This provides some level of confidence that a similar optimization can be produced for MTG-IRS. A parallel effort to process and ingest MTG-IRS has begun using a proxy data set. Unlike the work with CrIS, the MTG-IRS implementation will be using the new JEDI enabled GEOS-ADAS.

The Joint Center for Satellite Data Assimilation (JCSDA) is an organization created by NOAA, NASA, the US Navy, and US Air Force to advance the state of satellite data assimilation. Dr. Karpowicz has been involved in several aspects of this effort including contributions to the Community Radiative Transfer Model (CRTM), and the next-generation data assimilation system known as the Joint Effort in Data Integration (JEDI). Dr. Karpowicz has contributed pyCRTM to the JCSDA, a Python package that he developed, which acts as a wrapper to CRTM. The package allows for quick and easy simulation of various satellite instruments, and is widely used in the research community, including NASA, NOAA, and the US Naval Research Laboratory. He has made a series of updates including bug fixes from the community, and updates to the installation process. The second release of pyCRTM was posted June 5, 2025. In addition to pyCRTM, Dr. Karpowicz has contributed updates to Evaluation and Verification of the Analysis (EVA), a package used in part to plot statistics from observations used in data assimilation. These contributions specifically included bug fixes, reduced processing time, and added the capability to compute statistical significance.

During the next year, Dr. Karpowicz will write and submit a journal article summarizing the CrIS Principle Component Reconstructed Radiance work. He will work with Ms. Erin Jones (ESSIC) and Dr. Chris Burrows (ECMWF) to write and submit a paper summarizing previous work from a visiting scientist using the shortwave infrared band on CrIS for cloud detection. Dr. Karpowicz will work to add MTG-IRS into the GEOS-ADAS and conduct Observation System Experiments using MTG-IRS.

Dr. Karpowicz will work with Drs. Nikki Privé and Erica McGrath-Spangler (both GESTAR II/MSU) to conduct an Observation Simulation Sensitivity Experiment (OSSE) to assess the impact of spaceborne hyperspectral microwave observations on numerical weather prediction and inform the NOAA NEON program on possible augmentation of the SMBA sensor.

NIKKI PRIVÉ

Sponsor Ron Gelaro / Code 610.1 / Task 007

Dr. Privé performed a series of Observing System Simulation Experiments (OSSE) investigating the necessary refresh rate of radio occultation (RO) observations. This work was in support of a NESDIS Analysis of Alternatives to evaluate the use of commercial RO data without a backbone of government GNSS-RO platforms. Dr. Privé tested different configurations of GNSS-RO platform orbits for a three-month experimental period in the OSSE framework. A manuscript was prepared for publication and will be submitted once funding is transferred from NOAA.

Dr. Privé completed an OSSE for the Joint Polar Satellite Program investigating the impacts of an orbital platform with 0530 local time of ascending node in a future global observing network scenario. A manuscript was published in Tellus-A, and Dr. Privé presented the results at the AGU Annual meeting in Washington, DC in December 2024. She contributed to the “Global cloud-resolving OSSE framework” project for the final year of AIST-21. This project involves designing and demonstrating proof of concept for a new OSSE framework for very high-resolution global Nature Runs. Dr. Privé advised the OSSE framework design and coded a mechanism for thinning simulated observations based on cloud and precipitation contamination from the Nature Run. She completed an analysis of correlations between forecast and analysis error fields using output from the baseline OSSE. A manuscript describing the results was submitted to the Quarterly Journal of the Royal Meteorological Society.

The AIST project will be completed, including testing the framework once a high-resolution Nature Run sample period is available. Dr. Privé will implement the thinning code and test-calibrate a week of simulated observational data to show proof of concept. Additionally, an OSSE to support the GSFC hyperspectral microwave instrument team will be initiated. Dr. Privé will produce a control run for the OSSE using the baseline global observing system selected by the instrument development team

ERICA MCGRATH-SPANGLE

Sponsor Ron Gelaro / Code 610.1 / Task 008

Dr. McGrath-Spangler uses the Global Modeling and Assimilation Office (GMAO) Observing System Simulation Experiment (OSSE) framework to evaluate the impact of hyperspectral infrared (IR) sounders from geosynchronous Earth orbit (GEO) in preparation for the planned NOAA/NASA Geostationary eXtended Observations (GeoXO) satellite mission, to be launched in the 2030s. Her research has focused on the GeoXO Sounder (GXS), proposed to be the first IR sounder in GEO for the United States. Studies performed included evaluations of the impact of GXS within the context of existing low-Earth orbit (LEO) IR sounders. Dr. McGrath-Spangler was lead author of a related manuscript published in March 2025. Two additional manuscripts were published with Dr. McGrath-Spangler as a co-author, and an additional manuscript is in preparation.

Upcoming plans include attending and presenting at the 2025 EUMETSAT conference in Lyon, France in September 2025, and finalizing preparations of a manuscript to be submitted to the peer-reviewed literature. Additional plans include organizing NOAA/NASA GXS subgroup meetings as required by the program, including a monthly discussion meeting and plans for implementation of the European equivalent of GXS into data assimilation systems. New research will begin on the impact of positioning GXS at new subsatellite subpoints as the GeoXO mission’s revised plans potentially eliminate the previously identified central satellite on which GXS was planned to reside.

PAMELA WALES

Sponsor Lesley Ott / Code 610.1 / Task 022

Dr. Wales is a lead developer for the GEOS Composition Forecast (GEOS-CF) system, contributing to a major update in the GEOS-CF system. She has conducted simulations of the updated GEOS-

CF system to support initial benchmarking and has provided routine monitoring and preliminary evaluations of stratospheric and upper tropospheric composition in the system. Dr. Wales has coordinated with the TEMPO and GEMS instrument teams to provide early access to the updated system and facilitate the use of GEOS-CF output in retrievals from the geostationary satellite instruments. She drafted a technical document outlining changes in the GEOS-CF system, data availability, and data access and provided guidance on data management and system workflow.

Dr. Wales is also the GMAO liaison to the Chemistry-Climate modeling group and a member of the composition reanalysis team. In support of the development of a composition reanalysis, she coordinated with the SAGE III/ISS instrument team to facilitate the inclusion of SAGE III/ISS stratospheric water vapor profiles in the reanalysis.

Looking ahead, Dr. Wales will contribute to a publication on the validation of the updated GEOS-CF system, including evaluating forecast skill of the ozone layer, changes in stratospheric composition, and the impact of changes in transport within GEOS on atmospheric composition observed during the 2022 ACCLIP aircraft campaign.

LIONEL ARTEAGA

Sponsor Lesley Ott / Code 610.1 / Task 023

Dr. Arteaga has been working on quantifying oceanic carbon export production based on the assimilation of ocean color data into the NASA Ocean Biogeochemical Model (NOBM). Specifically, he submitted a manuscript in February 2025 to the journal *Science Advances* describing the weakening of carbon export in the equatorial Pacific during the extreme 2016 El Niño (Figure below). Dr. Arteaga is currently revising the final manuscript for resubmission to this journal. In parallel, Dr. Arteaga has been guiding and evaluating a spin-up run of the new configuration of the NOBM, now integrated as part of the GEOS modeling system of the Global Modeling and Assimilation Office. The freely running spin-up is nearing 250 years of simulation time, and its output will be used as initial conditions for a data-atmosphere run of GEOS-NOBM that will include PACE data assimilation after 2024.

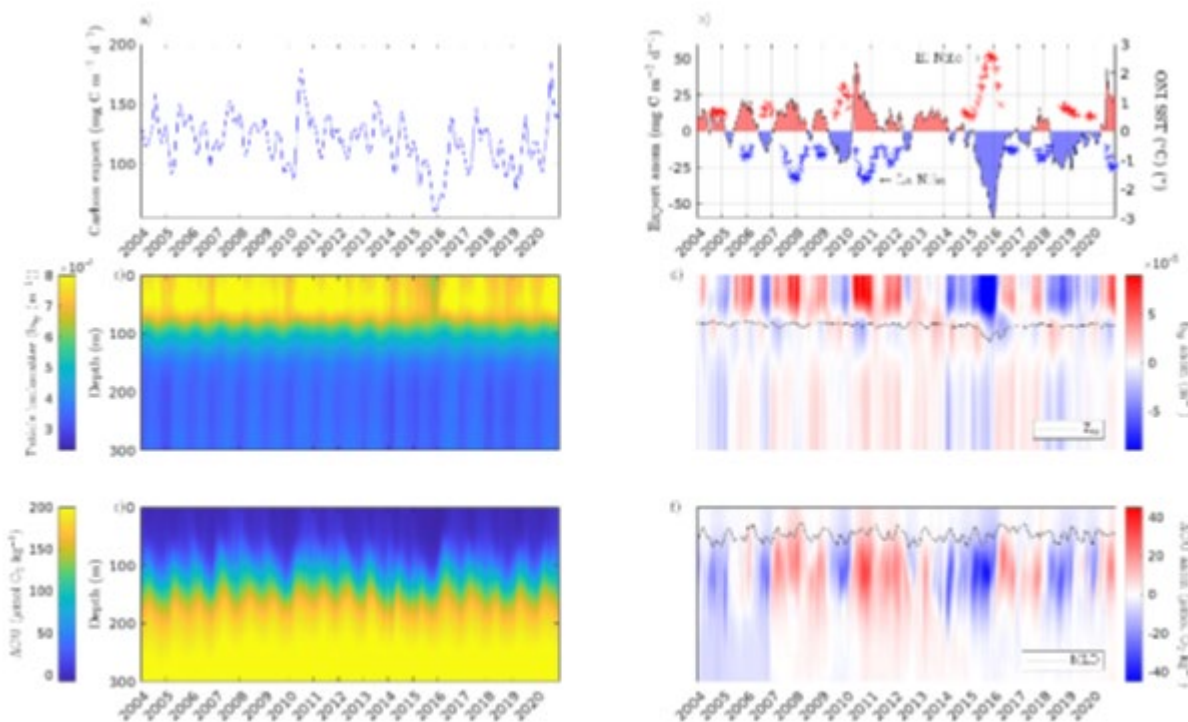


Image: Interannual variability in export and respiration in relation to ENSO cycles (a) Time series of modeled carbon export flux out of the surface mixed layer ($\text{mg C m}^{-2} \text{ d}^{-1}$). (b) (Shaded area) Deseasonalized anomalies in modeled export (red: positive, blue: negative) ($\text{mg C m}^{-2} \text{ d}^{-1}$), and (*) El Niño (red) and La Niña (blue) periods based on a threshold of $\pm 0.5 \text{ }^{\circ}\text{C}$ for the Oceanic Niño Index (ONI). (c) Time series of depth-resolved particle backscatter (bbp, m^{-1}) in the upper 200 m. (d) Time series of deseasonalized anomalies in bbp (m^{-1}). Black line represents the upper euphotic depth (Z_{eu}). (e) Time series of Apparent Oxygen Utilization (AOU, $\mu\text{mol O}_2 \text{ kg}^{-1}$) in the upper 500 m of the water column. (f) Time series of deseasonalized anomalies in AOU ($\mu\text{mol O}_2 \text{ kg}^{-1}$). Black line represents the mixed layer depth (MLD) obtained from temperature and salinity profiles. All variables are computed at a monthly temporal resolution and averaged for the ENSO 3.4 region.

Dr. Arteaga received notification on the evaluation of two submitted ROSES proposals. The proposal titled “*Retrospective analysis and forecasting of the impact of marine heatwaves on oceanic export production*” was successful and selected for funding by NASA’s Ocean Biology and Biogeochemistry (OBB) program. The second proposal titled “*Assimilation of PACE hyperspectral data into the NASA Ocean Biogeochemical Model*” was marked as *selectable*, and final selection is contingent on funding of NASA’s Modeling Analysis and Prediction (MAP) program.

Dr. Arteaga will dedicate the latter part of 2025 to finalize revisions and seek final publication of his work on carbon export weakening during the 2016 El Niño. Once the GEOS-NOBM spin-up run achieves steady-state in oceanic carbon and related biogeochemical variables, Dr. Arteaga will evaluate output related to carbon fluxes, especially in the Southern Ocean. The goal is to have a manuscript draft of this new implementation of the model by mid-2026. He will participate as PI in the upcoming annual meeting of the Carbon Monitoring System in September 2025 and also plans to attend the bi-annual Ocean Sciences Meeting in Glasgow in February 2026 to present his work on carbon export in the NOBM. While in Glasgow, Dr. Arteaga expects to participate in a workshop on carbon export organized by the European program for the Joint Exploration of the Twilight Zone Ocean Network (JETZON) (<https://jetzon.org>).

BRAD WEIR

Sponsor Lesley Ott / Code 610.1 / Task 025

During Year 4, Dr. Weir continued development of constituent assimilation and greenhouse gas monitoring in GEOS. This included modernization of a legacy biospheric model, the Carnegie-Ames-Stanford Approach (CASA), which is widely used throughout the greenhouse gas community. The modernized product, Más informada CASA (MiCASA), is a considerable upgrade in resolution from a monthly, 0.5 degrees to daily, 0.1 degrees. This dataset has been released to the public through the NCCS DataPortal and the interagency United States Greenhouse Gas Center (GHGC). MiCASA is a foundational product of the GHGC which plans to serve as a main access point of information and data about greenhouse gases across the US government, including agencies like NASA, NOAA, and EPA.

Dr. Weir also continued development and support of constituent assimilation in GEOS through the Constituent Data Assimilation System (CoDAS). This work supports the long-term effort to produce a next-generation constituent reanalysis. He developed and produced near-real-time (NRT) assimilated fields of carbon dioxide (CO₂), methane (CH₄), and carbon monoxide (CO) with a roughly 5-day latency. These fields are the result of the assimilation of several satellite datasets into NASA's Goddard Earth Observing System (GEOS). They are delivered each day to <https://fluid.nccs.nasa.gov/carbon> and other assets including the US GHGC.

In the remainder of the year, Dr. Weir plans to continue development of constituent assimilation products. This includes beginning production of GMAO's next constituent reanalysis.

NATALIE THOMAS

Sponsor Michael Bosilovich / Code 610.1 / Task 027

Over the past year, Dr. Thomas has continued to examine weather extremes in GMAO systems. She conducted analysis on indices representing the timing of the yearly last spring freeze and first fall freeze over the United States from MERRA-2. This work was presented at the American Geophysical Union fall meeting in December 2024 and a manuscript is in preparation. She also contributed to studies on case studies of extreme events, including the 2023 Texas heat wave (study led by Y.K. Lim) and extreme precipitation in April 2011 (study led by S. Schubert). Finally, she continued to participate in an affinity group supporting a new GEWEX Regional Hydroclimate Project, titled "Humans and Hydroclimate in the United States (H2US)".

In the upcoming months, Dr. Thomas will continue to work on the analysis of the spring and fall freeze indices. The manuscript in preparation on this topic will be submitted to the Journal of Applied Meteorology and Climatology. She plans to begin a new project evaluating winds from two reanalysis data sets, MERRA-2 and MERRA-21C, at wind turbine height for potential energy applications. She also plans to continue developing collaborative research through the H2US project on precipitation extremes.

NIAMA BOUKACHABA

Sponsor Yanqiu Zhu / Code 610.1 / Task 046

As part of her responsibilities within the GMAO, Dr. Boukachaba has led efforts to enhance the assimilation of hyperspectral infrared radiances from the Infrared Atmospheric Sounding

Interferometer (IASI) and the Cross-track Infrared Sounder (CrIS) over land in the NASA Goddard Earth Observing System (GEOS) data assimilation system.

In close collaboration with Dr. Yanqiu Zhu, Dr. Boukachaba corrected and refined retrieval code to derive Land Surface Temperature (LST) from selected IASI and CrIS surface-sensitive channels. These retrieved LSTs were subsequently assimilated to improve the use of other surface-sensitive radiances from the same sensors.

Dr. Boukachaba conducted a series of data assimilation experiments to evaluate and refine various components of the system. Her work included: 1) Quality control assessment and bias correction for the LST retrievals; 2) Tuning of the cloud detection algorithm over both land and ocean; and 3) Evaluation and optimization of the LST assimilation workflow.

Through this work, Dr. Boukachaba contributed to ongoing efforts within the GMAO to improve the assimilation of land-sensitive infrared radiances, with a focus on challenges related to surface representation, cloud detection, and retrieval accuracy. These activities align with GMAO's broader mission to enhance the use of satellite observations in support of global weather prediction and Earth system modeling.

This task concluded in November 2024. Dr. Boukachaba's efforts contributed to improving the assimilation of hyperspectral infrared radiances over land, and outcomes from this task will continue to inform related research activities within GMAO.

VIRGINIE BUCHARD

Sponsor Anton Darmanov / Code 610.1 / Task 050

Dr. Buchard has been actively working on the aerosol data assimilation (DA) system development in GEOS, as well as maintaining the GOCART2G model. On the DA side, the aerosol observing system has been expanded to include observations of Aerosol Optical Depth (AOD) from VIIRS sensors from both SNPP and NOAA-20 satellites. Dr. Buchard has been updating the aerosol DA codes to incorporate these VIIRS data sources, which require thorough testing before final implementation into GMAO's operations. Progress has been made on the JEDI-based aerosol DA framework, focusing on advancing the observation quality control. This includes the development of Background and Buddy-Check codes, along with rewriting the icosahedron geometry required for binning observations. These components have been developed as standalone modules using Python-Fortran interfaces, eliminating dependencies on legacy GEOS shared libraries while improving system modularity and maintainability.

On the GOCART2G model side, Dr. Buchard has continued maintaining the GOCART2G aerosol model on GitHub, coordinating new pull requests from both internal colleagues and NOAA collaborators, and participating in the testing of new features. Additionally, Dr. Buchard presented her research findings on aerosol data assimilation at the CEOS AC-VC meeting in College Park, MD, and at the Fall AGU conference in Washington, DC.

Dr. Buchard plans to continue her work on aerosol data assimilation (DA) within GEOS. This includes ongoing testing of VIIRS data integration into GMAO's operational DA system, with plans to eventually publish an article documenting the impact of VIIRS DA. As the JEDI-based

aerosol DA framework matures, she will begin testing the impact of assimilating multi-wavelength AOD observations on aerosol forecasting capabilities.

ALLISON COLLOW

Sponsors Arlindo da Silva & Patricia Castellanos / Code 610.1 / Task 051

Dr. Collow's primary role is to lead the evaluation of aerosols in the Goddard Earth Observing System (GEOS) through the various stages of model development. This evaluation and validation ranges across research, experimentation, pre-production, and operational products. In the experimental framework, Version 12 of the GEOS atmospheric general circulation model is characterized by a major shift in the model state including changes in vertical resolution, temporal resolution, and moist physics. These code changes have had a profound impact on the aerosols. Dr. Collow worked to ensure the impact of each code change on aerosols is well understood and does not cause a degradation in our representation with respect to observations. Previously, Dr. Collow had documented a new version of GOCART-2G, and this version of the aerosol module has since made its way into pre-production testing. She evaluated the aerosols from GOCART-2G in "x-runs" and a parallel version of forward processing. Based on her results, she is optimistic that GOCART-2G will be included in the next operational version of GEOS FP, which will be put into production in the coming months. Dr. Collow has compiled documentation on these results as well as the changes to the aerosol file specification that will be posted on the GMAO website when the system goes into production.

A specific type of evaluation for aerosols in GEOS has utilized observations from the ASIA-AQ airborne field campaign. Dr. Collow compared vertical profiles of aerosol mass from the model to observations collected over the Philippines, South Korea, and Thailand. Findings from this evaluation demonstrated that there are spatial and temporal biases in the nitric acid and oxidant fields that are prescribed and used to drive sulfate and nitrate chemistry. Additionally, biases in organic carbon over Thailand provided additional evidence that biomass burning emissions are missing from small fires in the region and that revisions are needed in the optical properties for smoke.

Dr. Collow has been involved in the reanalysis activities with the GMAO. Aside from attending weekly meetings to offer guidance pertaining to aerosols, she evaluated the representation of aerosols in preliminary data for the next reanalysis, MERRA-21C. Preliminary evaluations have been presented internally at GMAO monitoring meetings and externally at the AGU fall meeting and a seminar given at UMBC.

Wildfire smoke plays a large role in the Earth-atmosphere system. At the present time, smoke emissions are prescribed within GEOS using an in-house product, QFED, that derives emissions from MODIS observed fire radiative power. In collaboration with others in the GMAO as well as GESDISC, Dr. Collow is preparing a new version of QFED that also includes fire radiative power from VIIRS to be used by GEOS and released to the public.

Dr. Collow spent a small fraction of her time contributing toward the reanalysis instance of the FLUID website. As part of that effort, she produced a new style of seasonal cycle time series plots from MERRA-2 that will soon be added to the FLUID website. A sample figure that can be found on the website is shown here (in this case, global mean 2 m temperature for 2024

compared to the period of 1980 through 2024). The first half of the year 2024 marked the warmest global temperatures on record since the beginning of MERRA-2 in 1980.

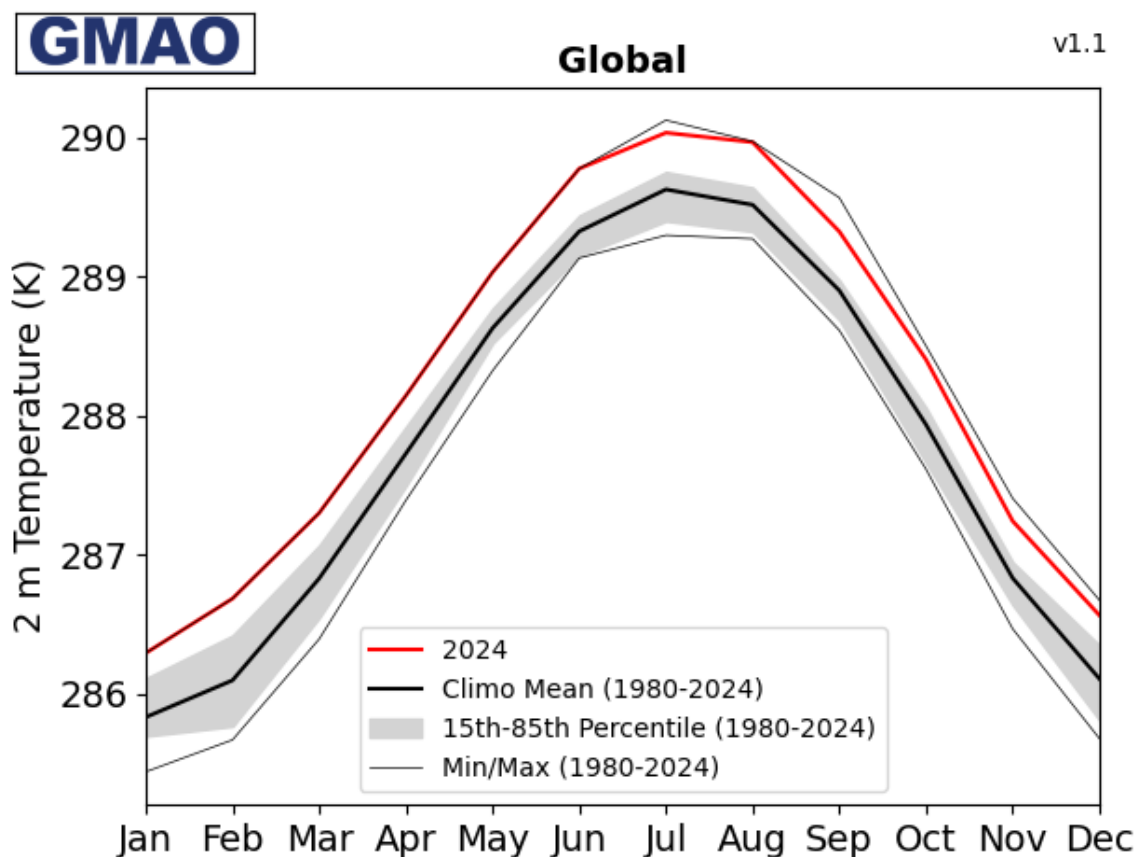


Image: A sample figure from the FLUID website shows global mean 2 m temperature for 2024 compared to the period of 1980 through 2024. Credit: A. Collow.

Over the next year, Dr. Collow expects to continue to lead the evaluation effort for aerosols in GEOS. A large focus will be placed on version 12 of the model and the validation of MERRA-21C. Dr. Collow anticipates that she will contribute toward incorporating updated versions of QFED biomass burning aerosol emissions and CEDS anthropogenic aerosol emissions in future versions of GEOS.

MANISHA GANESHAN

Sponsor Rolf Riechle / Code 610.1 / Task 052

The research performed under this grant involves investigating the impact of assimilating SMAP soil moisture observations on the prediction of landfalling Tropical Cyclones (TCs). Dr. Ganeshan's contribution included analyzing output from Observing System Experiments (OSEs) using a weakly coupled version of the GEOS ADAS and LDAS systems to explore the sensitivity of TCs and TC-related precipitation to soil moisture. Dr. Ganeshan utilized the Integrated Multi-satellite Retrievals for GPM (IMERG) data for validation of TC-related precipitation. She further helped develop diagnostic metrics to quantify the land influence on TC structure and intensity by conducting back trajectory analyses and helping to isolate the land areas that influence the TC. She contributed to a manuscript describing this research that was published in the Quarterly Journal of the Royal Meteorological Society.

Dr. Ganeshan will continue working on the successor SMAP-funded project to systematically investigate the value of assimilating SMAP observations for TC predictions globally. She will contribute a follow-up manuscript to the TC Idai paper, investigating the impact of SMAP on TCs Gulab (2021) and Chaba (2022). She also will run experiments using the coupled GEOS ADAS and LDAS systems as needed.

ERICA MCGRATH-SPANGLER

Sponsor Rolf Reichle / Code 610.1 / Task 052

Dr. McGrath-Spangler's work on this task is focused on evaluating the impact of NASA's Soil Moisture Active Passive (SMAP) soil moisture information on numerical weather prediction. As part of this project, SMAP data are assimilated into the coupled land-atmosphere Global Earth Observing System (GEOS) data assimilation system (DAS) and compared to a control simulation in a set of Observing System Experiments (OSEs) to calculate the beneficial impact to tropical cyclones (TCs) that are proximate to land. Recent efforts have focused on Cyclone Idai (2019) that affected the population on the southeastern African continent and Madagascar. This work was recently published in a peer-reviewed article, and it was highlighted as a NASA GMAO Science Snapshot. For this project, Dr. McGrath-Spangler led the evaluation of the TC impact in both analyses and forecasts.

Additionally, Dr. McGrath-Spangler began preparations for the implementation of a new project based on a proposal selected in August 2024. This proposal, "A systematic investigation of the potential of SMAP soil moisture assimilation for improving the simulation and prediction of tropical cyclones", led by J. Kolassa, is focused on a full calendar year to include worldwide tropical cyclones interacting with land. Dr. McGrath-Spangler determined appropriate criteria for defining land-interacting TCs and identified over 40 that meet these criteria. Furthermore, she determined the names and dates of 10 Atlantic hurricanes that developed within the Main Development Region (MDR) from African Easterly Waves originating over the African continent.

Following the departure of the project PI, Dr. Jana Kolassa, in early August, Dr. McGrath-Spangler will work with the new project PI, Dr. Anthony DeAngelis. The coming months will focus on completing year-long control and assimilation runs as part of an OSE set examining the impact of SMAP assimilation on land-interacting TCs. As the data become available, Dr. McGrath-Spangler will begin evaluating the representation of the previously identified TCs in the coupled land-atmosphere experiments.

EUNJEE LEE

Sponsor Lesley Ott / Code 610.1 / Task 059

Dr. Lee has been working on hydrological forecasts for the rivers in Southeast Asia. She led the research and found that use of satellite-based rainfall in areas of uncertain gauge measurements improves the subseasonal streamflow forecast at the regional rivers through proper land initialization. The manuscript led by Dr. Lee is under review at Water Resources Research. As a co-author, Dr. Lee has contributed to five other papers. One co-authored paper, recently accepted by Journal of Hydrology, examines the effect of land model's resolution on soil moisture and wildfire simulations. The other topics of the co-authored papers include hydrological forecasting over the CONUS, methane forecasting for the Amazonia,

characterization of hydrological extremes in Asia, and investigation of the various contributing factors to river discharge in Myanmar. In addition, she has been evaluating the performance of the new version (v5.1) of the Catchment-CN land surface model and conducting the spin-up experiments.

Dr. Lee will participate in writing a proposal entitled “Subseasonal-to-Seasonal Forecast of Nutrient Pollution in Florida” as a Co-I in response to NASA ROSES A.7. Water Quality Applications. She will also continue to perform the evaluation of the Catchment-CN5.1 model and conduct scientific experiments of the wildfire forecast.

YOUNG - KWON LIM

Sponsor Andrea Molod / Code 610.1 / Task 061

Dr. Lim has contributed to a range of projects, such as: 1) improving and evaluating NASA’s GEOS subseasonal to seasonal (S2S) forecasting model, 2) exploring the atmospheric dynamics behind extreme weather/climate events and their predictions using the GEOS model and assimilation system, 3) assessing the GEOS S2S system’s capability in capturing and predicting major climate modes and tropical cyclones, 4) examining how surface salinity assimilation impacts Madden-Julian Oscillation (MJO) simulations, 5) assessing the benefits of using non-hydrostatic high-resolution models for better MJO simulation, and 6) investigating the representation of the MJO and its link to the Quasi-Biennial Oscillation (QBO) in the upgraded GEOS Atmospheric General Circulation Model (AGCM), which features enhanced gravity wave drag and vertical resolution.

In Project #1, Dr. Lim has worked as the S2S forecast team member to help develop and validate Version 3 of the GEOS subseasonal-to-seasonal forecast system (GEOS-S2S-3). For evaluation, his focus was on the model’s performance in simulating tropical cyclones, ENSO, key climate modes, and the Madden-Julian Oscillation (MJO), particularly its associated moist processes. He presented findings on the model’s skill in representing and forecasting MJOs at the AGU meeting. In Project #2, he studied the atmospheric dynamics behind the deadliest 2023 Texas heatwaves and the historic flooding events across the contiguous U.S. Working with collaborators, he authored two papers, one as lead author (revised version under review currently) and the other as a coauthor (published), in the Journal of Climate. In Project #3, he collaborated with the Columbia University team for the MAP project to identify how well the GEOS S2S system reproduces observed tropical cyclone characteristics, including their spatial patterns, frequency, and intensity. This research resulted in two publications in Weather and Forecasting. For Projects #4 and #5, he investigated the impact of assimilating sea surface salinity data and increasing spatial resolution on improving MJO simulations. His results were shared at the AGU meeting, and two related papers are expected to appear in Journal of Climate and Nature/Scientific Data. Finally, in Project #6, he demonstrated that the upgraded GEOS AGCM system offers improved representation of the MJO's connection to the Quasi-Biennial Oscillation (QBO), with findings also presented at the AGU meeting.

No further research is expected as this task will end on Sept 30, 2025.

DHRUVA KATHURIA

Sponsor Alexey Shiklomanov / Code 610.1 / Task 093

Dr. Kathuria has been working on developing novel Bayesian statistical algorithms for predicting plant functional traits (e.g., chlorophyll, nitrogen, etc.) from hyperspectral data at leaf and canopy scales. He has successfully developed a statistical algorithm which is (a) interpretable, (b) computationally efficient, (c) accounts for uncertainties in input reflectance, and (d) provides parameter and prediction uncertainties. The proposed algorithm is an improvement over commonly used algorithms, such as Partial Least Squares Regression. The algorithm is relevant to developing trait retrieval algorithms for upcoming hyperspectral satellite missions, such as Surface Biology and Geology (SBG). Dr. Kathuria has finished a manuscript on this work which is under review in the journal Ecological Applications.

Dr. Kathuria is also working on improving the land surface temperature (LST) product of the Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2) reanalysis product produced by NASA GMAO at approximately 50 km spatial resolution by characterizing its spatio-temporal variability using 2 km hourly LST data Geostationary Operational Environmental Satellites (GOES)-R satellites. This analysis will help us better understand how much information is lost when we go from 2 km GOES resolution to 50 km Merra resolution and how this information loss varies between land use/land cover types. Dr. Kathuria has finalized the related manuscript, which will be submitted to the Journal of Applied Climatology and Meteorology in September 2025.

Additionally, Dr. Kathuria is working on developing novel unmixing algorithms to generate flowering maps using airborne and satellite hyperspectral data. A manuscript based on this work, accepted in the journal Ecosphere, successfully maps yellow flowering areas using airborne data collected as part of the SBG High-Frequency Time Series (SHIFT) campaign in Santa Barbara, California. Dr. Kathuria is a co-investigator on a NASA ROSES proposal that was accepted to extend this work to other study sites.

Dr. Kathuria is also a core member of the NASA VSWIR vegetation group. In these roles, he is developing vegetation trait algorithms for future hyperspectral missions. Dr. Kathuria is also working with the JPL SBG thermal team. He has developed global atmospheric uncertainty maps that will be delivered to JPL in October. These uncertainty maps will be used to quantify the uncertainty caused due to atmosphere on land surface temperature retrievals of the Temperature Emissivity Algorithm. Dr. Kathuria will also write a short data paper based on this work.

Dr. Kathuria is currently finalizing a paper based on his land surface temperature work, which will be submitted to Journal of Applied Climatology and Meteorology in September 2025. Dr. Kathuria also will deliver atmospheric uncertainty quantification maps to JPL as part of the core SBG thermal uncertainty quantification work. Additionally, he will develop the VSWIR Plants database for future hyperspectral VSWIR missions.

ANDREW FOX

Sponsor Rolf Reichle / Code 610.1 / Task 094

Over the past year, Dr. Fox focused on developing new land data assimilation (DA) capabilities to support GEOS reanalyses, including the supplemental land surface reanalysis MERRA-21C-Land. He enhanced the GEOS Land Data Assimilation System (GEOSIdas) to assimilate L-band brightness temperatures from SMAP (2015–present) and SMOS (2010–present), surface soil moisture from ASCAT (2007–present), and snow-cover fraction from MODIS (2000–present) into the NASA Catchment land surface model, and he conducted 25-year global DA experiments. His code is included in the public GEOSIdas v20.1.0 release (<https://github.com/GEOS-ESM/GEOSIdas/releases/tag/v20.1.0>). He evaluated DA impacts using observation-minus-forecast (O–F) statistics, comparisons with *in-situ* and satellite benchmarks, and analysis of anomaly variance and trends relative to a free-running model. Dr. Fox also submitted and revised a manuscript on joint SMAP–ASCAT assimilation in GEOSIdas, which has been published in the *Journal of Hydrometeorology*.

Dr. Fox is drafting a manuscript describing the 25-year global DA experiments. Preliminary results indicate that multi-sensor DA improves model skill, modifies hydrologic variability, and enhances detection of extremes (droughts, floods, snowmelt), with stepwise gains aligned with the introduction of new observations. He plans to submit this manuscript in Fall 2025. He is also preparing a manuscript on new GEOSIdas capabilities for assimilating CYGNSS soil-moisture observations.

YUJIN ZENG

Sponsor Steven Pawson / Code 610.1 / Task 124

Dr. Zeng has developed a new global runoff routing model based on hydraulic geometry principles and hydrologic catchments. The model leverages 1) the river network topology defined by the Pfafstetter coding system, 2) hydraulic geometry principles linking river discharge to flow velocity, 3) calibration with more than 2.7 million field measurements of flow velocity across the contiguous United States (CONUS), and 4) information and simulations of lakes and reservoirs. The offline version of the model has been completed and tested. Dr. Zeng is now working on implementing the routing model within NASA's GEOS Land Data Assimilation System (GEOSIdas).

Dr. Zeng is developing an urban module designed for integration with GEOSIdas. This module aims to improve the representation of urban processes, particularly in capturing urban heat island effects and other urban impacts in Earth system modeling.

Dr. Zeng's future work includes implementing the developed runoff routing model within GEOSIdas as well as the continued development and testing of the urban module.

WILLIAM S. OLSON

Sponsor Michael Bosilovich / Code 610.1 / Task 125

The overarching goal of this task is to produce a budget-consistent description of the Earth's water and energy cycles. That is, for any region of the globe over a given time period, the amount of water or energy being horizontally transported into (out of) a region either leads to

increases (decreases) of water/energy storage in that region or vertical fluxes of water/energy out of (into) the region. For example, water vapor carried by the atmosphere into a region must lead to an increase of total water vapor storage in the atmosphere of that region or increased precipitation or decreased evaporation at the surface in that region. In the current project, the globe has been divided into 25 continental/ocean basin regions, and monthly water and energy flux/storage data have been collected for each region; however, due to errors in those data, the budgets of water and energy data are not balanced.

The balancing method, previously developed, for calculating budget-consistent water and energy fluxes/storages closest to the collected (and unbalanced) monthly, regional observations is an application of constrained optimization, which (a) assumes that the collected observations are unbiased and Gaussian-distributed, and (b) requires estimates of the uncertainties of those observations. In Year 3, the assumption of unbiased, Gaussian-distributed errors in the observations was challenged by Dr. Olson, since mean imbalances of the water and energy fluxes/storages were shown to have an annual cycle that dominated the yearly imbalance cycle. This suggests that the observational errors that contribute to the yearly imbalances are also cyclical and systematic. Dr. Olson proposed a simple two-parameter model for the systematic error of each water and energy budget component, as well as an optimization method for estimating the two parameters using the full time series of available water and energy data.

This past year, Dr. Olson studied the capability of the two-parameter model to represent systematic errors of the water and energy cycle components. He determined that the use of two parameters led to overfitting of the water/energy data, but a simple one-parameter bias adjustment could still reduce systematic errors substantially—almost the same reduction of error that could be obtained using the two-parameter model. In addition, Dr. Olson revised his general software to calculate *a priori* error standard deviations of the water/energy observations that could be used as approximate “bounds” on any adjustments of the observations that are needed to achieve balance. The software performs estimates of both random errors and potential systematic errors using multiple, redundant time series of the observations from different sources. The determination of *a priori* error “bounds” is important because the balanced state is not necessarily unique, and without bounds on the solution, the balancing procedure could find balanced, but unrealistic, water/energy component fields. Dr. Olson also developed a Monte Carlo procedure to investigate the uncertainties of the error estimation procedure due to the limited time series of observations (~ 20 years) and the limited number of alternative time series (~ 3). The Monte Carlo technique revealed that uncertainties of estimated random errors of observed precipitation could be in the range of 5-14% if the full time series is used, or 20-50% if only data from each calendar month are grouped to assess the errors. Potential uncertainties of bias errors could be ~50% if only 3 alternative time series of observations are utilized, or ~40% if 4 alternative sets are used.

In the coming months, *a priori* errors for each water and energy cycle component will be evaluated in relation to other estimates developed by Drs. Brent Roberts and Seiji Kato of NASA’s water and energy cycle investigation team. With the anticipated addition of new time series of model reanalysis variables, a complete set of *a priori* random and bias error estimates should be produced, and final, balanced water and energy component fields will be generated.

CARL MALINGS

Sponsor Patricia Castellanos / Code 610.1 / Task 129

Dr. Malings is PI on a NASA ROSES funded project in Earth Science Applications: Health and Air Quality to combine model, satellite, and in-situ monitor data to improve air quality forecasting. Since Sep 2023, he has worked to develop, test, and refine data fusion algorithms. He has attended numerous project team meetings and meetings with end-users and stakeholders to discuss developments in the project and future needs. He has published a paper describing the methodology of this work and has secured funding for a follow-on project.

Dr. Malings was selected as a member of the NASA [Health and Air Quality Applied Sciences Team](#) (HAQAST) for the fourth iteration of this team in June 2025. His core HAQAST project, for which he is PI, will be to implement the air quality forecasting data fusion system, developed under the above project, for application across several Latin American cities. He will also contribute to other HAQAST activities to increase stakeholder capacity in the use of NASA Earth observations and data products in air quality and public health decision-making.

Dr. Malings is working on a NASA ROSES funded project supporting the Asia-AQ field campaign (Jan-Feb 2024) by providing high spatial and temporal resolution air quality forecasts. Since Sep 2023, he has gathered necessary surface, model, and satellite datasets to support forecasting, and has experimented with various approaches to combining these data, including statistical and deep-learning-based methods.

Dr. Malings is a trainer in the NASA Applied Remote Sensing Training (ARSET) capacity-building program in the Health and Air Quality topic. He has contributed to the in-person training "[Introduction to Geostationary Satellite Observations for Air Quality Applications in the Western US](#)" in Fort Collins, Colorado (Aug 2025), and helped to coordinate the virtual training "Remote Sensing for Climate-Sensitive Infectious Diseases" (Sep 2025). He participated in a live Q&A session "[Ask NASA ARSET: Remote Sensing Observations for Air Quality Applications](#)" (Sep 2024). He contributed to the development of an online self-paced training in the [Fundamentals of Remote Sensing](#) (opened Jan 2025) and is contributing to another online self-paced training in the Fundamentals of Air Quality Remote Sensing (still under development, anticipated Jan 2026).



Photo: Dr. Carl Malings (seated, farthest right) was an organizer and instructor at the NASA ARSET workshop “Introduction to Geostationary Satellite Observations for Air Quality Applications in the Western US”, held in Fort Collins, Colorado, 5-7 Aug 2025. This workshop, attended by 34 participants from US federal, state, and local air quality management organizations, as well as university and private sector partners, was aimed at expanding this community’s use of NASA data in general, and data from the new TEMPO mission in particular. Credit: Shawn McClure.

Dr. Malings continues to engage in various activities aimed at promoting the use of NASA resources in air quality applications and building user capacity. This includes serving as a guest lecturer in an introductory course on air quality at UMBC (Apr 2025). Dr. Malings also continues to serve as a lead of the GSFC Air Quality and Health work group (since 2021), a lead of the GEO Health Community of Practice Air Quality Working Group (since 2023), and an organizer of the GMAO Machine Learning and AI Journal Club (since May 2024) and the GMAO Seminar Series (since Aug 2024).

Dr. Malings will begin to serve as PI on a NASA ROSES funded project on Responsive Science Initiatives Research. This project will create a km-scale global reanalysis product and apply this product to quantify uncertainties in downscaled climate projections with applications to end-users, such as stormwater infrastructure managers. This project will begin Oct 2025. Dr. Malings will coordinate the overall project and consult with project end users to ensure the developed reanalysis product and uncertainty estimates meet their needs.

Dr. Malings is collaborating with others at NASA and elsewhere to prepare a pre-conference workshop associated with the AfriGEO meeting in Oct 2025. This workshop will present an introduction to how satellite remote sensing data can be used to study air quality and will illustrate several approaches to accessing these data. This workshop will help to address specific

challenges of African air quality and public health officials, including a lack of *in-situ* monitoring equipment and limited internet connectivity and computational resources.

KATHERINE BREEN

Sponsor Donifan Barahona / Code 610.1 / Task 140

Dr. Breen collaborated on a Science Task Group to quantitatively evaluate foundation models for weather and climate against the operational forecast system, GEOS-FP. She led analyses of five foundation models (GenCast, Aurora, Privthi WxC, Pangu, and AIFS) “out-of-the-box” for 10-day forecasts spanning December 2023 to January 2025. These models were evaluated using mean global anomaly correlation coefficients and biases relative to input reanalysis, as well as error and correlation statistics across vertical levels and geographic regions. The results of this work are now informing additional experiments on ensemble member generation for background forecasts, high-resolution replay forecasts, vertical profile interpolation, and machine learning applications for data assimilation.

In addition, Dr. Breen served as co-investigator on several successfully funded ROSES proposals submitted in 2024 and 2025. She was a co-author on multiple publications, including studies advancing machine learning parameterizations of vertical velocity variability and aerosol mass and number concentrations, as well as a highly cited Nature Communications paper on the atmospheric response to changes in international shipping regulations led by Dr. Tianle Yuan.

Dr. Breen gave numerous presentations at major scientific meetings. She delivered invited talks at the Reanalysis Conference at the University of Tokyo, the American Meteorological Society annual meeting, and the ICAMS Workshop for interagency collaboration. She also presented Hyperwall talks at Supercomputing 2024 and participated on a panel on machine learning for Earth science at the 2024 American Geophysical Union meeting.

Dr. Breen will continue work to leverage foundation models, reanalysis, forecasts, and observations to reconstruct vertical structure in prognostic variables for weather and climate simulations. This activity is expected to generate proof-of-concept results for a forthcoming ROSES proposal. She is also preparing a ROSES proposal as principal investigator to use machine learning and dynamically downscaled reanalyses with NASA foundation models to predict extreme precipitation, with targeted applications for water resource management in the state of Maryland.

MANISHA GANESHAN

Sponsor Yanqiu Zhu / Code 610.1 / Task 152

Under this task, Dr. Ganeshan works on two projects. The goal of the first project is optimal utilization of satellite hyperspectral infrared radiances from AIRS and CrIS instruments in the GEOS Hybrid 4D-EnVar data assimilation system and model, by favoring radiance assimilation in areas affected by clouds surrounding Tropical Cyclones (TCs). Dr. Ganeshan contributed to analyzing the representation of TC Sally (2020) in an all-sky experiment, which allows assimilation of all-sky CrIS radiances as opposed to clear-sky only radiances. There is a significant improvement in the vertical structure of TC Sally as well as in its predicted intensity and track, in the all-sky experiment. The results of this study are currently being written in a manuscript, and Dr. Ganeshan is a co-author. She also contributed to preparing GEOS code for

the assimilation of radiances within AI-generated TC masks for the 2020 hurricane season as part of an adaptive thinning or variable thinning experiment to be run in the GEOS Hybrid 4DnVar system. The results of this adaptive thinning experiment will be summarized in a separate manuscript. As part of this project, Dr. Ganeshan also runs the 2D Hilbert Huang Transform (HHT) for Mars to compare the output from various Martian models. The HHT is an advanced signal processing technique for analyzing non-linear and non-stationary fields, like zonal and meridional winds, and it is available in open multi-processing (openMP) mode on NCCS' Discover. Dr. Ganeshan participated as co-I in a proposal to NASA ROSES 2024 Mars Data Analysis Program as part of this work.

Dr. Ganeshan also contributes to a project exploring strategies for assimilating planetary boundary layer (PBL) height observations in the GEOS, with her specific task being to assist in the assimilation of Global Navigation Satellite System Radio Occultation (GNSS RO) observations and their derived PBL heights globally. She helped in tuning the RO algorithm to prepare the data for assimilation in the GEOS as well as in assessing the impact of assimilating RO-derived PBL heights in the GEOS. Dr. Ganeshan contributed to two papers: "Utilizing PBL Height Data from Multiple Observing Systems in the GEOS System (I): Assimilation Framework", published in Monthly Weather Review, and "Utilizing PBL Height Data from Multiple Observing Systems in the GEOS System (II): Assessment of PBL Height Data", submitted to Journal of Geophysical Research-Atmospheres. Dr. Ganeshan participated in two proposals as co-I and one proposal as collaborator, all of which were submitted to the NASA ROSES 2024 Decadal Survey Incubation program.

Dr. Ganeshan will contribute to writing two manuscripts, the first one describing the impact of all-sky assimilation of CrIS radiances in the GEOS and specifically, on the representation and prediction of TC Sally. The second paper will investigate the impact of using AI-derived TC mask for the optimal assimilation of clear-sky CrIS radiances, specifically with respect to TCs during the 2020 Hurricane season. She also will contribute to an IRAD project investigating the feasibility of improving Martian weather prediction by designing OSSEs to be run using the NASA Ames, Mars WRF, and EMARS models.

Dr. Ganeshan will continue working on the successor project for building PBL data assimilation capability in the GEOS. She will derive PBL height from commercial GNSS RO satellites, such as Spire, GeoOptics, PlanetiQ, depending on their availability, and assess their quality prior to assimilation in the GEOS model. She will contribute to other areas of this project as needed. Dr. Ganeshan is also contributing to a paper which compares GNSS RO derived PBL height with that obtained from ground-based instruments, such as Micro-Pulse Lidar Network (MPLNet), ceilometer, and Radar Wind Profiler (RWP) over the Beltsville area.

AMIN DEZFULI

Sponsor Michael Bosilovich / Code 610.1 / Task 162

Dr. Dezfuli has been contributing to the Framework for Live User-Invoked Data (FLUID), which is an online platform for climate/weather visualization developed at GMAO. In this task, he writes and runs computer programs that produce NetCDF files for MERRA-2-based climate statistics, which are then plotted in FLUID. The files are also transferred to GES-DISC to be available to the broader community.

He is a team member of the GMAO's Weather Applications and Diagnostics group funded by NASA, working on various applications of extreme weather events in the U.S. using NASA products. Dr. Dezfuli also served as a co-author on the paper "Evaluation of Seasonal Precipitation Forecasts in the Tigris-Euphrates Basin," which is in revision at Journal of Hydrometeorology.

Dr. Dezfuli has been assisting the Goddard Applied Science Program Manager to coordinate an interagency health-related collaboration between NASA and CDC, which will continue through June 2027. Additionally, he co-leads a cross-disciplinary study examining the impacts of weather extremes on migraine headaches in the United States. This collaborative research involves neurologists from Johns Hopkins University School of Medicine and the Medical University of South Carolina. Nearly 100 patients have been recruited since September 2024, with data collection ongoing. Dr. Dezfuli has conducted preliminary analyses in close communication with the medical team members. Analysis continues as new data arrive, and by the end of August 2025, the team will be able to capture any seasonality in migraine-weather links. The team plans to pursue external funding to support continuation of the study and involve several other institutions that have expressed interest in participating.

Dr. Dezfuli has obtained neonatal data for more than one million patients across the U.S. through a data use agreement (DUA) between UMBC and a healthcare provider company. He has preprocessed the data and plans to integrate NASA Earth observation data to explore impacts of compound weather extremes on preterm birth.

Following up on a recent interdisciplinary project that he led, Dr. Dezfuli is planning to further explore the continental patterns of bird migration in North America and their large-scale climatic drivers. He is also actively looking for external funding for this analysis.

EUN - GYEONG YANG

Sponsor Yanqiu Zhu / Code 610.1 / Task 163

Dr. Yang continued to develop and refine Planetary Boundary Layer (PBL) height (PBLH) Data Assimilation (DA) capability in the Goddard Earth Observing System (GEOS) model and DA system. With radar wind profiler-based model PBLH, which was newly developed by the team, Dr. Yang assimilated PBLH data derived from radar wind profiler observations with the consistent PBLH definition in the GEOS model; she found that the consistent comparisons between observed and model PBLHs are essential for assimilation. In addition, Dr. Yang has explored an innovative approach to assimilate Global Navigation Satellite System Radio Occultation (GNSS-RO) refractivity gradient to improve the representation of thermodynamic structures for lower troposphere in the GEOS model. Dr. Yang has been investigating PBLH increment to forecast model via parameter adjustment in physics scheme in the GEOS model by performing and analyzing the experiment assimilating PBLH data derived from radiosonde and GNSS-RO observations. Dr. Yang has conducted and evaluated one month of experiments to demonstrate the impact of assimilating PBLH data, resulting in a first-author manuscript submitted to *Journal of Geophysical Research: Atmospheres*. Dr. Yang also presented these scientific results to an interdisciplinary audience at the 2024 AGU Annual Meeting and the NASA Decadal Survey Planetary Boundary Layer Incubation Community Meeting in 2025. Dr. Yang was recognized with the NASA Goddard Space Flight Center (GSFC) GMAO Peer Award for Outstanding Contribution by GMAO members in 2024.

In the coming months, Dr. Yang will work on enhancing and analyzing parameter adjustment approach and DA capability for GNSS-RO refractivity gradient in the lower atmosphere. Dr. Yang will evaluate and assimilate lidar-based PBLH data updated with machine learning method, and integrate lidar-based PBLH derived from space- and ground-based observations with the consistent lidar-based model PBLH, which will be developed soon with the latest version of GEOS model. Dr. Yang will also work on incorporating peer-review feedback for the manuscript she submitted regarding PBLH DA studies.

MICHAEL J. MURPHY, JR.

Sponsor Steven Pawson / Code 610.1 / Task 168

Dr. Murphy has been working on the use of Global Navigation Satellite System (GNSS) Radio Occultation (RO) observations in the GEOS numerical weather prediction (NWP) modeling and data assimilation system. His focus has been on assessing 1) the impact of assimilating large datasets of commercial RO, 2) using these commercial RO observations in GMAO's upcoming MERRA-21C product, and 3) improving how RO (including commercial) observations are used in GEOS. The assimilation work has primarily used the massive dataset of commercial RO from Spire in NASA's Commercial Smallsat Data Acquisition (CSDA) archive, but also has included a broader range of commercial RO from various commercial providers as part of his participation in the RO Modeling Experiment (ROMEX) in collaboration with numerous operational NWP centers and UCAR's COSMIC Program.

Part of his assimilation work compares the quality of the Spire RO dataset in the CSDA archive to the much smaller real-time Spire RO dataset acquired by NOAA and the state-of-the-science COSMIC-2 RO mission. This assimilation work was important in the decision of whether and how to include the CSDA Spire RO observations into MERRA-21C. Evaluations of MERRA-21C are beginning and documentation of how RO was used in this product is nearly completed. Further assessment of the impact of assimilating commercial RO was undertaken in the context of ROMEX, and the comparison was made between the impacts in GEOS to the modeling systems of the other major NWP centers that participated. An issue with the geopotential heights in the analyses and forecasts from all NWP centers was identified and attributed to a small bias in RO observations themselves. This bias is in all RO observations and is not specific to commercial RO; it was previously overlooked as it only has a large effect on the models when large volumes of RO is assimilated (tens of thousands of RO profiles per day, as is the case for commercial RO). Despite this bias issue, the overall impact of assimilating the ROMEX commercial RO was consistently positive across NWP centers.

Dr. Murphy's work to improve how RO observations are used in GEOS focuses on how commercial RO observations are managed within the modeling framework and has included the observation uncertainty model and quality controls performed on RO observations. This was motivated by the desire to use more of the RO observations in the GEOS NWP system, particularly for commercial RO, which is currently not used below approximately 3 km in altitude, as well as using a framework that is more consistent across latitudes and RO missions. This work includes careful review of current procedures, the implementation of the ECMWF method of specifying observation uncertainties and quality control checks, and initial assessment of its impact on the NWP forecasts. This implementation of the ECMWF method was shared with colleagues within GMAO and has been used for an OSSE project that Dr.

Murphy assisted Dr. Privé with. Finally, Dr. Murphy has been working with RO colleagues at NASA JPL on ways to use the emerging technique of polarimetric RO in NWP models, including a NASA ROSES proposal that was evaluated as “selectable” on this topic.

During the next year, Dr. Murphy will continue work on evaluating the impact of assimilating commercial RO in the context of ROMEX as well as the CSDA Spire experiments. The impact of the bias in RO observations found in ROMEX on GEOS forecasts and analyses will be further investigated, and the impact of using alternative methods of observation uncertainty and quality control procedures for RO on GEOS forecasts will be further assessed. Collaborative work with JPL on polarimetric RO will continue, including using Spire commercial polarimetric RO observations available through NASA’s CSDA archive.

RETHA MECIKALSKI

Sponsor Steven Pawson / Code 610.1 / Task 169

Dr. Mecikalski has been working on developing a new lightning simulation algorithm (called FLASH: FLash Algorithm derived from Satellite Harmonization) that uses only infrared (IR) channels from the NOAA Geostationary Operational Environmental Satellite (GOES)-East domain. She also has been working on implementing the FLASH algorithm in the NASA GMAO’s Goddard Earth Observing System (GEOS) ESM (hereafter the “GEOS model”). The aim of this new scheme is to improve the location and amount of forecasted lightning flashes compared to the current lightning parameterization schemes in the GEOS model.

The new FLASH algorithm was applied to GOES-East IR data on 20 test days and compared to Geostationary Lightning Mapper (GLM) observations as well as two current lightning parameterization schemes within GEOS: (1) the “GCHEM” scheme, and (2) the “GCTM” scheme. Both of these schemes over-estimate the amount and spatial coverage of lightning compared to the observations. Statistical tests that were performed showed the new FLASH algorithm outperformed the current lightning parameterization schemes from the GEOS model for 100% of the test cases for the full GOES-East domain.

The FLASH algorithm was then adapted and applied to the stretched grid of the 24-hour GEOS forecasted satellite IR fields with a resolution of 2 – 12 km ($\sim 0.0625^\circ$) for 30 consecutive days (22 April 2025 - 21 May 2025). Statistical tests were performed to verify the accuracy of the 24-hour forecasted lightning from the FLASH algorithm as compared to lightning observations from GLM. Although the overall probability of detection over the domain is <0.63 , the false alarm rate is also very low (<0.05), leading to accuracies of >0.90 over the domain. The figure below shows a comparison between (a) the gridded observed GLM flashes versus (b) the gridded 24-hour forecasted lightning from the new FLASH algorithm for a case on May 13, 2025. Work is ongoing to improve the FLASH algorithm when applied to the 24-hour GEOS forecasted satellite fields for the stretched grid, including expanding the algorithm to other regions, such as EUMETSAT’s Meteosat Third Generation domain coverage, as well as to the entire GEOS domain.

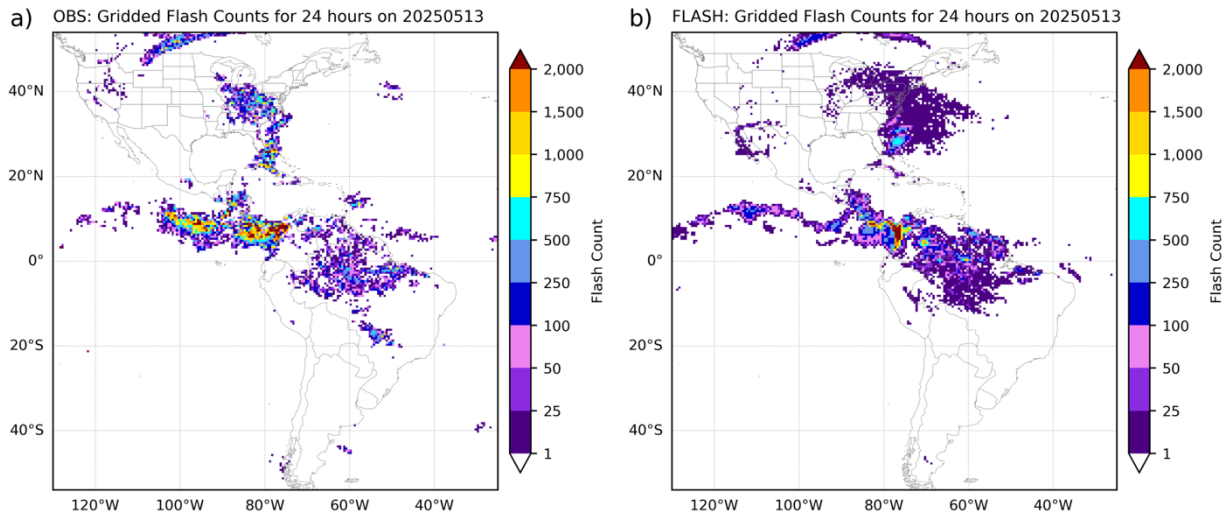


Image: Comparison between the (a) gridded observed GLM flashes from GOES-East versus (b) the gridded 24-hour forecasted lightning from the new FLASH algorithm for a case on May 13, 2025.

Dr. Mecikalski will work on developing two papers for submission to journals: the first paper will focus on the results from FLASH algorithm when applied to NOAA (GOES)-East IR data, and the second paper will focus on the results from the FLASH algorithm when applied to the 24-hour GEOS forecasted satellite IR fields. Additionally, Dr. Mecikalski submitted an abstract to present her FLASH algorithm at the 27th Conference on Satellite Meteorology, Oceanography, and Climatology at the American Meteorological Society's annual conference in January 2026.

AMITA MEHTA

Sponsor Nathan Arnold / Code 610.1 / Task 171

This task began in October 2023 with the goal of developing a statistical disaggregation methodology for precipitation to be used in a land surface model. The project concluded in June 2025. Dr. Mehta, assisted by UMBC Data Science graduate student Nimit Tolia, worked on the disaggregation of IMERG (Integrated Multi-satellitE Retrievals) for GPM (Global Precipitation Measurement) precipitation data. With support from Mr. Tolia, Dr. Mehta used 20 years of half-hourly IMERG data at $0.1^\circ \times 0.1^\circ$ spatial resolution to compute statistical parameters for disaggregation. They validated the IMERG precipitation data using radar precipitation data and tested and mapped the disaggregation parameters. The resulting disaggregation parameter data and precipitation statistics have been delivered to Dr. Arnold for use in downscaling precipitation from a global atmospheric model with $1^\circ \times 1^\circ$ resolution to $0.1^\circ \times 0.1^\circ$ resolution.

This project has been completed, but Dr. Mehta will continue to assist Dr. Arnold as needed, such as participating in publishing the results of this project.

JANAK JOSHI

Sponsor Arlindo da Silva / Code 610.1 / Task 176

Dr. Joshi tested, evaluated, and compared four dust emission schemes within the GOCART aerosol module of the NASA GEOS model, including the schemes he had previously modified. He also adjusted global tuning constants for some of the schemes. Despite their differences, all the schemes consistently underpredict dust over the Taklimakan Desert. The implementation of Dr. Joshi's new dust source (figure below) and the use of high-resolution meteorology appear to

significantly reduce this bias. This work was guided by Dr. da Silva, with complementary feedback from Dr. Peter Colarco (NASA GSFC). Dr. Joshi gave a talk on this work at the AMS Annual Meeting.

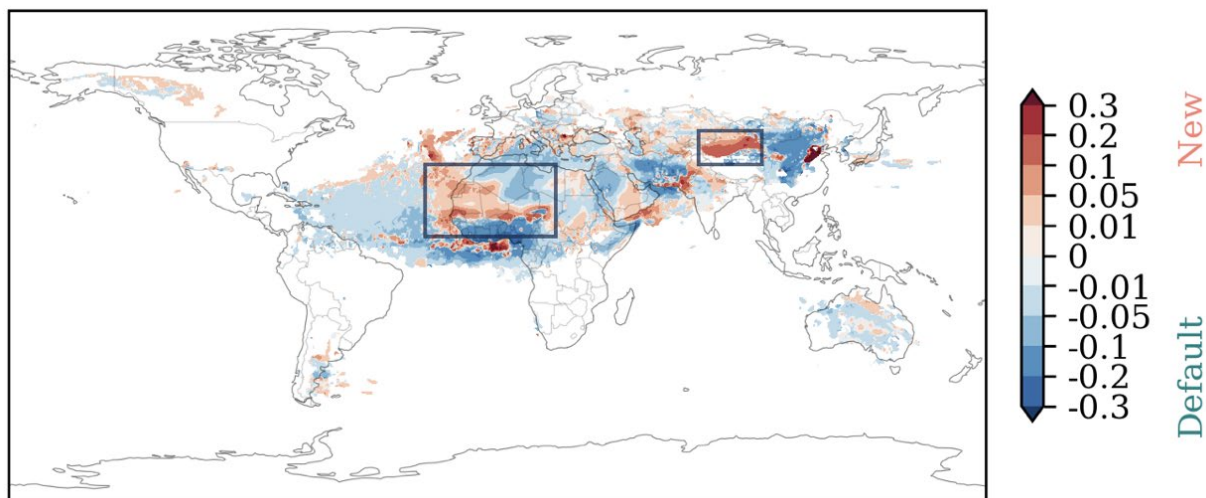


Image: Closeness to observed aerosol optical depth using default vs. new dust sources. Red: new source closer; blue: default closer. Bias over the Taklimakan Desert is notably reduced with the new source. Credit: J. Joshi.

Under the guidance of Dr. da Silva, Dr. Joshi has initiated work on developing an inverse modeling framework to fine-tune dust source maps. His efforts have included performing a mass budget analysis, formulating the relevant linear algebra, casting the stationary equation in spherical coordinates into a block matrix form, constructing and applying abstract operators, and testing various optimization techniques.

Based on code and literature reviews, Dr. Joshi identified several other areas for potential improvement in the GOCART aerosol module. His preliminary analysis suggests that the simplified dust resuspension process may be unnecessary (after model recalibration) or in need of significant revision to account for surface types. In one meeting, he discussed that the aerosol dry deposition parameterization could be improved by incorporating dependence on land cover (including vegetation types) and particle size. Dr. Joshi also contributed to ongoing updates of the GOCART aerosol module by conducting test experiments and reviewing and generating pull requests in close coordination with other team members.

In the coming months, Dr. Joshi will focus on preparing and submitting a journal manuscript, in collaboration with his coauthors, on the testing and evaluation of dust schemes.

MENG ZHOU

Sponsor Arlindo da Silva / Code 610.1 / Task 185

Dr. Zhou's research primarily focuses on estimating modified combustion efficiency (MCE) and their modulation of emission factors (EF), data-driven estimates of plume height, and thermodynamically consistent vertical mass distribution functions. Dr. Zhou has developed a multi-channel biphasic extension of Dozier's algorithm for wildfire characterization, leveraging data from the Fire Light Detection Algorithm version 2 (FILDA-2). The FILDA-2 product, innovated by Dr. Zhou, is NASA's new nighttime fire MCE product. His research on Monte Carlo Bi-phasic Fire Property (McBEF) algorithm offers crucial insights into qualifying the subpixel

burning temperature and corresponding heat flux; this provides essential data for modeling plume rise and the vertical distribution of fire emissions for NASA's quick fire emission dataset (QFED) and GEOS modeling system. Dr. Zhou is currently preparing a manuscript on multi-channel biphasic wildfire characterization for submission to the journal Remote Sensing of Environment.

Dr. Zhou's upcoming plans for the next few months include 1) developing QFED version 3.2, which transitions from MODIS to VIIRS, and 2) developing the daytime FILDA and McBEF algorithms in preparation for QFED version 4.

FEI LIU

Sponsor Arlindo Da Silva / Code 610.1 / Task 186

Dr. Liu has been working to improve the emission inputs for the GEOS model. She is developing an intercomparison tool to compare the latest available anthropogenic emission inventories with benchmark inventories currently used by the GEOS model. Additionally, Dr. Liu is developing an evaluation platform to assess the performance of the latest available emission inventories within the GEOS model.

Dr. Liu has been working to develop a framework for tracking and analyzing individual aerosol plumes in different types of datasets, such as model simulations and geostationary satellite retrievals. The developed framework provides a flexible new way to understand the evolution of the characteristics of individual aerosol plumes in model intercomparison studies or model assessment based on observational data. Dr. Liu has developed a machine learning model designed to detect pyrocumulonimbus (pyroCb) events during nighttime using IR channels from the Advanced Baseline Imager (ABI) aboard GOES-16. Furthermore, she has employed an established cloud-tracking tool known as Tracking and Object-Based Analysis of Clouds (tobac) to analyze the evolution of the clouds plumes and infer their lifetimes. Dr. Liu has demonstrated the framework using 6 pyroCb firestorm events as the case study. The cloud tracking project is ongoing, aiming to enhance our understanding of pyroCb dynamics.

Dr. Liu will be documenting the pyroCb-detecting method developed under the same task and submit a peer-reviewed paper. Understanding pyroCb dynamics will be helpful for investigating the radiative implications and the potential impact on stratospheric chemistry. Dr. Liu plans to continue developing the emission assessment platform for the GEOS model. This platform will contribute to improving the simulation of aerosols and gases in GEOS, enhance the quality of emissions utilized by the model, and facilitate more timely updates.

STEVEN J. FLETCHER

Sponsor Ricardo Todling / Code 610.1 / Task 190

Dr. Fletcher has been working with a programmer at the Joint Center for Satellite Data Assimilation (JCSDA) to overcome the code problems of using JEDI on a Linux machine at Colorado State University (CSU). Throughout the year, there have been changes to the base code that are not supported in the public released versions. Also, with the discontinuation of support for the singularity version, and CSU's reserve about using Docker, a work-around was found to transform a Docker image into a singularity image; however, problems continued. Ultimately, Dr. Fletcher and the programmer from JCSDA decided to build the whole system

from scratch outside an image through building a Spack stack with JEDI at the top of the compilation.

Dr. Fletcher was finally able to complete a compilation of the Gaussian-based JEDI FV3-JEDI system. The c-tests were run and the system passed all but 8 of these tests. Given the fully compiled system, Dr. Fletcher was now able to investigate the code to determine where changes would need to be introduced for the lognormal approach. He determined the following changes: the current NMC GSIBEC approach for the moisture-based covariance model should be applied to $\ln q_1$; a new control variable transform in the form of $\ln q_2 = B^{1/2} \ln q_1$ is required; and, new `costJb`, `costJo`, and `totalcost` headers would have to be created along with the extra term for the lognormal mode. Finally, Dr. Fletcher determined that the limit memory quasi Newton minimizer should be applied to solve for the minimum of the lognormal based cost function. He also identified where modifications to the gradient of the cost function operators would need to be introduced as well as indicated that an inverse of the control variable also would need to be coded.

This project concluded on March 31, 2025.

CHRISTOPHER O'DELL, ANDREW SCHUH, AND SCOTT DENNING
Sponsor Lesley Ott / Code 610.1 / Task 196

The Colorado State University (CSU) greenhouse gas team had a productive year under their GESTAR II funding agreement, conducting research and activities along a few fronts. While Dr. Andrew Schuh led the second year of the Summer School for Inverse Modeling of Greenhouse Gases (SSIM-GHG), Dr. Chris O'Dell led a small team at CSU conducting the reprocessing of GOSAT CO₂ data as well as near real time production of data from the OCO-2 and OCO-3 instruments, and graduate student Jessie Lyons began her work on diagnosing transport error in global atmospheric transport models.

Dr. O'Dell's group made solid progress this year on producing CO₂ data for ingestion into the NASA GMAO Carbon Reanalysis (<https://fluid.nccs.nasa.gov/carbon>). Last year, the group obtained OCO-2 data working for the GMAO group, and now they also are providing OCO-3 near-real-time data to them. Further, the team has made great progress on the ACOS version 11 GOSAT XCO₂ product, which has the aim to use the latest version of the OCO/ACOS retrieval algorithm (version 11) but as applied to the Japanese GOSAT instrument. This will provide a seamless record of XCO₂ from GOSAT from 2009-2025, which can be used alongside the OCO-2 and OCO-3 systems. This product is expected to be available in early 2026. A presentation on this project was given in Takamatsu, Japan in June 2025 at the International Workshop on Greenhouse Gas Measurements from Space (IWGGMS) annual meeting. An example plot showing the mean residual patterns in the Model-Observation fits for ACOS as applied to GOSAT is shown in Figure 1 for the O₂A band. The second EOF is much better behaved, indicating improved calibration in the latest GOSAT data version.

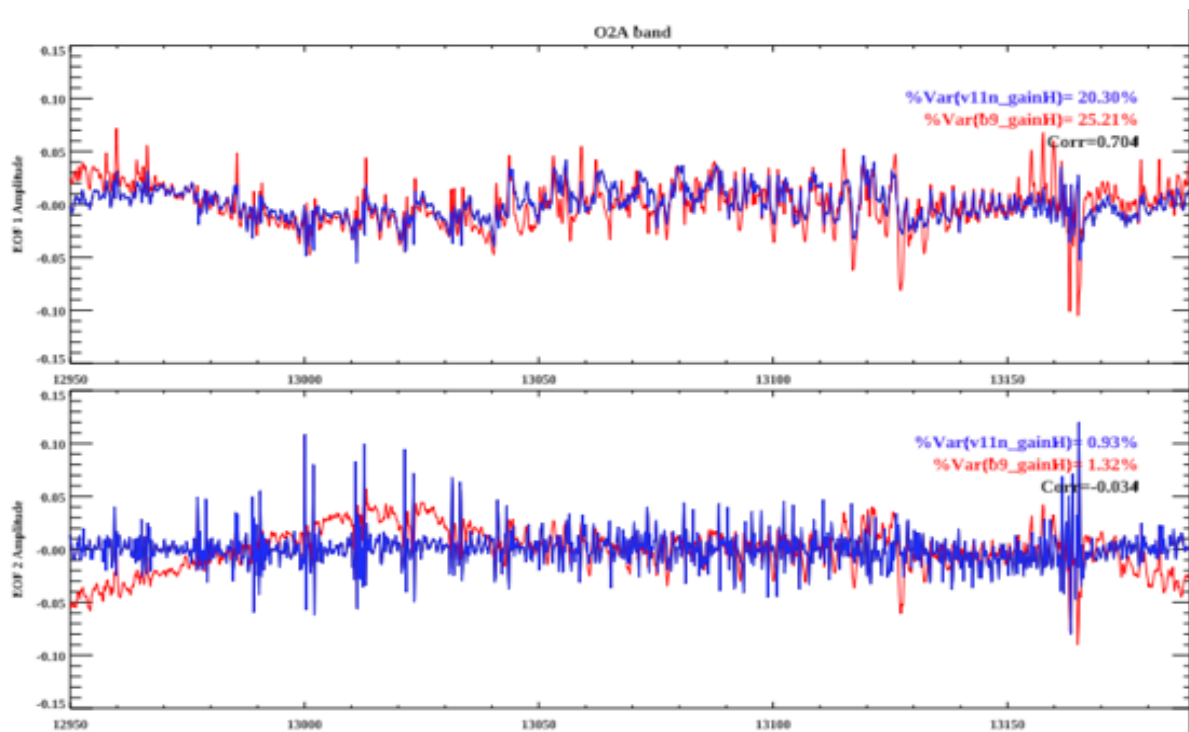


Image: SEQ Figure * ARABIC 1. EOFs of residual patterns in the GOSAT O2A band for ACOS v9 (using GOSAT v201201 L1b data) in red, and ACOS v11 (using GOSAT v300300 L1b data). The second EOF is much better behaved in the new version.

Dr. Schuh led the second iteration of the [Summer School for Inverse Modeling of Greenhouse Gases \(SSIM-GHG\)](#) in Fort Collins, CO, July 8-18, 2025. This work involved meetings and work efforts spread across at least 6 months in advance of the summer school. The meeting brought roughly 30 students, post-docs, and early career scientists to CSU to learn about atmospheric inverse modeling over a two-week long intensive training period. The training involves several hours of class time and several hours of hands-on coding plus data analysis each day. Drs. Scott Denning and Christopher O'Dell assisted Dr. Schuh and others by teaching 3-4 hours on one of the summer school days and participating in the first 1-1.5 weeks of the summer school. Dr. O'Dell helped lead one of the group field trips as well.



Photo: 2025 SSIM-GHG class at University of Colorado Mountain Research Station's Niwot Ridge field site. Credit: Sourish Basu.

This GESTAR II agreement has funded graduate student Jessie Lyons since January 2025. In addition to a full load of coursework in Spring 2025, under the guidance of Dr. Schuh, Jessie has begun to run GEOS-Chem. Jessie also has run simulations of sulfur hexafluoride (SF₆) as part of an effort to diagnose and ultimately improve passive tracer transport in atmospheric transport models using observation data from NOAA-GML. She is beginning to analyze her own GEOS-Chem simulations along with a suite of transport models being used in the OCO-2/3 v11 MIP exercise (e.g., TM5, LMDz, GEOS, etc) provided by the OCO-2/3 Science Team. This exercise should lead to more robust inferences of greenhouse gas sources and sinks in the top-down inverse model framework.

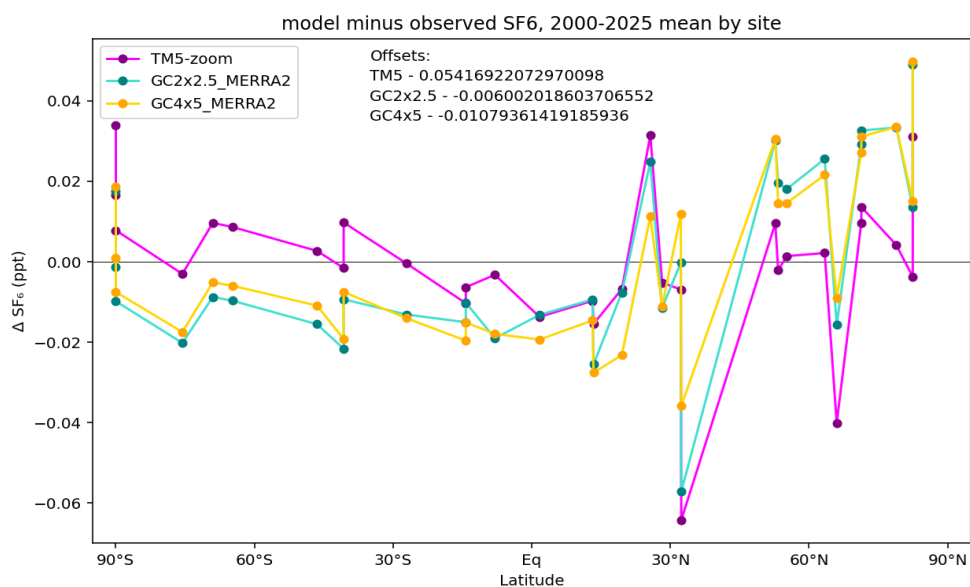


Image: Preliminary analysis of the TM5 and GEOS-Chem models used in the OCO-2/3 v11 MIP exercise against SF₆. The plot shows 25-year average residuals (Model – Obs) over a subset of Marine Boundary Layer (MBL) sites from NOAA. We are focusing on the underestimation of SF₆ concentrations in the southern hemisphere relative to the northern hemisphere along with the associated inferences for flux inversion studies of various trace gases. Credit: Jess Lyons.

Dr. Schuh will finalize documentation and web availability of presentations from the 2025 Summer School on Inverse Modeling of Greenhouse Gases. He and graduate student Jessie Lyons will continue the SF6 atmospheric transport modeling research. They plan on submitting a poster on this research at both the Sept 2025 OCO-2/3 STM as well as the 2025 AGU Fall Meeting in New Orleans. Work will begin on a manuscript summarizing the work in 2026.

Dr. O'Dell will work with his group (Greg McGarragh and Tommy Taylor at CSU) regarding the reprocessing of GOSAT data with the latest ACOS algorithm version. This will involve generating the data, uploading it to the GES-DISC, and making it available to the NASA GMAO carbon reanalysis team. Dr. O'Dell will present an update to his team's progress at the September OCO-2/3 science team meeting.

AHREUM LEE

Sponsor Yanqiu Zhu / Code 610.1 / Task 209

Dr. Lee has begun research on the GSI data assimilation system within NASA's GEOS by incorporating the assimilation of Visible Infrared Imaging Radiometer Suite (VIIRS) observations on SNPP and NOAA-20 satellites. Her work focuses on adding VIIRS surface-sensitive channels, with particular emphasis on the novel aspect of handling solar-affected and surface-sensitive channels. She has established comprehensive data reading processes, quality control procedures, and observation error assignment for these new observations. She is currently conducting assimilation experiments and analyzing the impact of VIIRS observations on the GEOS analysis and forecast fields. Her research extends to preparing the transition of VIIRS observations to the JEDI-based GEOS system, which is currently under development as the future operational framework.

In her work with surface-sensitive channels over oceanic regions, Dr. Lee is investigating the structure of sea surface temperature in GEOS to accurately retrieve temperature at the penetration depth, which is essential for satellite radiance observations and critical for the successful assimilation of surface-sensitive channel radiances.

Additionally, Dr. Lee is leveraging her extensive expertise in satellite radiance assimilation to support other observation systems being prepared for use in GEOS. She has contributed her knowledge to GOES-16/18 ABI radiance assimilation efforts and has provided technical reviews for pull requests related to radiance assimilation in operational source codes, thereby helping to expand satellite data use in the GEOS system.

Dr. Lee will continue to optimize the VIIRS surface-sensitive radiance assimilation within GEOS and complete the assessment of the impact of VIIRS observations on the GEOS system. To conclude her work on VIIRS assimilation, she will submit a pull request for the operational implementation of VIIRS observation assimilation and finalize the transition to the JEDI-based GEOS framework. Beyond this work, she is preparing several upcoming satellite radiance observations for integration into the operational GEOS assimilation system.

VERONICA RUIZ XOMCHUK

Sponsor Amal El Akkraoui / Code 610.1 / Task 210

Dr. Ruiz Xomchuk has been evaluating the impact of rain-corrected sea surface salinity (SSS) observations on NASA's GEOS modeling and data assimilation system, with a specific focus on the initialization states within the Seasonal to Sub-seasonal prediction (S2S-version 3). In parallel with this effort, Dr. Ruiz has been modernizing and refactoring the Ocean Data Assimilation System (ODAS) code to adapt to a new hardware infrastructure at the NASA Center for Climate Simulation (NCCS). This transition required optimization of memory usage. Additionally, Dr. Ruiz has implemented routines for generating ensemble members through perturbations of ocean states in the Near Real Time (NRT) S2S3.

Dr. Ruiz collaborated with Dr. Eric Hackert and other co-authors on a manuscript examining the impact of a diffusivity model as a rain correction procedure on SMAP (Soil Moisture Active Passive) SSS observations. For this work, Dr. Ruiz developed a new set of forecasts and analyses in response to significant revisions in the publication. The manuscript was accepted and published.

In the coming months, Dr. Ruiz will continue research on the assimilation of rain-corrected SSS data from SMOS (Soil Moisture and Ocean Salinity). Dr. Ruiz's work demonstrates that correcting for the fresh bias in rain-affected observations leads to improved initial states for predicting conditions in the tropical Pacific, such as El Niño. This improvement is attributed to a more dynamically balanced model, as evidenced by a consistent reduction of salt increments in the Ocean Data Assimilation System (ODAS) during the rainy periods of the Intertropical Convergence Zone (ITCZ).

MARYAM ABDI-OSKOEI

Sponsor Steven Pawson / Code 610.1 / Task 211

Previously, Dr. Abdi-Oskoueï had been working at the Joint Center for Satellite Data Assimilation (JCSDA) on implementing GEOS-CF with the JEDI framework. In August 2025, Dr. Abdi-Oskoueï joined GESTAR II, and has been working on finishing a paper titled "Capability demonstration of a JEDI-based system for TEMPO assimilation: system description and evaluation", which will be submitted to the AGU Journal of Advances in Modeling Earth Systems (JAMES). The paper discusses the newly implemented EDA 4DVar assimilation system, which assimilates TEMPO and TROPOMI tropospheric NO₂ data using the JEDI framework and the GEOS-CF model. Dr. Abdi-Oskoueï also presented the results of this work to the TEMPO/GeoXO ACX Joint Science Team Workshop.

Dr. Abdi-Oskoueï will continue working on the aforementioned paper and submit it to the AGU JAMES journal. The assimilation experiment discussed in the paper was conducted using the JCSDA's workflow. Dr. Abdi-Oskoueï will start using NASA's SWELL workflow and incorporate the GEOS-CF model into the suite of models within SWELL for future data assimilation experiments. Dr. Abdi-Oskoueï also will work on high-resolution aspects, such as testing and utilizing the "stretched" grid feature in JEDI in high-resolution experiments over the CONUS region. Another focus will be on developing downscaling of the GEOS-CF forecasts using land use and ground-based station (AirNow, PurpleAir) datasets of O₃, PM_{2.5}, and NO₂ with deep learning techniques.

JÉRÔME BARRÉ

Sponsor Steven Pawson / Code 610.1 / Task 211

Previously at UCAR/JCSDA, Dr. Barre had been developing data assimilation capability for atmospheric composition (reactive gases, aerosols and greenhouse gases) in the JEDI system. Dr. Barré co-led capability demonstrations using GEOS-CF and JEDI for the assimilation of TEMPO geostationary observations, applying the EDA-4DVar technique. A first preprint has been published, and a peer review paper is about to be submitted to AGU Journal of Advances in Modeling Earth Systems (JAMES).

The expected activities and research for September 1, 2025 to November 30, 2025 will consist of writing a subsequent paper demonstrating the potential of the system to perform anthropogenic emission inversion and monitoring with the JEDI-GEOS-CF system and the TEMPO observations. This will be the first priority and will close the work that was carried out at UCAR/JCSDA.

Another advancement will consist of looking at data assimilation cycling speedup with deep learning. This will consist of assessing the capability of the already developed model (AQcGAN) to generate ensembles for the 4DVar and the retraining needed for continuing ongoing developments made by Dr. Barré (ACORNN) to emulate chemical tendencies for 4DVar data assimilation. Lastly, introducing JEDI to the broader GMAO atmospheric composition groups will be emphasized.

VIRAL SHAH

Sponsor Steven Pawson / Code 610.1 / Task 212

Dr. Shah leads the development of GMAO's GEOS-CF system. Dr. Shah's work has led to a new release of the system that includes several scientific updates. In the past year, his work has focused on the scientific evaluation of the results to assess consistency with satellite, aircraft, and surface observations. Dr. Shah's work also involved running the system for a two-year period (fixing issues as they arose), developing a workflow for running the system in near-realtime, handling satellite data acquisition, forecast setup, post-processing of data, etc., and testing the system to prepare it for production. Dr. Shah also coordinates the work of the CF team, which includes leading weekly team meetings as well as coordinating with other GMAO groups and Goddard and external partners.

In the coming months, Dr. Shah will focus on publishing the paper describing and evaluating the new version of the GEOS-CF system. He will continue to lead the development of the next-generation of the GEOS-CF system, focusing on increasing the horizontal and vertical resolution of the model, integrating additional satellite data in the system through the recently developed JEDI data assimilation system, and exploring the use of AI to complement the physics-based model.

AMITA MEHTA

Sponsor Andrea Molod / Code 610.1 / Task 238

Dr. Mehta started a new project with NASA's GMAO in June 2025. Dr. Mehta is collecting information about GMAO's various model data products that are useful for applications in water resources and disaster management sectors. She plans to disseminate this information to relevant stakeholders via online training. Dr. Mehta will analyze and validate some of these data products to share with relevant stakeholders in public and private sectors.

Dr. Mehta will summarize and document GMAO's data products for applications to fire weather prediction as well as for solar energy sectors, using near real-time reanalysis (MERRA-2), short-term forecasts (GEOS-FP), and sub-seasonal to seasonal (S2S) predictions. Dr. Mehta will apply these data to two specific case studies:

- Fire Weather Analysis – Evaluate past S2S fire weather predictions in conjunction with recent wildfire events in California to assess the ability of S2S predictions to indicate fire risk;
- Solar Irradiance Validation – Validate/compare surface solar irradiance data from MERRA-2, GEOS-FP, and S2S against satellite and *in situ* measurements.

Dr. Mehta will plan an ARSET training (targeted for mid-2026) to disseminate S2S fire weather prediction data for fire risk assessment and planning.

ALLYSON ROKITA

Sponsor Steven Pawson / Code 610.1 / Task 241

Dr. Rokita began work on this task in September 2025. Dr. Rotika's research will include introducing observations of land-surface characteristics from NASA satellite observations into the GEOS modeling system and investigating their impacts on the land-atmosphere system in simulations with the GEOS atmosphere-land model. The research is motivated by the move towards kilometer-scale modeling with the GEOS system, a scale on which the extreme heterogeneity of the distribution of (say) vegetated and non-porous surfaces impacts the local heat balance, moisture exchange, as well as other factors including photosynthesis and dry deposition of ozone. The initial focus of this work will be to develop an efficient strategy to introduce high-resolution Landsat and MODIS imagery into the GEOS model, making use of existing and potentially new software tools. The developmental aspects of the work to be performed in this task will be performed in collaboration with technical specialists in the GMAO's support contracts. The second stage of the research will involve impact studies, focused specifically on regionally refined simulations over North America, and will serve to document the fine-scale changes in the moisture and energy budgets in and around regions, such as major cities, with high heterogeneity in the underlying surface that has not previously been included; this latter stage will also investigate instances where urbanization has led to increases in non-porous land surfaces - this serves as an important benchmark for planned downscaled reanalysis to be performed with GEOS systems.

CODE 612: MESOSCALE ATMOSPHERIC PROCESSES LABORATORY

LIANG LIAO

Sponsor George Huffman / Code 612 / Task 053

Dr. Liao continues to study the feasibility of using NASA Goddard Space Flight Center's multi-frequency radar systems (ER-2) to retrieve microphysical properties of precipitating hydrometeors. This work uses measurement data from the Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms (IMPACTS) field campaign. The ER-2 radar provides four-frequency radar reflectivity and Doppler velocity measurements, which are critical for understanding the mechanisms of storm formation, organization, and evolution. This study relies on comprehensive simulations of hydrometeor scattering for various phase states. It also incorporates a large amount of observed raindrop/snow-particle size distribution (DSD/PSD) data, which was acquired from a variety of storm systems during past NASA field campaigns.

Dr. Liao also has conducted a study involving the utilization of multi-frequency airborne Doppler radar for hydrometeor phase identification. This study, which aims to classify hydrometeor phase states by implementing a Doppler-based technique, has nearly been completed. The developed technique and its relevant results have been summarized in a paper submitted for publication to an AMS journal.

He also has been evaluating GPM/DPR PIA estimates from airborne radar measurements. The Dual-frequency Precipitation Radar (DPR) on the Global Precipitation Measurement (GPM) satellite is crucial for providing global, three-dimensional storm structure estimates. However, uncertainties in the DPR's signal attenuation corrections impede accurate precipitation rate estimates.

The path integral attenuation (PIA)—the accumulated attenuation along the radar's propagation path—is a critical parameter used to constrain solutions of the radar equations. PIA estimates primarily rely on the surface reference technique, which compares surface returns from rainy areas to nearby rain-free areas. The differences in these returns are attributed to the PIA. Because the DPR has a much coarser spatial resolution than the NASA airborne radar, its rain-free surface echoes experience greater variability. Additionally, non-uniform beamfilling (NUBF) issues, caused by the inhomogeneous distribution of precipitation, are far more significant for the DPR than for the NASA ER-2 radar. Comparisons of PIA estimates from coordinated observations by the DPR and airborne radar are an effective way to assess the DPR's PIA estimates. During the IMPACTS field campaign, the NASA ER-2 radar flew under the DPR for several storms. The collocated data from these flights have been used to evaluate the DPR's PIA estimates.

Dr. Liao also examines DSD estimates from Doppler measurements. Accurately retrieving the rain drop size distribution (DSD) is challenging due to its high spatial and temporal variability and the fact that unknown variables often exceed the number of measurable quantities, leaving radar equations under-constrained. Dual-frequency radar systems, like the DPR, are widely used to estimate DSD parameters by modeling DSD as a Gamma distribution. In this approach, a three-parameter Gamma DSD is simplified to a two-parameter model (D_m and N_m) with a fixed shape factor. Even with two radar frequencies, it's difficult to solve the two corresponding equations to find the two DSD unknowns without first accounting for attenuation. Attenuation correction is a complex procedure that relies on model assumptions and empirical relationships, making DSD retrieval vulnerable if the corrections are not applied properly.

Doppler measurements offer an alternative for estimating DSD parameters. The key advantages of Doppler-based techniques include their independence from attenuation corrections and

their insensitivity to radar calibration. A feasibility study on using multi-frequency Doppler radar measurements has shown encouraging preliminary results, though further research is needed.

Dr. Liao will continue and complete his current studies and explore new fields that can improve and enhance the space/air-bore radar algorithms for detection and estimates of precipitation microphysical properties.

HYOKYUNG KIM

Sponsor George Hoffman / Code 612 / Task 054

Dr. Kim has been working as a member of the science team developing algorithms for estimating global precipitation using the Dual-frequency Precipitation Radar (DPR) onboard the GPM satellite. Her primary responsibilities include the development and refinement of the Surface Reference Technique (SRT) module within the radar Level 2 algorithms, which corrects for radar signal attenuation caused by precipitation, as well as the advancement of the Level 3 algorithm, which generates global statistics derived from the Level 2 products.

Over the past year, Dr. Kim has focused on improving and finalizing the Version 8 GPM radar algorithm, now scheduled for release in January 2026. In Version 8 of the SRT module, two major updates were implemented. First, whereas Version 7 used five surface types (open ocean, sea-iced ocean, open land, snow-covered land, and coastal regions) to compute the no-rain reference σ_0 , Version 8 introduced a refinement in which snow-covered land was further subdivided into wet-snow and dry-snow conditions using surface temperature, and path attenuation was estimated accordingly. Second, for ocean regions, new relationships between σ_0 (no-rain) and surface wind speed were developed for each incidence angle at Ku- and Ka-band frequencies using DPR data and GANAL and GMI wind retrievals. These relationships were compiled into look-up tables and applied to improve path attenuation estimates. Although these two updates were implemented in the Version 8 algorithm, they are currently set to “off” for extended evaluation. Once the evaluation is completed and necessary refinements are made, they may be activated in the operational configuration. The updated attenuation correction algorithm was completed and submitted in April 2025 as Version V10.20250418.

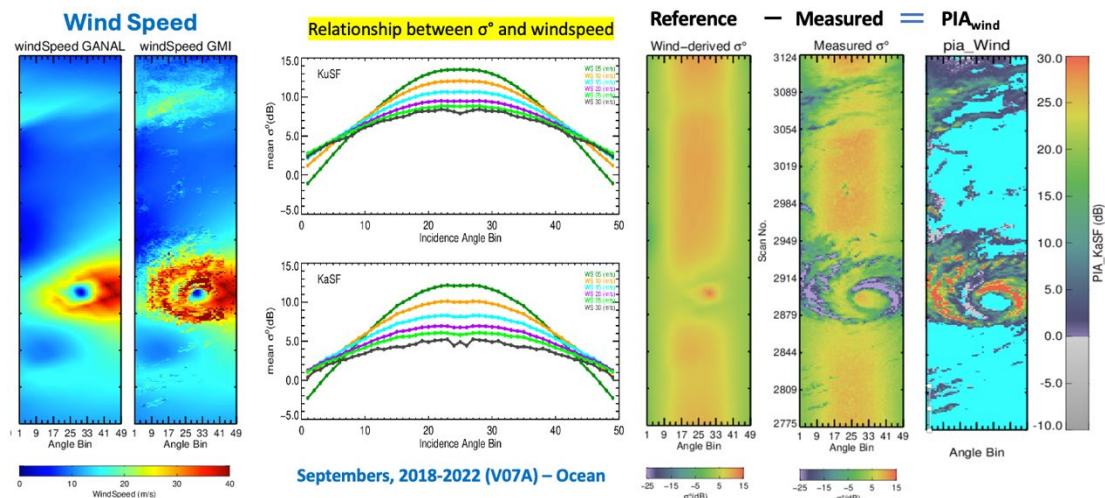


Image: Wind speed distributions (orbit #31343) derived from GANAL and GMI (Left panels). Mean σ_0 (dB) versus incidence angle at Ku- (top) and Ka-band (bottom) for different wind speeds (5–30 m/s), illustrating the relationship between no-rain σ_0 and surface wind speed used in the attenuation correction algorithm (Middle panels). PIA_{wind} can be estimated by subtracting measured σ_0 from Reference σ_0 derived from windspeed (Right panels).

For the radar Level 3 algorithm, Version 8 remains identical to Version 7 in scientific approach, but the output product format transitioned from HDF5 to netCDF. To accommodate this change, the Level 3 code was updated and released as Version V4.20250714, ensuring continued operational support.

Dr. Kim has been continuously collaborating with the PPS team, the Combined Algorithm Team, and the JAXA radar science team to provide operational support for Level 2 and Level 3 products. In the coming months, she will continue to refine and support these algorithms beyond the Version 8 release to ensure robust and accurate precipitation products for the GPM mission.

MIRCEA GRECU

Sponsor George Huffman / Code 612 / Task 055

Dr. Grecu's work during this past year focused on the development and implementation of a machine learning model designed to estimate precipitation from NASA's GPM Microwave Imager (GMI) observations. The model has been integrated into Version 8 of the GPM Combined Radar–Radiometer algorithm (CORRA). Within CORRA V8, the model plays a critical role in improving the detection of light precipitation that is below the sensitivity threshold of the radar but detectable by the radiometer.

In addition to the model development, Dr. Grecu worked to ensure that the newly introduced variables are properly handled within the algorithm's input/output structure and correctly written to the output files. A procedure was also developed to mitigate parallax effects, thereby improving the alignment between the GMI-only estimates and the nominal combined radar–radiometer precipitation products.

The updated CORRA Version 8, incorporating these advancements, is currently undergoing testing, and is scheduled for operational release in January 2026. Dr. Grecu's future work will focus primarily on maintenance and support.

JASPER LEWIS

Sponsor Judd Welton / Code 612 / Task 101

Dr. Lewis has evaluated aerosol and cloud observations from the EarthCARE satellite using Level 3 MPLNET products derived from collocated satellite-surface measurements from several diverse sites within the lidar network. Furthermore, Dr. Lewis continued to collaborate in a study intended to develop PBL data assimilation capabilities in the NASA Global Earth Observing System (GEOS), focusing on planetary boundary layer height retrievals from multiple observing systems. Part One of a paper describing this work was published during the reporting period and Part Two is in revision.

In February 2025, Dr. Lewis participated in the EarthCARE Validation Workshop. He also continued an intercomparison of PBL height retrievals from a collocated lidar, radar wind profiler, and ceilometer. The physical conditions under which these surface-based retrievals agree/disagree are being used to contextualize satellite-based and model results.

Dr. Lewis is working on comparisons of rain detection and rain rates from lidar measurements to satellite-based retrievals from NASA's Integrated Multi-Satellite Retrievals for GPM (IMERG)

and EarthCARE. A long-term study using MPLNET and IMERG precipitation has been conducted and a paper describing this work is in revision.

Looking ahead, Dr. Lewis plans to attend a Science and Validation Workshop in December 2025. He is currently planning a study using surface-based and satellite retrievals of clouds and precipitation from two recent typhoons in Taiwan.

WILLIAM OLSON

Sponsor Scott Braun / Code 612 / Task 108

For this task, Dr. Olson has two focus areas. The first focus area is the development and testing of software for operational estimation of precipitation rates based on a combination of spaceborne radar and passive microwave observations from the Tropical Rainfall Measuring Mission (TRMM) and Global Precipitation Measuring (GPM) mission core satellites. The estimation software is known as the COmbined Radar-Radiometer Algorithm, or CORRA. During the reporting period, the next generation CORRA algorithm (Version 8) was implemented. As part of the V8 update, all CORRA software was updated to conform with netCDF input/output formats and new estimation parameters calculated by the next generation algorithm. One of the new features of CORRA V8 is the estimation of surface precipitation rates using only the microwave radiometer channels of the TMI or GMI (TRMM or GPM microwave imager); this allows for estimation where precipitation has very weak signal (below detection) in spaceborne radar observations. For diagnostic purposes, new software structures in the Level 2 and 3 CORRA algorithms were created to hold only the radiometer-based estimates. Also, validation software was adapted to these new outputs. The outputs and validation software will be used to assess the capability of machine learning codes, implemented in V8, to estimate precipitation from only radiometer observations.

The second focus area of this task is the continued development of CORRA, which would lead to improvements of radar-radiometer estimation of precipitation. Previously, in collaboration with Drs. Craig Pelissier, Robert Schrom, Adrian Loftus, Kwo-Sen Kuo, and Ines Fenni, a computational model for melting snow particles (SnowMeLT) was developed, and the single-scattering properties of a few relatively small snow particles were computed. However, the original SnowMeLT was computationally too slow to melt larger snowflakes. Dr. Pelissier recently developed a Graphics Processing Unit (GPU) version of SnowMeLT, which greatly increased its processing speed. During the reporting period, Dr. Pelissier found mechanisms that led to a loss of meltwater due to a model resolution effect; this ultimately created force imbalances at the surfaces of the snow particles. The meltwater loss problem was resolved, and work continued on melting a select set of snow particles spanning a large range of particle sizes. Dr. Olson continued to work with Drs. Schrom and Kuo to complete the melting of that particle set and helped calculate the single-scattering properties of the melting particles using the Amsterdam Discrete Dipole Approximation (ADDA) software. All but the largest snow particles have been processed. Dr. Olson also made necessary updates to the software needed to integrate the single-scattering properties of melting particles over size to yield the “bulk” scattering parameters required for remote sensing applications.

In the coming months, both the radiometer-only and blended radar-radiometer estimates of precipitation will be evaluated against ground-based radar observations, and the continuity between TRMM and GPM estimates, as well as the changes of estimates due to the satellite boosts in August 2001 (TRMM) and November 2023 (GPM), will be quantified.

Additionally, the group will finish processing the particle set using ADDA, and Dr. Olson will help calculate the bulk scattering properties of the melting particles. These new scattering calculations will be compared to those produced by a different technique, the Method of Moments Integral-equation Decomposition for Arbitrarily shaped Scatterers (MIDAS), developed by Dr. Fenni. MIDAS shows promise as a much more computationally efficient approach relative to ADDA. A paper describing the melting snow particle properties will be prepared. The particle scattering properties will be tested against radar-radiometer and *in situ* airborne observations of melting snowflakes derived from the IMPACTS field campaign.

ALI TOKAY

Sponsor David B. Wolff / Code 612 / Task 123

Dr. Tokay participated in NASA's Global Precipitation Measurement (GPM) Ground Validation program field study in Storrs, CT (UCONN2025). The goal of the field study was to collect the winter precipitation dataset using state-of-the-art *in-situ* and remote sensing precipitation measuring instruments. The past winter was the fourth year of the field study, and the database consists of 36 events, 12 of which had frozen and/or mixed precipitation. The field study, which ran from Dec 2024 - May 2025, had two sites that were 3.3 km apart. The ground-based precipitation measuring devices at each site included weighing and tipping bucket gauges, Particle Imaging Package (PIP) and Particle Size Velocity (PARSIVEL) disdrometer, vertically pointing K-band micro rain radar (MRR), and an All-In-One weather station. During those six months, Dr. Tokay analyzed the datasets periodically.

Dr. Tokay evaluated the precipitation phase and amount products using three winter-long field studies in Southern New England. The precipitation phase segment of the study was conducted by a senior undergraduate student, Connor Mahone (UMBC/GES), and the findings were presented during the 2025 American Meteorological Society (AMS) annual meeting in New Orleans, LA. Mr. Mahone is the leading co-author of the findings of the precipitation phase study, which Dr. Tokay submitted to the Journal of Hydrometeorology.

Dr. Tokay investigated the performance of precipitation amount products using PIERS+ (Platforms for In-situ Estimation of Rainfall Systems) across five Mid-Atlantic sites and one Southern New England site. This segment of the study was conducted by a senior undergraduate student, Amalie Rebstock (UMBC/GES), and the findings were presented during the 2025 AMS annual meeting. The study first evaluated four different precipitation products: MRMS, HRRR, ERA5, and MERRA2. Later, Dr. Tokay used a year-long database from the NASA GSFC site to evaluate seven precipitation products, including two global satellite products, IMERG and GSMaP as well as StageIV. The findings of the extended study were presented during the 41st AMS Radar Meteorology conference in Toronto, Canada.

Dr. Tokay will expand the evaluation of the precipitation products study to multiple PIERS+ sites, which will allow for a more comprehensive study of product evaluation with a larger dataset. He will be able to evaluate the performance of precipitation products under different regimes (i.e., short versus long events, light versus heavy events). Dr. Tokay plans to present the findings of the detailed study during the 2026 AMS annual meeting in Houston, TX.

YULI LIU

Sponsor Ian Stuart Adams / Code 612 / Task 149

Dr. Liu has been working on two projects. The first focuses on reorganizing the IWP retrieval algorithm for potential applications with the AOS and PoLSIR sensors. This retrieval program includes the development of an *a priori* database and a retrieval algorithm based on a hybrid Bayesian MCI–OEM approach. Observing system simulation experiments are conducted with the developed algorithm to assess different combinations of submillimeter-wave channels. The algorithm is also applied to real observations to evaluate retrieval performance. A manuscript from this work is in preparation.

The second project is to advance the tomographic reconstruction algorithm and apply it to actual CoSSIR observations from the IMPACTS campaign. Various ice cloud particle habits are being evaluated to determine which yields the best retrieval performance. Preliminary results have been obtained, but additional testing is needed to complete the study and finalize a manuscript.

Dr. Liu expects to submit the IWP retrieval algorithm paper by the end of the year and to complete the development of the tomographic reconstruction algorithm using actual CoSSIR observations.

KATHERINE BREEN

Sponsor Scott Braun / Code 612 / Task 181

Dr. Breen contributed to the AOS mission by developing an emulator for rapid simulation of satellite retrievals. She advanced machine learning for air quality prediction and monitoring through the development of AQcGAN, in collaboration with the Johns Hopkins University Applied Physics Laboratory. She mentored a group of elite undergraduates in collaboration with the UCLA Institute for Pure and Applied Mathematics (IPAM), guiding their quantitative evaluation of a machine learning parameterization for vertical wind velocity against observational data; this work was the basis of her presentation at the AMS annual meeting. She co-organized and presented at a machine learning journal club for her research group and organized an internal workshop on machine learning applications across Goddard Space Flight Center. She also proposed and was granted funding for a machine learning workshop at IPAM, scheduled for February 2026, which will be co-sponsored by NASA GMAO, NASA Goddard Institute for Space Studies (GISS), World Meteorology Organization (WMO), the University of Miami, and Pacific Northwest National Laboratory (PNNL).

This task is scheduled to be completed on Sept 30, 2025. However, Dr. Breen will participate in a pilot project for the Integrative Modeling Virtual Institute (IMVI) to develop an observation-to-state forecast neural network workflow. This effort will rapidly advance AI-driven capabilities to transform satellite and conventional observations into full atmospheric states suitable for initializing forecast models, whether machine learning–based or traditional physics. She is co-leading this activity with the GSFC Data Science Group lead and serving as liaison between the Data Science Group, GMAO, and GISS to strengthen machine learning collaboration across centers. In this role, she is helping assemble a team of subject matter experts and deepening expertise in data assimilation, with particular focus on the system developed in GMAO.

SEAN FOLEY

Sponsor Scott Braun / Code 612 / Task 181

Mr. Foley's scientific focus has been on improving the characterization of 3-dimensional cloud structure from multi-angle sensors in orbit, focusing on the Hyper-Angular Rainbow Polarimeter (HARP2) aboard the Plankton, Aerosol, Cloud-ocean Ecosystem (PACE) mission, with implications for future multi-angle sensors like those on the Atmosphere Observing System (AOS). He has two primary research threads: an unsupervised machine learning approach based on neural rendering and a sparsely supervised approach. These approaches have complementary strengths and may eventually be incorporated into an ensemble approach to 3D cloud reconstruction.

For the unsupervised, neural rendering approach to 3D cloud reconstruction, Mr. Foley greatly improved his code base to be robust and easily extensible. He made countless algorithmic improvements, brought the runtime per granule down from 24 hours to approximately 12 minutes, greatly improved the organization of the code, implemented validation using co-incident observations from a different satellite, and communicated his work through various presentations to audiences at NASA, UMBC, and elsewhere. He developed this software on his own, completed a New Technology Report, passed a lengthy series of reviews, and just signed an Intellectual Property (IP) Disclosure to transfer the new technology from Morgan State University to NASA. The software should be publicly available and in the open source within the next few weeks. This is a novel and valuable approach which will help to improve the scientific community's understanding of clouds. Mr. Foley plans on submitting a paper on the approach to a Computer Vision Conference before the end of the year.

For the sparsely supervised approach, Mr. Foley made several strides. His paper "3-D Cloud Masking Across a Broad Swath using Multi-angle Polarimetry and Deep Learning" was published in Atmospheric Measurement Techniques, and his presentations on the topic in various venues have been well-received. His Internal Research and Development (IRAD) proposal for "3D Cloud Reconstruction in Multi-Angle Polarimetry with a Foundation Model" was funded. During this project, Mr. Foley has developed an approach for adapting a pre-trained foundation model to multi-angle polarimetry using sparse supervision from a co-incident active sensor. He intends to submit a paper on this approach as part of the required deliverables for the IRAD. He and his team also submitted a step-1 proposal for a different, yet related IRAD proposal on the efficient fine-tuning of foundation models.

Beyond his core research focus, Mr. Foley has continued to serve as a subject matter expert on machine learning for other scientists in his lab and beyond. He has strengthened his connections with researchers throughout GSFC and at UMBC. He has also leveraged his software development skills to support various needs of his group, such as automating data acquisition during the PACE-PAX field campaign in 2024 or developing an automated approach to finding overlapping observations between PACE and the Earth Cloud, Aerosol, and Radiation Explorer (EarthCARE). In fact, his work on the latter led to his recent funding for "PACE and EarthCARE Synergy with MAAP."

This task is scheduled to end at the end of September. Over the coming year, Mr. Foley will continue to seek new sources of funding. The allocation of his time depends to a certain extent on the outcomes of his pending proposals. Should his ROSES proposal be funded, he will spend more time on the unsupervised, neural rendering approach to cloud reconstruction; if his IRAD proposal is funded, he will spend more time on the sparsely supervised, foundation-model-based approach. He will complete any final steps in the open-source release of his atmospheric neural rendering code, will maintain that code, incorporate any valuable external contributions,

and continue to add new features as he improves the algorithm. He will submit the aforementioned paper to a computer vision conference. He will also release a pre-print and/or submit a paper for peer review on the work performed during his “3D Cloud Reconstruction in Multi-Angle Polarimetry with a Foundation Model” IRAD. He will remotely attend the EarthCARE Science and Validation Workshop 2025, where he will present his ongoing work on PACE and EarthCARE synergy. Mr. Foley will release a paper or technical report on the outcome of the “PACE and EarthCARE synergy with MAAP” project, although this may occur after the end of the 6-month project term. Having spent the previous year laying the methodological groundwork for his research, he will place a higher priority this year on publications and presentations. He will continue to act as a SME to assist his colleagues in their work.

SERGEY KORKIN

Sponsor Scott Braun / Code 612 / Task 182

Dr. Korkin has been supporting activities related to the Atmospheric Observing System (AOS) mission as a local GSFC expert in numerical simulations of solar light multiple scattering and absorption in Earth’s atmosphere, commonly referred to as radiative transfer (RT) modeling. He participated in the bi-weekly meetings of the AOS Aerosol Working Group (AWG), led by Dr. Reed Espinosa (613), as well as the monthly AOS-Sky virtual science meetings, led by Dr. Scott Braun (612). As a lead author, Dr. Korkin published one full-length peer-reviewed paper partially supported by the AOS. Another part of support came from Dr. Korkin’s Task 001 and publication costs were covered by the NASA GSFC PACE team. He gave two conference-style presentations at the virtual AOS meetings. As a PI, Dr. Korkin submitted a UMBC START proposal, which was declined due to budget limitations (according to the decision letter received June 24). Details of these activities are in the appendices.

This task is scheduled to end in September 2025; however, if funding is discovered, Dr. Korkin plans to continue AOS support as a local GSFC RT expert and to finish his paper “A Practical Guide to Simulating Continuum Absorption in the Earth’s Atmosphere (Excluding Water Vapor)” with co-authors. Otherwise, Dr. Korkin will continue seeking funding to finish the paper.

COLTEN PETERSON

Sponsor Scott Braun / Code 612 / Task 182

Dr. Peterson worked on preparing the radiative transfer modeling tools needed for AOS-related cloud retrievals. Namely, this involves understanding and running the infrared (IR) Optimal Estimation (IROE) algorithm that was developed in his group for retrievals of ice cloud properties from infrared imagery (e.g., MODIS, VIIRS). The goal was to include microwave channels in the retrieval scheme to enable synergistic infrared-microwave ice cloud retrievals for AOS. This work involved determining the appropriate forward modeling framework to simulate cloudy sky radiances from infrared through microwave wavelengths, and considerations such as ice crystal single scattering model consistency in the IR and microwave were considered. The work also involved determining the appropriate clear sky radiative transfer model to use in IROE and testing how each model impacts the ice cloud retrievals. Efforts were made to alleviate model limitations by working with the model developers to enable higher carbon dioxide concentrations in the model. Additionally, Dr. Peterson was involved in AOS-related meetings and discussions related to algorithm development.

This task is scheduled to end on September 30, 2025 and the future of AOS is highly uncertain. Dr. Peterson will continue to work on preparing IROE for use in AOS-related algorithms. The upcoming North American Upstream Feature-Resolving and Tropopause Uncertainty Reconnaissance Experiment (NURTURE) is a NASA-funded large-scale aircraft field campaign; this campaign, which Dr. Peterson will participate in, is relevant to AOS. He will be developing radiative transfer tools and algorithm approaches related to synergistic IR-microwave ice cloud retrievals for NURTURE, which should be applicable to AOS should the mission continue to develop.

WEI-KUO TAO

Sponsor Adrian Loftus / Code 612 / Task 233

Dr. Wei-Kuo Tao is an affiliated senior research scientist responsible for helping make research and development efforts successful in atmospheric science and weather modeling. Dr. Tao made improvements to the NCU-Goddard two-moment 4ICE scheme weather model component. Dr. Tao also integrated the improved component into a separate, larger algorithm, which is the Goddard Convective-Stratiform Latent Heating Algorithm.

CODE 613: CLIMATE AND RADIATION LABORATORY

SERGEY KORKIN

Sponsor Alexei Lyapustin / Code 613 / Task 001

As an expert in numerical simulation of multiple scattering and absorption of sunlight in Earth's environment (commonly called radiative transfer (RT)), Dr. Korkin collaborates with colleagues from GSFC Codes 613 (supporting Dr. A. Lyapustin's MAIAC algorithm, which is Dr. Korkin's primary task), 614 (integration of Dr. Korkin's code for light scattering by spheroids into their retrieval algorithm), 616 (publication of the "Practical Guides" – papers sharing knowledge and experience in RT numerical simulation), and 618 (collaboration with the NASA GSFC AERONET team).

As a result of these efforts, during the past year Dr. Korkin has: a) given one seminar and presented two conference posters as lead author; b) published one paper as lead author (see also Dr. Korkin's Task 182) and one paper as co-author; c) co-authored three papers recently submitted for review, and one paper currently in preparation; d) served as reviewer for four full-length papers, three proposals, and twice as a Red Team member; and e) communicated with colleagues from the private sector and European institutions. Details of all these activities are provided in this report's appendices.

Dr. Korkin's ROSES RST proposal, submitted in September 2024, is still pending; subsequent plans depend heavily on the outcome. Uncertainties in the NASA Earth Science budget complicate matters further. However, Dr. Korkin will help revise submitted papers in response to reviewers' comments, continue seeking funding to support the RT "Practical Guide" series of papers, and provide RT simulation support to various groups at GSFC. Dr. Korkin also plans to seek collaboration beyond Earth Science, for example, with NASA's Planetary Spectrum Generator team (PSG, Code 690).

MANISHA GANESHAN

Dr. Ganeshan's research is aimed at studying the changing behavior of the polar atmosphere, particularly the Planetary Boundary Layer (PBL), clouds, and blowing snow, that are crucial for correctly predicting the surface radiation budget, weather, and climate in polar regions. She uses satellite and in-situ measurements to study Antarctic and Arctic atmospheres, cloud properties, and PBL behavior, and for comparing their representation in model and reanalysis data. Dr. Ganeshan has submitted a manuscript titled "Characteristics of Tropospheric Clouds over Dome C, Antarctica, using CALIPSO and In-situ Measurements" to the Journal of Geophysical Research-Atmospheres where the manuscript has been conditionally accepted subject to revisions. Dr. Ganeshan is also involved in exploring the use of Global Navigation Satellite System radio occultation (GNSS RO) satellite observations for PBL studies, over polar and midlatitude land regions. She submitted a ROSES 2024 proposal for utilizing GNSS RO data to advance Arctic PBL science as well as assimilating RO data for enhancing the PBL representation and prediction in polar regions. She published a paper, "Exploring commercial GNSS RO products for Planetary Boundary Layer studies in the Arctic", in the OPAC-IROWG 2022 Special Issue in *Atmospheric Measurement Techniques (AMT)*, which discusses the lower atmospheric sounding capability of new commercial GNSS RO products over the Arctic Ocean.

In the coming months, Dr. Ganeshan will work on addressing the reviewer's comments to revise her manuscript and re-submit to JGR-atmospheres. She will present her work describing Dome C tropospheric clouds and their properties at the AGU fall meeting. Dr. Ganeshan will lead a NASA ROSES 2025 proposal in response to the solicitation 'Earth Venture: Tropics and Prefire Science and Applications Teams.'

JACKSON TAN

Sponsor George Huffman / Code 613 / Task 018

Dr. Tan has been working on the IMERG satellite precipitation algorithm. He is involved with refining the code and implementing research ideas, with the goal of improving the IMERG products. During this period, he played a crucial role in extending the IMERG V07B record from 2000 back to 1998. At the same time, development for the IMERG V08 algorithm was in progress, with many planned changes demonstrating improvement in its accuracy. Dr. Tan presented his work at the AGU Fall Meeting, the AMS Annual Meeting, and the NASA PMM Science Team Meeting. He was also the lead author on a publication in Geophysical Research Letters and a co-author on three publications.

Dr Tan will continue to implement the desired changes to the IMERG V08 algorithm. Furthermore, with IMERG V08 processing set to begin soon after this period, he will work with the production system to test the code and work towards implementation feasibility.

CORNELIUS CSAR JUDE H. SALINAS

Sponsor Dong L. Wu / Code 613 / Task 035

Dr. Salinas has mainly been working on analyzing and modeling ionospheric E-region electron density variations observed by Global Navigation Satellite System Radio Occultation (GNSS RO) measurements. In the year 2024 – 2025, his work became part of a funded NASA ROSES project. The project is under the NASA Living With A Star Program. It is a 4-year project entitled

“Investigation of Global Ionospheric Conductivity Variabilities driven by E-region electron density”. Dr. Salinas is the principal investigator of this project. In addition, his work also became part of a 1-year project under UMBC’s Strategic Awards for Research Transitions (START) program. The proposal is titled “Space Weather Effects on Ionospheric E-region Electron Density as observed by Global Navigation Satellite System Radio Occultation Missions”.

Dr. Salinas’ first major research output in 2024 – 2025 was the release of the first empirical E-region electron density model that accounts for monthly-mean variabilities due to photoionization, solar cycle and non-photoionization forcing (e.g. auroral precipitation). The model is called E-region Prompt Radio Occultation Based Electron Density (E-PROBED) model. The model has been validated through comparisons with ionosonde and radar observations as well as simulations from other empirical and Physics-based models. The paper detailing the model’s development, architecture and validation is published in the AGU journal Space Weather. The model can be downloaded from GitHub.

Dr. Salinas’ second major research output in 2024 – 2025 is a report on quantifying the contributions of geomagnetic activity on the day-to-day variability of E-region electron density. This is published in the AGU journal Geophysical Research Letters. We reported that for E-region Ne between 21 PM and 3 AM, we clearly saw enhanced E-region Ne over the auroral ovals during periods of enhanced Kp indices. The below figure shows a highlight figure for this paper.

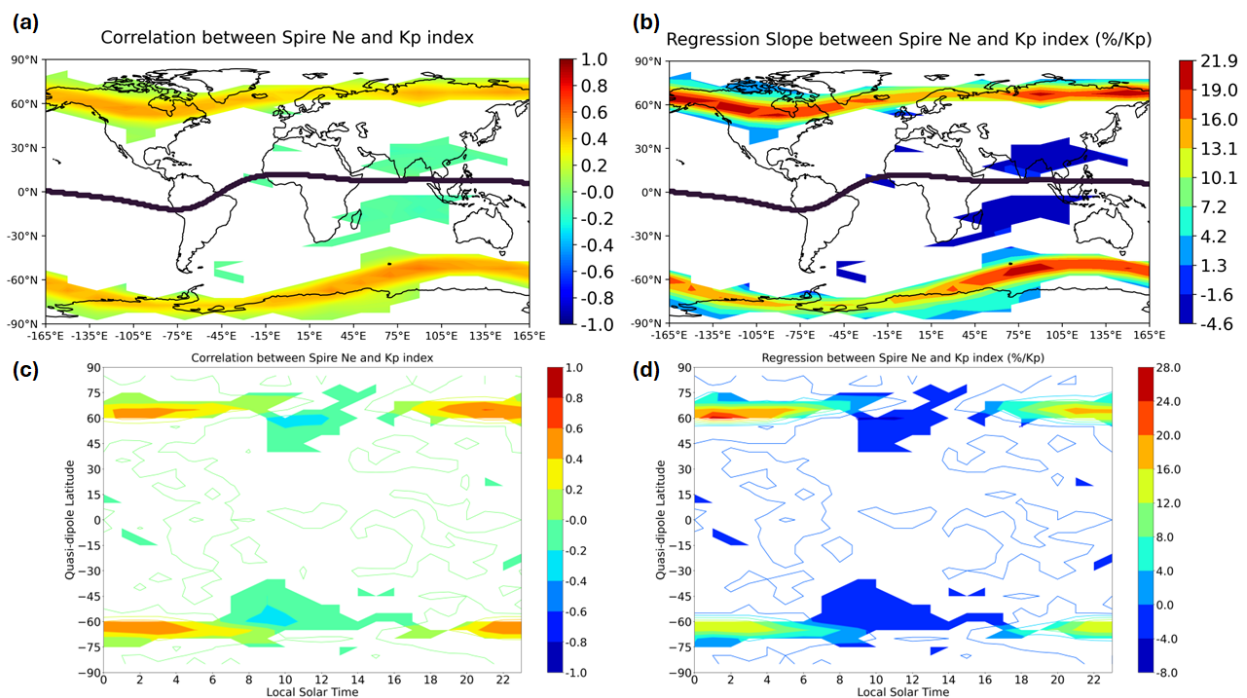


Image: (a) Correlation coefficients and (b) linear regression coefficients between de-seasonalized night-time Spire Ne at ~110 km and the Kp index as a function of geographic longitude and geographic latitude. Black lines indicate the geomagnetic equator. (c) Correlation coefficients and (d) linear regression coefficients between de-seasonalized Spire Ne at ~110 km and the Kp index as a function of local solar time and quasi-dipole latitude. Contour-filled regions have a statistically significant correlation (95% confidence level).

Dr. Salinas’ third major research output for 2024 – 2025 is the discovery that the May 2024 severe geomagnetic storm suppressed the E-region electron density formation mechanism over the mid-latitudes. This discovery was made possible through the merging of radio occultation data on E-region electron density from three satellite constellations: COSMIC-2 mission, Spire

RO mission and FengYun-3 mission. It was first found that during the main to recovery phases of the May 2024 severe geomagnetic storm, day-time E-region electron density was significantly reduced. This reduction was reproduced by the Thermosphere Ionosphere Electrodynamics – General Circulation Model. Model diagnostics then suggested that this reduction was because the severe storm induced a lower thermospheric circulation with significant downwelling over the mid-latitudes. The downwelling transported air with low molecular oxygen down into the E-region. Since molecular oxygen is a major source of E-region electrons, this weakened this production mechanism. Thus, E-region electron density was reduced. This has been written in a manuscript that has been submitted to the AGU journal Geophysical Research Letters.

Dr. Salinas' fourth major research output for 2024 – 2025 was the development of a new method to estimate Sporadic-E perturbations on E-region electron density using radio occultation measurements of excess phase. Using this new method, we found that, over the mid-latitudes, the second downward propagating layer appears to mostly be made of Sporadic-E with peak densities greater than 10^{10} e-/m³. This does coincide with larger vertical ion convergence values as estimated by the Specified Dynamics – Whole Atmosphere Community Climate Model with Ionosphere/Thermosphere eXtension. The estimated Sporadic-E thickness also exhibited coherent diurnal pattern wherein the day-time thickness was clearly higher than night-time thickness. Finally, our estimates agree with recent reports that Sporadic-E over the southern hemisphere was significantly enhanced during the May 2024 geomagnetic storm. This is currently being written into a manuscript that is being submitted as an invited paper to the MDPI journal Remote Sensing.

Apart from these major research outputs, Dr. Salinas has been leading new research activities as part of his NASA Living With A Star (NASA LWS) grant. The NASA LWS grant requires all funded groups to come together and perform research efforts outside of their proposed tasks. This includes meeting twice a year. Last November 2024, Dr. Salinas attended the kick-off meeting at UC Berkeley. During this meeting, Dr. Salinas was assigned leader of the team's sub-goal 1, which is to quantify the relative contributions of solar, geomagnetic and lower-atmosphere drivers on large-scale conductivity variability. Then, in April 2025, during another LWS meeting, Dr. Salinas was assigned leader of the research efforts on Sporadic-E. Sporadic-E are thin layers of high ion density in the E-region.

As part of the research efforts on Sporadic-E, he proposed a radar campaign during the Coupling Energetics and Dynamics of Atmospheric Regions (CEDAR) workshop that was approved. The proposed radar campaign is called "Sporadic-E Perturbations on Ionospheric Conductivity during the Perseids Meteor Shower". Dr. Salinas is principal investigator of the campaign. It aims to estimate Sporadic-E perturbations on ionospheric conductivity during the Perseids Meteor Shower from August 11 to 13, 2026. Radars from Jicamarca, Millstone Hill, Svalbard, Reunion Island and Pokerflat shall be simultaneously activated for these two days so that we can observe the needed parameters to estimate Sporadic-E perturbations on ionospheric conductivity.

From September 1, 2025 to November 30, 2025, Dr. Salinas' expected activities and research are:

- Publish paper on suppression of E-region formation mechanism by the May 2024 severe geomagnetic storm.
- Submit invited paper to MDPI journal Remote Sensing on method to estimate Sporadic-E perturbations on E-region electron density using radio occultation phase measurements.

- Isolate lower atmospheric-driven variabilities (e.g. planetary scale waves, sudden stratospheric warming) in observed E-region electron density and Sporadic-E.
- Perform additional error quantification analysis on retrieved E-region electron density.
- Prepare for AGU Fall Meeting 2025
- Attend NASA LWS Virtual Team Meeting in November 2025.

YOUNG - KWON LIM

Sponsor Dong Wu / Code 613 / Task 036

Dr. Lim has been conducting ongoing research on climate variability in Antarctica and its connection to sea ice changes in the Southern Ocean. The main goal of this project is to advance the understanding of the dynamic processes behind Antarctic Sea ice fluctuations and to assess the reliability of NASA's reanalysis datasets, such as MERRA-2, along with their modeling systems for climate studies focused on this region. His research has primarily concentrated on sea ice variability in the Ross, Amundsen, and Bellingshausen Sea (RAB) area, where changes in sea ice are significantly affected by distant tropical heat influences like ENSO and the Madden-Julian Oscillation (MJO), extra-tropical influences like Southern Annular Mode (SAM), as well as long-term oceanic patterns such as the Pacific Decadal Oscillation (PDO) and the Atlantic Multi-decadal Oscillation (AMO). Additionally, Dr. Lim is exploring local vertical air movements (katabatic winds) and adiabatic warming near the Antarctic coast, which may contribute to coastal sea ice melting. These works build upon findings he previously published and presented last year.

No further research is anticipated as this task is closed as of September 30, 2025.

LIPi MUKHERJEE

Sponsor Dong Wu / Code 613 / Task 037

Dr. Mukherjee led a study on the use of twilight near-infrared (NIR) radiometry to retrieve the height of the stratospheric aerosol layer, utilizing ground-based observations and radiative transfer modeling. Her research demonstrated that NIR twilight sky radiance contains a strong signal from stratospheric aerosols, particularly between 850–1100 nm, enabling a novel method for inferring aerosol layer height based on the timing and angular position of peak radiance during twilight. Through comparison with lidar measurements, Dr. Mukherjee validated this approach and showed that it can achieve good agreement with independent observations. The method offers a cost-effective and passive alternative to active remote sensing techniques for monitoring volcanic aerosol layers and other stratospheric perturbations. She published this work as first author in *Remote Sensing*.

Currently, Dr. Mukherjee is developing a passive remote sensing technique to estimate cloud base height (CBH) using visible satellite imagery and sun-sensor geometry. The algorithm matches cloud tops with their projected shadows, enabling geometric CBH retrieval without the need for stereo or active sensing. Optimized for isolated, fair-weather cumulus clouds typical of the planetary boundary layer, this technique addresses a key observational gap over oceanic regions where in situ measurements are limited.

Validation using MODIS imagery over land shows strong agreement with co-located radiosonde and MPLNET data, supporting its application in remote and data-sparse domains. This approach

enables scalable, low-cost CBH estimation to support mesoscale air–sea interaction studies and convective cloud modeling.

From September 1 to November 30, 2025, Dr. Mukherjee will focus on preparing two publications to present her recent research findings related to cloud base height (CBH) retrieval. The first manuscript will detail the development and validation of a passive remote sensing technique for estimating CBH using visible satellite imagery and cloud shadow displacement. This study builds on the method’s demonstrated accuracy over land and explores its applicability over oceanic regions where in situ observations are limited. The second manuscript will examine the integration of machine learning techniques to enhance the CBH retrieval framework. Specifically, the use of automated algorithms for cloud and shadow detection is expected to improve retrieval accuracy and operational robustness under suboptimal imaging conditions. Together, these publications aim to advance scalable, low-cost approaches for characterizing cloud properties in support of mesoscale modeling and air–sea interaction studies.

In addition to manuscript preparation, Dr. Mukherjee will also be developing a NASA ROSES proposal based on this work. The proposed research will aim to expand and operationalize the CBH retrieval method for broader application in satellite-based climate and weather studies, particularly in data-sparse oceanic environments.

DONGMIN LEE

Sponsor Lazaros Oreopoulos / Code 613 / Task 038

Dr. Lee has focused on the analysis and comparison of cloud properties from global climate models and satellite observations, advancing our understanding of cloud feedback mechanisms within the Earth system. His research activities included an extensive benchmarking of model-simulated clouds against active satellite datasets, as well as investigations into the interplay between model-predicted and observed cloud radiative effects.

This year, Dr. Lee contributed to the publication of two peer-reviewed articles, Lee et al. (2025) explores global regimes of cloud vertical structure using active remote sensing, establishing robust frameworks for climate model evaluation. Cho et al. (2025) introduces an innovative methodology to describe and classify the seasonal variability of cloud regimes, shedding light on large-scale atmospheric patterns. In addition, a manuscript has been accepted for publication, Lee et al. (2025) investigates how global models respond to perturbations in cloud properties and quantifies the resulting cloud feedback.

Throughout the year, Dr. Lee continued his research into the mechanisms of Earth’s energy imbalance and hemispheric albedo asymmetry, comparing these indices between models and satellite observations. He actively engaged with CloudSat/PMM satellite data, laying the groundwork for machine learning applications aimed at improving model subcolumn representations of hydrometeors.

Dr. Lee will focus on refining the analysis of Earth’s energy imbalance and hemispheric albedo asymmetry using an expanded dataset of model simulations and satellite observations. Advancing machine learning techniques to enhance subcolumn hydrometeor variability representations in global climate models by leveraging CloudSat/PMM data.

Continuing his investigation into the impacts of cloud feedback on global and regional climate dynamics, with the goal of connecting observed radiative effects to future climate projections.

NAYEONG CHO

Sponsor Lazaros Oreopoulos / Code 613 / Task 039

Dr. Cho has been developing and analyzing a new type of cloud classification called Regimes of Regimes (ROR). RORs are a temporally higher-order (monthly to seasonal) classification constructed from mixtures of daily cloud regimes (CRs), which themselves are defined by the distribution of cloud fraction across distinct combinations of cloud-top pressure and cloud optical thickness retrieved from passive satellite observations. Using a 20-year dataset (<https://doi.org/10.5281/zenodo.11099765>), she has shown that RORs provide meaningful insights for climate research, especially in identifying trends and feedback of the cloud radiative effect. RORs also serve as an effective framework to characterize large-scale transitions in atmospheric states, such as the seasonal progression of the monsoon or ENSO variability (El Niño and La Niña). This work was published in Journal of Climate under the title “Describing Seasonal Mixtures of Cloud Regimes via ‘Regimes of Regimes’” and has been presented at several scientific meetings.

In parallel, as part of the CloudSat/CALIPSO project task, Dr. Cho has contributed to the introduction of a new type of cloud classification termed Active Cloud Regimes (ACR), derived from spaceborne active observations (CALIPSO lidar and CloudSat radar). The ACR framework captures prevalent monthly mixtures, at ~400 km scales, of previously defined cloud vertical structures (CVS) that are inferred from instantaneous ~2 km observations. For this purpose, she produced a CVS dataset (<https://doi.org/10.5281/zenodo.12574972>) based on the 2B-CLDCLASS-LIDAR product, which merges CALIPSO and CloudSat cloud detections. In addition to observational analysis, the ACR concept has been implemented in NASA’s GEOS model, demonstrating its utility for evaluating whether Earth System Models can realistically represent subgrid cloudiness governed by vertical overlap rules. Results from this effort were published in Journal of Geophysical Research: Atmospheres as “Regimes of Cloud Vertical Structure from Active Observations”, in which Cho is a co-author.

Most recently, Dr. Cho co-authored a study titled “The role of Earth’s major cloud systems in the hemispheric albedo symmetry” (ESS Open Archive, under revision; <https://doi.org/10.22541/essoar.174835432.21500524/v1>). This research examines how major cloud systems contribute to the remarkable symmetry of Earth’s reflected solar radiation (RSR) between the Northern and Southern Hemispheres, despite their distinct land–ocean distributions and seasonal variations. Using the ROR framework and two decades of CERES satellite observations, the study shows that population differences among cloud regimes, rather than their intrinsic radiative properties, largely drive the hemispheric RSR symmetry and its variability. The analysis further reveals a consistent global dimming trend, with a slightly stronger reduction in reflected solar radiation over the Northern Hemisphere. This hemispheric balance results in greater solar energy absorption in the Northern Hemisphere, reinforcing the net energy transport from north to south. The work demonstrates that the ROR framework provides a powerful tool for understanding both the mean state and variability of hemispheric albedo symmetry, with broader implications for studies of Earth’s energy budget. Dr. Cho is analyzing short-term cloud feedback over the past ~21.5 years using satellite observations and the Cloud Radiative Kernel (CRK) framework with interannually varying

kernels. Her ongoing work focuses on quantifying the contributions of cloud amount, optical depth, and altitude changes to radiative flux anomalies, with plans to refine the analysis to better isolate temperature-mediated responses and enhance the accuracy of observationally derived cloud feedback estimates.

DAEHO JIN

Sponsor Lazaros Oreopoulos / Code 613 / Task 040

Dr. Jin has been investigating the large-scale relationship among cloud, radiation, and physical environment variables (known as “cloud controlling factors”). Based on a pre-built set of cloud regimes, Dr. Jin quantified the role of clouds in the changes of outgoing shortwave radiation (OSR) and outgoing longwave radiation (OLR) in recent years. This result has been submitted to a peer-reviewed journal (JGR-Atmosphere). In addition, Dr. Jin also prepared a manuscript for the possibility of predicting cloud occurrences based on physical environmental variables, which can be applied to global climate models. Dr. Jin presented a part of this research at AGU Fall 2024, which was held on 12/09-12/13 in Washington DC.

Contribution to OSR mean difference in 60°S–60°N

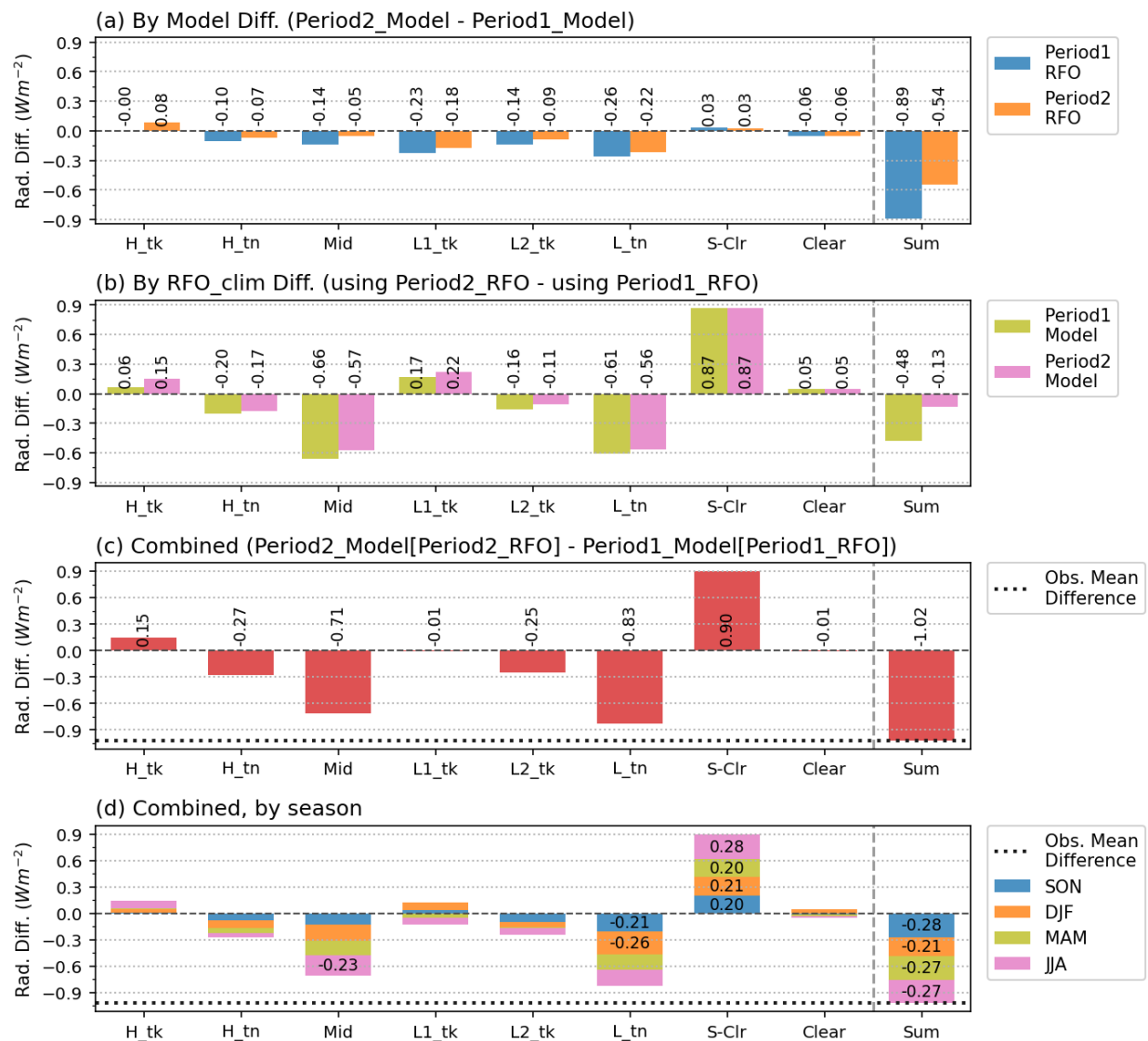


Image: Contributions of cloud regime groups to the changes of outgoing shortwave radiation (OSR) between two periods, 2003-2012 vs. 2015-2024, in the domain of 60°S - 60°N.

In addition, Dr. Jin submitted a proposal to the call of PMM+CloudSat in ROSES 2024. This proposal is about building a sub-column generator based on machine learning algorithm combined with satellite observations, which is expected to improve the performance of global climate models in simulating cloud-related variables. This proposal is now in the “selectable” status.

Dr. Jin will finalize the second manuscript about the cloud controlling factors. In addition, Dr. Jin will also start new research about organized index based on the identification of synoptic scale convective areas using cloud regimes.

GUOYONG WEN

Sponsor Alexander Marshak / Code 613 / Task 043

Dr. Wen has been studying radiative transfer of solar radiation in the atmosphere, specifically to study the 3D cloud radiative effects on aerosol retrieval in the vicinity of clouds for MODIS/VIIRS aerosol retrievals, characterize near cloud properties from MODIS and CALIPSO, analyze EPIC observed reflectance changes due to clouds and satellite orbit, and perform radiative transfer simulations to understand the physical processes. Dr. Wen has reported their findings in national conferences and science meetings and published scientific results in peer reviewed journals.

This task ended in October 2024.

ALFONSO DELGADO-BONAL

Sponsor Alexander Marshak / Code 613 / Task 044

Dr. Delgado-Bonal has been working to analyze DSCOVR EPIC observations to better understand global cloud properties and their variability across spatial and temporal scales. His research has focused on evaluating daytime cloud characteristics over the past decade using EPIC data, resulting in a publication in Frontiers in Remote Sensing that documents long-term trends and variability in cloud fraction, optical thickness, and related metrics. In addition, he has been investigating how pixel resolution influences EPIC reflectance and cloud retrievals, which led to the submission of a second manuscript to the same journal. Together, these studies advance the use of EPIC observations for climate monitoring and highlight the importance of instrument resolution in interpreting cloud properties from space.

The continuous development of algorithms to study cloud variability will be extended to two dimensions. This new metric will provide a metric to study the evolution of cloud complexity from satellite imagery that is suitable for a variety of satellites.

SURENDRA BHATTA

Sponsor Yuekui Yang / Code 613 / Task 098

Dr. Bhatta has been conducting research on Blowing Snow (BLSN) over Antarctica. He has applied Machine Learning models to investigate BLSN properties during the MERRA-2 era. Recently, he completed a project that generated a long-term, hourly BLSN dataset spanning

from 1980 to the present. This dataset enables improved estimation of Surface Mass Balance (SMB) over Antarctic Sea ice. In addition, he is studying global cloud properties, such as occurrence and height, using DSCOVR–EPIC satellite data.

Dr. Bhatta is now studying the climatology of BLSN to investigate how it has evolved over the past four decades using long-term BLSN data.

TAMÁS VÁRNAI

Sponsor Alexander Marshak / Code 613 / Task 102

Dr. Várnai and his colleagues continued examining sun glints from ice clouds, which are caused by the intense, focused reflection of sunlight by ice crystals that maintain a steady horizontal orientation. This year they examined geographical, seasonal, and interannual variability in glints detected by the operational sun glint product of the Earth Polychromatic Camera (EPIC) onboard the Deep Space Climate Observatory (DSCOVR) spacecraft. They also examined the way the likelihood of glint detection depends on cloud parameters such as altitude, optical thickness, and particle size. Dr. Várnai also participated in examining and interpreting the angular width of EPIC-observed glints. The team is now preparing two manuscripts to report their findings, with Dr. Várnai as first author for one of them. He and his colleagues also examined glint effects in MODIS observations and reported the results at an international conference. Dr. Várnai was also first author of an article that the team published this year about the statistical relationships between cloud properties and spatial variations in satellite-observed radiances, with the goal of improving our ability to characterize the observed clouds. In addition, Dr. Várnai participated in a team effort to explore the potential benefits of a lidar instrument that could observe clouds at two wavelengths and thus provide information on variations in the number and size of droplets deep inside clouds. Finally, he continued expanding the user community of the first publicly available online simulator of atmospheric three-dimensional radiative processes, which the team developed earlier; this year, the user community expanded by more than 500 people and now includes people from over 80 countries.

Dr. Várnai plans to complete the publication process for two manuscripts (about satellite observations of sun glint) that the team plans to submit in late August 2025. He also plans to further analyze statistics of spaceborne glint observations. In addition, he plans to further expand the user base and make improvements to the online simulator of three-dimensional radiative processes.

ANIN PUTHUKKUDY

Sponsor W. Reed Espinosa / Code 613 / Task 110

The retrieval-simulation setup for the CAMP2Ex observations has been meticulously developed for the multi-angular polarimeter (MAP), specifically utilizing a polarimeter from the HARP family of MAPs. This task required a detailed examination of the impact of various assumptions on the measured versus modeled size distribution of aerosols, as well as the effects of simplified modeling approximations on aerosol and surface properties, which significantly influence the retrieved products from MAP. The framework established through this research is highly adaptable and can be seamlessly integrated into future MAP instruments. The findings were

showcased by Dr. Puthukkudy at the CAMP2EX 2024 science meeting in Pasadena, CA, and a draft manuscript of the study has been prepared and reviewed by supervisor Reed Espinosa.

The project will be wrapped up with the submission of the manuscript for publication and the release of the code and data used in this study to the public domain. Dr. Espinosa and Dr. Puthukkudy submitted a proposal to examine high-resolution aerosol retrievals from commercial satellite data for the solicitation, which has been approved. The subsequent year will be dedicated to the project proposed in the CSDA project.

TIANLE YUAN

Sponsor Lazaros Oreopoulos / Code 613 / Task 112

Dr. Yuan has been working to study aerosol-cloud interactions within ship-tracks. These activities are funded through his projects with NOAA, NASA and DOE. He and his team have been using insights from ship-track analyses and applying them to larger scale aerosol forcing calculations. He published four papers this year. They study the impact of shipping fuel regulation on the climate with observations and models. One paper describes how to use machine learning and AI to classify satellite images into different cloud types. One study uses data products that Dr. Yuan's team have produced to study potential impact of aerosols on cloud type. These studies advance our understanding of clouds and aerosol-cloud interactions.

Dr. Yuan will continue his work on ship-tracks.

DANIEL J. MILLER

Sponsor Kerry Meyer / Code 613 / Task 113

Dr. Miller has been simulating a large dataset for evaluating a potential multiangle correction for cloud droplet effective radius retrievals. With MODIS project funding coming to an end soon we intend to publish this work soon. The method has significant overlap and relevance to the PACE Science & Applications team project as well because the multiangle polarimeter observations may make such a correction readily feasible for the PACE mission. This sort of correction toward better agreement with microphysical cloud top droplet size has a significant impact on the ability of remote sensing products to be able to inform aerosol cloud radiative impacts because it hinders our ability to accurately infer cloud droplet number concentration.

Dr. Miller plans to publish his work toward the multi-angle droplet size correction soon. In parallel with that project, he has also been developing new methods for implementing spectral cloud algorithms for the PACE mission that can take unique advantage of the spectral and multiangle polarimetric capabilities of the observatory.

JAE N. LEE

Sponsor Dong L. Wu / Code 613 / Task 114

Dr. Lee's major task involves providing theoretical and physical scientific expertise for the Total and Spectral solar Irradiance Sensor-1 (TSIS-1) mission operation and upcoming TSIS-2 mission development. Scheduled to launch as a free-flyer in 2026 as a follow-up of the TSIS-1, TSIS-2 will continue to measure solar irradiance toward a continuous climate data record as suggested by last decadal survey. Throughout mission activities, Dr. Lee is managing science data quality and

engaging in validation and calibration status so that the mission can fulfill all levels of requirements and science objectives. During 2024-2025, Dr. Lee supported the TSIS-2 instrument team to build the instrument and to complete the Instrument Integration Review (IRR) and System Integration Review (SIR). Besides the solar irradiance, Dr. Lee's broader research interests encompass the Sun-climate connection, exploring the complex interplay between solar variations and Earth's atmosphere via stratospheric ozone changes, and to lead science publications. In 2025, Dr. Lee was recognized with a "Scientific Leadership Award" by NASA "for outstanding leadership in Sun-Climate research".

For more than 46 years, NASA has been measuring how much solar irradiance is arriving on Earth's top of the atmosphere. Solar irradiance is a primary natural forcing of the Earth's system - it represents the Sun's direct energy input to the planet and influences atmospheric circulation, chemical composition, and surface temperature. In December 2017, NASA launched the TSIS-1 with two instruments to the International Space Station to continue monitoring the Sun's energy input to Earth, as the successor to the SORCE mission. The Total Irradiance Monitor (TIM) is taking measurement of the total amount of radiant energy emitted from the Sun coming to the Earth called total solar irradiance. The Spectral Irradiance Monitor (SIM) is measuring solar spectrum, spectral solar irradiance.

Despite extensive research on the Sun-Earth relationship, the precise mechanisms underlying solar forcing of climate change remain elusive. Accurate and consistent solar irradiance measurements are crucial for establishing Earth's energy balance and attributing climate change to various natural forcing factors. Dr. Lee's research aims to unravel the complexities of the Sun-climate connection by exploring a wide range of atmospheric and solar phenomena. This includes exploring processes throughout the whole atmosphere from the planetary boundary layer to the heliosphere. A comprehensive understanding of the models for both the Earth system and solar irradiance is essential for uncovering the Sun's role in shaping our planet's climate.

While continuing her science research on solar irradiance, middle atmosphere dynamics, stratospheric ozone, teleconnections in the Arctic and Antarctic changes, and Sun-Climate Connection, Dr. Lee is planning to continue to support TSIS-1 and TSIS-2 missions. The upcoming year is critical for the TSIS-2 mission, as shipment of the instruments and system integration must be completed in preparation for its successful launch in 2026.

YUJIE WANG

Sponsor Alexei Lyapustin / Code 613 / Task 118

Dr. Wang has been continuously working on improvement and extension of the Multi-Angle Implementation of Atmospheric Correction (MAIAC) algorithm. First, Dr. Wang completed cross-calibration among the VIIRS sensors on NPP, J1, and J2, thereby extending MAIAC-VIIRS processing to J2. The operational code has been submitted. Second, Dr. Wang completed the MAIAC-VIIRS global CMG code, which generates aggregated daily global MAIAC VIIRS products at $0.05^\circ \times 0.05^\circ$ resolution for modeling applications. Third, Dr. Wang developed a new gridding algorithm based on the Zone Sinusoidal Projection (ZSP), which significantly reduces spatial distortion relative to the standard Sinusoidal projection used in current MODIS products. The code has been delivered to MODAPS for operational integration. Fourth, he upgraded the MAIAC-MODIS algorithm to Collection 7 (C7), making it ready for C7 processing. The code has

been delivered to MODAPS for integration. Lastly, Dr. Wang continues to provide support to the community on MAIAC data use.

Dr. Wang will continue MAIAC VIIRS and MODIS code development and maintenance, develop MAIAC MODIS CMG code for C7, and finish the new version of PACE OCI MAIAC code delivery.

SUJUNG GO

Sponsor Alexei Lyapustin / Code 613 / Task 119

Dr. Go worked on generating climatological data for dust iron-oxide species (e.g., hematite and goethite) using MAIAC EPIC version3 algorithm. This work particularly focused on the aerosol layer height retrieval updates, which utilized EPIC's UV and Oxygen-A, -B bands. Her analysis included the monthly and seasonal climatology of mineral dust iron-oxide species, as well as the vertical distribution of hematite and goethite over major dust source regions globally. Additionally, the study monitored long-range dust transport over the Atlantic Ocean, with a focus on the Godzilla dust event in June 2020, using MAIAC EPIC level 2 products. This task ended in November 2024.

MYUNGJE CHOI

Sponsor Alexei Lyapustin / Code 613 / Task 120

Dr. Choi has enhanced the MAIAC EPIC aerosol retrieval algorithm to enable the simultaneous retrieval of aerosol optical depth (AOD), spectral absorption, and aerosol layer height (ALH). This included region-specific optimization of spectral weights in the inversion process, as well as updates to regional smoke aerosol models and the global dust model. A global, long-term validation using ground-based AERONET data and satellite-based CALIOP aerosol profile measurements demonstrated improved accuracy in the retrieved properties. These updated results have been submitted and are currently under peer review.

Using nearly a decade of EPIC observations, Dr. Choi analyzed the climatology and variability of smoke aerosols over North America, with a focus on black carbon and brown carbon. She produced gridded global MAIAC EPIC datasets at daily, monthly, seasonal, and annual timescales, and identified an increasing trend in smoke AOD, particularly associated with rising levels of brown carbon. These results are also under review in a scientific journal.

In addition, Dr. Choi conducted a radiometric calibration assessment of Satellogic's NewSat satellites under NASA's Commercial Satellite Data Acquisition (CSDA) program. High-resolution (~1 m) imagery was collected over the Libya-4 site, and the MAIAC Desert Calibration Algorithm was applied to evaluate absolute radiometric calibration, signal-to-noise ratio (SNR), and temporal stability. The results were presented to NASA Headquarters and the vendor, and the final report is currently in development.

Dr. Choi will present the "MAIAC EPIC version 3: Joint retrieval of AOD, spectral absorption, and aerosol layer height" at the 2025 AGU fall meeting, which will be held December 15-19, 2025.

YINGXI SHI

Sponsor Robert Levy / Code 613 / Task 132

Dr. Shi executed a thorough and careful validation and comparison work on DarkTarget (DT) and DeepBlue (DB) Version 2 VIIRS products on SNPP and NOAA20. The data are validated against AERONET and MAN separately for over land and ocean data. All level-2 products were validated against ground-based measurements as well as compared to each other to illustrate the similarities/differences between them. The main goal is to provide guidance for merging the two products as was done for MODIS AOD products.

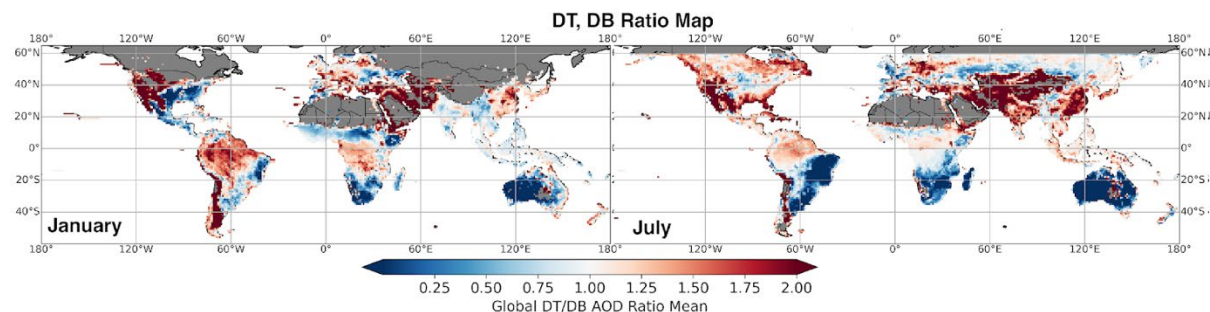


Image: The ratio of DT/DB AOD at 550nm over land using 1 by 1 degree box using 2020 data over January and July, to illustrate regions where two products vastly disagree with each other.

Dr. Shi prepared the delivery of MODIS C7 and VIIRS V2.2 algorithm change, including validating the over the coastal aerosol algorithm and evaluating the heavy smog scheme that retrieves over intense pollution over East China during winter seasons. Evaluation and tests were performed to ensure the improvement is efficient and robust.

Dr. Shi guided a student to publish his first paper on developing an aerosol absorption algorithm using critical reflectance methods and high-temporal resolution geostationary data. The smoke single scattering albedo over North America is retrieved and evaluated against AERONET. The sensitivity study of potential assumed smoke size distribution and other uncertainty sources impacts are evaluated and modeled. Multiple case studies have shown that our SSA product can capture the temporal evolution of SSA with high accuracy when compared against ground truth.

Dr. Shi is developing a Machine Learning algorithm to identify atmospheric components, including clouds and aerosols using spectral, spatial, and temporal information. The machine learning model is trained using multiple datasets including collocated active and passive sensors to utilize the lidar's high sensitivity of identifying dust, hand-picked smoke and dust cases, and AERONET collocated aerosol cases. Careful evaluation is performed to adjust the targeting values of dust to match the dust detectability by passive sensors. Various models are trained to accommodate different sensors' unique measurements.

Dr. Shi also provided datasets for NASA MUREP PBI/HBCU Data Science Equity, Access and Priority for Research and Education (DEAP) project to guide the students from Morgan State University to learn how to use ML techniques.

Dr. Shi will continue to update the retrieval algorithm results to ensure the success of the VIIRS Dark Target V2 product release. Dr. Shi will continue to optimize and improve the ML models to identify sub-aerosol types along with identification of clouds and aerosols.

PENGWANG ZHAI

Sponsor Yuekui Yang / Code 613 / Task 135

Dr. Zhai continues to maintain the radiative transfer code developed for the DSCOVR EPIC instrument. This code simulates how light interacts with the Earth's atmosphere, including clouds, aerosols, and the surface, which is essential for processing the data from EPIC. He provides consulting service to the sponsor on how to use the code and revise it as needed. He also contributes to the study of the Earth curvature impacts in EPIC cloud height retrievals and presented in the DSCOVR science team and AGU24 meetings. At the edges of the EPIC images, the viewing geometry becomes more extreme, and the curvature of the Earth becomes a significant factor that needs to be accounted for in the retrieval algorithms. Neglecting this effect can lead to inaccuracies in determining the height of clouds, particularly at high latitudes where the solar zenith angle is large. Dr. Zhai's work helps to correct for this effect, improving the accuracy of cloud products derived from EPIC data. The DSCOVR science team consists of scientists from various organizations, including NASA and NOAA, who work on different aspects of the mission.

Dr. Zhai will provide updates to his sponsor Dr. Yang on new versions of the radiative transfer code and answer any new requests. He will continue to work with his sponsor to improve cloud data products based on the RT simulations.

SEYOOUNG LEE

Sponsor Si-Chee Tsay / Code 613 / Task 156

Dr. Lee worked on evaluating and enhancing the Deep Blue (DB) aerosol retrieval algorithm. Her work primarily involved implementing the DB algorithm on MODIS Collection 7 (C7) data and validating the resulting aerosol products against ground-based observations. Much of her effort focused on improving cloud masking and adjusting aerosol models to ensure the accuracy of retrievals. In addition to her work with MODIS data, Dr. Lee evaluated the DB algorithm for geostationary sensors. This analysis leverages the advantages of geostationary observations, enabling the production of hourly aerosol data and facilitating the study of diurnal variations on a global scale.

Dr. Lee found a new position in late August 2025.

MIJIN KIM

Sponsor Robert C. Levy / Code 613 / Task 165

Dr. Kim has been actively engaged in the evaluation and enhancement of the Dark Target (DT) aerosol retrieval algorithms. As the DT algorithm has been extended to VIIRS and other geostationary (GEO) sensors, including ABI and AHI, Dr. Kim has ensured its high retrieval performance through continuous refinement of surface reflectance assumptions and related procedures. Dr. Kim co-authored a peer-reviewed article published in *Frontiers in Environmental Science* titled "An updated VIIRS dark target aerosol product for continuity with MODIS: assessing regional aerosol trends."

Dr. Kim is currently leading the development of the DT 3 km resolution version for MODIS Collection 7, which will further advance the utility of MODIS aerosol products. In addition, Dr. Kim's recent research explores the synergistic use of multi-GEO, multi-algorithm aerosol retrieval products to improve the characterization of regional and global aerosol patterns.

After completing the DT 3 km algorithm update in August, Dr. Kim will update the MODIS Collection 7 user document. With an interest in the synergistic use of multi-sensor retrievals, Dr. Kim will focus on wildfire events and work on collocating MODIS, VIIRS, ABI, TEMPO, and other satellite data to investigate three-dimensional changes in atmospheric components.

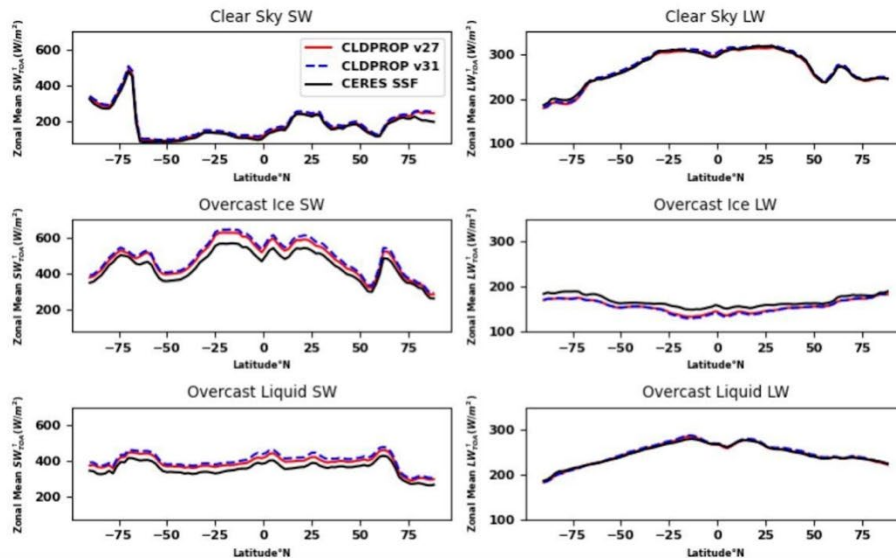
COLTEN PETERSON

Sponsor Kerry Meyer / Code 613 / Task 170

Dr. Peterson has been evaluating pixel-level shortwave and longwave radiative flux datasets that he has been developing for the upcoming releases of the MODIS Collection 7 (C7) Cloud Products and the MODIS/VIIRS Continuity Cloud Products (CLDPROP) Version 2. While many of the core science changes were made to the flux portion of these codes prior to Year 4, numerous other updates were made to the inputs and other parts of the codes that directly impact the flux outputs. For example, atmospheric and surface ancillary datasets were changed. Dr. Peterson assisted in determining if these code implementation changes produced the expected results, or if further modifications needed to be made. For example, he evaluated changes to the land snow and ice, as well as spectral surface albedo, made to the C7/CLDPROP codes. This involved comparing the C7/CLDPROP snow and ice distribution to satellite observations, and assessing the albedo implementation by comparing the C7/CLDPROP SW fluxes over snow and ice regions to SW fluxes derived from satellite measurements (CERES). Additionally, Dr. Peterson aided in the development of a framework for producing daily and monthly globally gridded level-3 (L3) flux datasets, and the group has started to produce these L3 flux datasets. Evaluations of the flux datasets have been ongoing and consist of comparing C7/CLDPROP fluxes to co-located satellite and ground-based radiation measurements (e.g., CERES SSF, BSRN), as well as other flux products in which fluxes are modeled from satellite observations of clouds (e.g., CERES CRS).

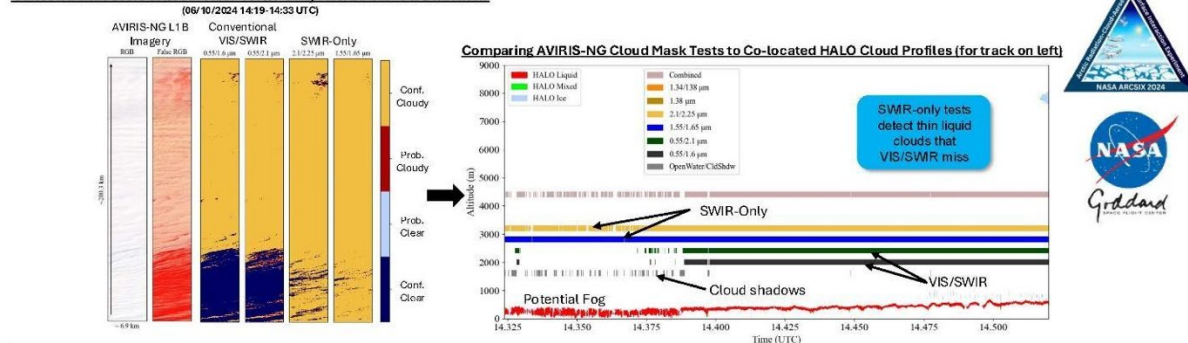
Dr. Peterson participated in both Spring and Summer 2024 NASA ARCSIX airborne campaigns and has been actively working on science product development for ARCSIX in addition to collaborating with the ARCSIX team on ongoing activities. He and his sponsor are responsible for producing a suite of cloud and radiation products for the AVIRIS-NG instrument, a hyperspectral shortwave (SW) imager that flew on the NASA G3 aircraft during ARCSIX. Dr. Peterson developed a cloud detection algorithm for AVIRIS-NG that aims to improve shortwave-imager-based cloud detection (or cloud masking) over complex snow and ice surfaces. A series of spectral cloud mask tests were developed that utilize SW spectral information not available from current spaceborne imagers, such as MODIS. These cloud mask tests were evaluated against co-located observations of clouds from the HALO lidar, which also flew aboard the G3. The cloud mask tests (e.g., open water detection, snow and ice detection, high cloud detection) are combined in a decision tree framework in order to produce a final cloud mask. Dr. Peterson developed new spectral tests in the SW-infrared (or SWIR) that appear to be more sensitive to the characteristic spectral signatures of snow and ice compared to conventional SW methods that use ratios of visible (VIS) and SWIR reflectance. This allows for the SWIR cloud mask tests to be more sensitive to thin liquid clouds over snow and ice surfaces compared to the conventional VIS/SWIR methods. Furthermore, the SWIR cloud mask tests can be used to detect sea ice leads, melt ponds, and open water during clear sky conditions, which was an unexpected result of this study.

Additionally, Dr. Peterson has been developing a cloud thermodynamic phase algorithm for the ARCSIX AVIRIS-NG cloud and radiation products. Initially, a machine learning approach was pursued in which AVIRIS-NG SW spectra would be trained against HALO liquid and ice cloud profiles obtained during ARCSIX. However, limitations in ice cloud sampling led to a more physical approach being pursued. Dr. Peterson produced AVIRIS-HALO co-location files so that AVIRIS-NG spectra associated with ice and liquid clouds over the Arctic Ocean can be analyzed. Statistics of liquid and ice cloud spectra were used to develop potential cloud phase tests, all using SWIR spectral information.

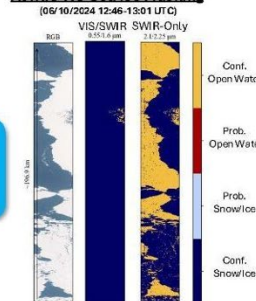


Zonal mean top-of-atmosphere (TOA) flux comparisons between CLDPROP Aqua (two recent science tests in which ancillary data was changed) and CERES SSF for July and January 2015. The results are shown for CERES footprints in which all co-located MODIS pixels are clear sky (top row), ice clouds (middle row), and liquid clouds (bottom row)

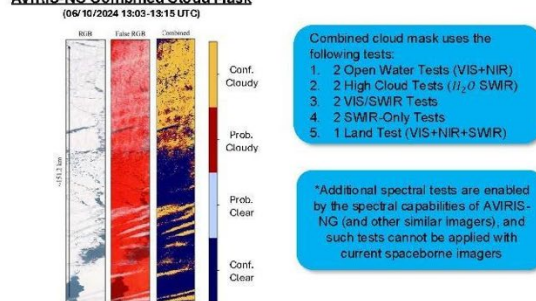
Conventional VIS/SWIR vs. New SWIR-Only AVIRIS-NG Cloud Masks



AVIRIS-NG Sea Ice Masking



AVIRIS-NG Combined Cloud Mask



Dr. Peterson is performing the final evaluations of the flux datasets for both the MODIS C7 and the CLDPROP cloud products, as the code changes must be final in Fall 2025. This involves

several more flux science tests, and assessments of any potential code errors that could be introduced during these final changes. The ARCSIX AVIRIS-NG cloud mask and its file specifications are being finalized so that the files can be delivered to the ARCSIX archive in the coming weeks. The cloud phase component of the AVIRIS-NG cloud and radiation products will now be a major focus, and a final algorithm will be produced and tested in the coming months. The development of the cloud phase algorithm enables the processing of AVIRIS-NG data through the full chain of cloud retrievals and radiation calculations. The cloud optical property retrievals and radiative fluxes will be compared to co-located *in situ* aircraft measurements of clouds and radiation that were obtained during the coordinated flights in ARCSIX. This work will be performed in preparation for the 2025 AGU meeting. Dr. Peterson is also preparing for the upcoming NASA NURTURE airborne campaign, as his group is involved in developing synergistic infrared-microwave ice cloud retrieval algorithms as well as flight planning. The radiative transfer tools for this campaign will be developed in the coming months.

YINGXI SHI

Sponsor Scott Braun / Code 613 / Task 182

Dr. Shi attended bi-weekly/weekly AOS Aerosol Algorithm Working Group Meetings, the monthly AOS Sky Science Meetings, and provided suggestions on the aerosol algorithm designs and synergy between multi-sensors aerosol algorithm synergy. The scenarios have been tested and evaluated, especially over a heavy aerosol loading case to evaluate between different polarimeter, wavelength settings

This task is scheduled to end on September 30, 2025.

ADELEKE ADEMAKINWA

Sponsor Kerry Meyer / Code 613 / Task 184

Adeleke is a graduate student who worked with Dr. Kerry Meyer on cloud imager retrieval studies. The study utilized Large-Eddy Simulation (LES) cloud fields and RT simulations to investigate the impacts of the three-dimensional (3D) radiative transfer (RT) effects on cloud droplet number concentration (Nd) retrieval and aerosol cloud interaction (ACI) analyses. Sensitivity studies carried out confirm that the bi-spectral retrievals using the 3.7 μm channel—whose retrieval is closest to cloud top—shows better agreement with Nd from our LES models, compared to results based on the 1.6 and 2.1 μm retrievals. At the native LES resolution of 100 m, across all absorbing channels, Nd is strongly impacted by the 3D-effects, with the magnitude depending on the solar zenith angles (SZAs); on average, for high/low sun conditions the 3D-RT code underestimates/overestimates its 1D-RT counterpart, which indicates dominant brightening/darkening effects. At coarser satellite-like resolutions, average statistics between 1D and 3D retrievals agree better, indicating compensation between 3D and plane-parallel effects.

Furthermore, the impact of 3D-effects on ACI analyses produced similar results across all spectral band pairings, with minimal disagreement between 1D and 3D at coarse spatial resolution. Together these results indicate that 3D retrieval artifacts in bi-spectral retrievals do not seem to drive uncertainties associated with radiative impact applications, resulting in reliable ACI and flux related analyses.

Results from the study were presented in the poster session at the AGU 2024 fall meeting in Washington, D.C and at the Code 613 Lab Seminar series in GSFC on April 16, 2025.

JIANYU ZHENG

Sponsor Hongbin Yu / Code 613 / Task 193

Dr. Zheng has been working to develop the retrieval algorithms of dust aerosol in both the mid-visible and thermal infrared (TIR) wavelengths for MODIS observation. The recently developed TIR retrieval relies on the CALIOP observations of dust vertical distributions along the orbit track. Dr. Zheng has extended it to the off-CALIOP-track MODIS pixels by using the derived CALIOP 10-year climatological dust vertical distributions with relatively low uncertainty. Secondly, Dr. Zheng has explored the extension of the TIR retrieval from over oceans to over lands with improved representations of atmospheric profiles and surface characteristics. The new TIR retrieval has been developed and validated through comparison with AERONET and multiple in-situ measurements spanning from 2000 to 2015. The algorithm is described in a manuscript submitted to *Remote Sensing of Environment* and is currently under review.

Upcoming Plans: From September 1, 2025 to November 1, 2025, Dr. Zheng will implement the retrieval for 20 years of Aqua and Terra MODIS observations. From November 1, 2025 to December 30, 2025, Dr. Zheng will analyze the 20-year MODIS data records in terms of spatial and temporal variations of dust AOD and effective diameter and submit the results as a paper along with the datasets for publications. From January 1, 2026 to March 1, 2026, Dr. Zheng will perform a climatological analysis of the newly developed multi-year retrieval data for dust cycle (including transport and deposition). From March 1, 2026 to May 1, 2026, Dr. Zheng will evaluate the dust cycle simulation from climate models with the constraint from the newly developed retrieval data. From May 1 2026 to August 30, 2026, Dr. Zheng will draft up a paper on the observational constraint of the dust transport and deposition from the 20-year data records to support the climate model simulations.

ALEXANDER MATUS

Sponsor Lazaros Oreopoulos / Code 613 / Task 195

Dr. Alexander Matus is working on a MEASURES-funded project using NASA satellite data to construct a climate data record of observed radiative forcing and feedback responses. Since joining the Climate and Radiation lab in November 2023, Dr. Matus has worked to develop, test, and refine kernel-based methods used to estimate radiative responses due to individual changes in temperature, water vapor, clouds, and surface albedo. His analysis applies observation-based radiative kernels to measurements from CERES, AIRS, CrIS, and VIIRS spaceborne instruments to produce spatially-resolved time series of broadband and spectrally-resolved radiative forcing and feedback. Dr. Matus is developing data products to assess shortwave and longwave radiation budgets on global scales, allowing for investigation of both climate and hydrological sensitivity. Dr. Matus has attended numerous project team meetings with end-users and stakeholders to discuss developments in the project and future needs.

Dr. Matus is also leading air quality research focused on enhancing model estimates of surface particulate matter ($PM_{2.5}$) concentrations from the GEOS-5 model using vertically-resolved NASA CATS spaceborne lidar data. Through these efforts, Dr. Matus has initiated efforts to design, develop, and deliver global estimates of surface $PM_{2.5}$ concentrations enhanced by vertical

observations from spaceborne lidar. Dr. Matus has collaborated on this project in support of the Model, In situ, and Remote sensing of Aerosols (MIRA) working group and presented research findings at the 2025 NASA Health and Air Quality Applied Science Team (HAQAST) meeting at NASA Headquarters in Washington, D.C. Dr. Matus has presented UMBC-funded research at international meetings, including the IGAC conference in Kuala Lumpur, Malaysia and CFMIP in Exeter, UK. Dr. Matus also assisted the lidar instrument team with deployment, maintenance, and data analysis in the IMPACTS field campaign to study snowfall formation with results presented at IMPACTS science team meetings.

Going forward, Dr. Matus will continue to lead efforts on the MEASURES project to study observed radiative forcing and feedback, focusing on refining estimates and uncertainty quantification of cloud radiative forcing. Special attention will be given toward evaluating the spectral variability in radiative responses as well as their implications on our understanding of radiative changes due to greenhouse gases. Dr. Matus will integrate new observational datasets and present results of these efforts at future conferences. Dr. Matus will continue to refine satellite retrievals of fine particulate matter in support of improving air quality initiatives in the United States. Furthermore, he will continue collaborations with international research partners on focused studies of air quality conditions in India. Several manuscripts are currently being prepared for submission to a peer-reviewed journal in the coming months.

HIREN JETHVA

Sponsor Rob Levy / Code 613 / Task 198

Dr. Jethva's task ended November 2024. Dr. Jethva delivered the first version of the global above-cloud aerosol product, ported to DT-VIIRS aerosol algorithm package. This involved testing and analysis of the retrievals over different regions and validation of the product using ORACLES airborne measurements over the southeastern Atlantic Ocean.

CHRISTINA HSU

Sponsor Si-Chee Tsay / Code 613 / Task 203

Dr. Hsu is an affiliated research scientist. Dr. Hsu has been actively involved in the activities of mentoring and transferring knowledge of Deep Blue retrieval algorithms to the GSFC Deep Blue team (i.e., Drs. J. Lee and V. W. Kim, both affiliated with ESSIC/UMCP). Dr. Hsu has continuously provided technical and scientific guidance to the team in support of the development of the AVHRR Deep Blue aerosol products for NASA's MEaSUREs project. Dr. Hsu also attends the weekly group meeting regularly either in-person or online.

UKKYO JEONG

Sponsor Si-Chee Tsay / Code 613 / Task 203

Dr. Ukkyo Jeong led the SMART-s workshop for implementation of the SMART-s trace gas and aerosol inversion algorithm (i.e., Jeong et al. 2018, 2020, 2022), in support of the NASA/PACE Validation Science Team (PVST) activities, at the ESSIC/UMCP meeting room with the team including Mr. S. Windle (a Ph.D. candidate) and Dr. H.-Y. Huang (both affiliated with ESSIC/UMCP). The goal of the workshop was to convert the retrieval codes to use for the current SMART-s PVST mission and train the current team in its use, in which the codes was updated for radiometric, spectral, and Langley calibration processing for the four instruments

used in the SMART-s PVST campaigns. From there, measurements are processed to Level 2 retrieval products of aerosol optical depth, NO₂, H₂O, and O₃. Finally, training on the radiative transfer models for processing Level 2 data for higher order aerosol products was completed.

Dr. Jeong will continue to help and train the SMART-s team on further fine-tuning the ozone retrievals (e.g., weaker Huggins/Chappuis bands, including using U340 filter), cloud screening, and *VLIDORT* simulating direct beam of downwelling radiance at the bottom-of-atmosphere. Also, the cumbersome but critical stray light issues have been studied extensively by using measurements from the tunable lasers (GLAMR), in which valuable procedures were developed to remove the contribution of stray light and made significant accuracy improvement, particularly over useful UV wavelength range.

AMANDA VIEIRA DOS SANTOS

Sponsor Jie Gong / Code 613 / Task 218

Amanda Vieira dos Santos is a graduate student. Ms. Vieira dos Santos' research activities centered on analyzing atmospheric responses to the 2023 and 2024 solar eclipses. Amanda used data from a field campaign to specifically investigate how the planetary boundary layer (PBL) and surface conditions were affected by the two eclipses. Amanda's work involved several key steps: lead the analysis of collected field data to identify the direct responses of the PBL and surface to the solar eclipses and study the possible underlying physical mechanisms that caused these responses. Furthermore, Amanda compared the findings from the field data analysis with outputs from numerical models and satellite remote sensing retrievals. This is done to understand any discrepancies and to identify areas for improving future models and satellite data analysis techniques.

GUOYONG WEN

Sponsor Alexander Marshak / Code 613 / Task 230

Dr. Guoyong Wen will submit a paper to the special issue for 10 Years of DSCOVR Mission on Journal of Frontiers in Remote Sensing. Dr. Wen's research on the "Variability of the EPIC Observed Global Spectral Reflectance" aims to advance our understanding of how Earth's spectral reflectance, as measured by DSCOVR/EPIC, varies seasonally across different wavelengths. By analyzing the correlation between monthly averaged spectral reflectance and the day of the year, this work will identify the periods when Earth appears brightest and darkest in various spectral bands. The study is expected to yield new insights into the seasonal dynamics of Earth's albedo, the sensitivity of different spectral channels to surface and atmospheric changes, and the implications for Earth's energy balance. Additionally, the research will contribute to improved methodologies for analyzing EPIC data and may support future climate monitoring missions by providing a refined model of global reflectance variability.

DASOL IM & ZAC FAITZ

Sponsor Reed Espinosa / Code 613 / Task 239

The two University of Wisconsin-Madison graduate students (Zac Faitz and Dasol Im) visited the lab located at GSFC in building 6 to deliver and install a key optical component of a hyperspectral imager breadboard prototype. While on-site they also advised on integration of this component into the existing breadboard setup. This activity was a successful collaborative

research effort. The UW-Madison team provided core technology, while the GSFC team provided the project leadership, broader mission context, and integration expertise.

ALFONSO DELGADO-BONAL

Sponsor Dong Wu / Code 613 / Task 240

This task started in the Summer 2025. Dr. Alfonso Delgado-Bonal will use Machine Learning (ML) and Artificial Intelligence (AI) to analyze solar irradiance variability as observed by TSIS and other sensors such as Solar Dynamics Observatory (SDO). The goal is to improve understanding of solar energy variability as well as solar physics and space weather predictions. The study will include the analyses of Total Solar Irradiance (TSI) and Spectral Solar Irradiance (SSI), which are key parameters for Earth system modeling and space weather, ML models for estimating TSI/SSI using SDO observations of the Sun's magnetic features (e.g., sunspots, plages, active regions) to model irradiance changes over time, detection and classification of solar features (sunspots, filaments, active regions, coronal holes, flares) and their connection to TSI/SSI variability.

CODE 614: ATMOSPHERIC CHEMISTRY AND DYNAMICS LABORATORY

DANIEL ANDERSON

Sponsor Bryan Duncan / Code 614 / Task 013

Dr. Anderson is working to improve understanding of the hydroxyl radical (OH), the primary atmospheric oxidant, using NASA satellites, the GEOS model, and machine learning. He contributed to a GSFC-led effort that determined the necessary improvements to the current satellite observational network to constrain OH from space over a wide range of environments. This work resulted in a publication in Atmospheric Chemistry and Physics (ACP) and will serve as the basis for a white paper to help inform the next decadal survey. Dr. Anderson has also developed a technique to constrain primary OH production from space, using a combination of machine learning and satellite data, which will allow for improved understanding of the drivers of trends and interannual variability of OH. The results are currently being written up for publication in ACP. Finally, he is using machine learning and output from the NASA GEOS model to understand how dynamics and meteorology affect OH distributions. For this work, he has secured funding from Schmidt Sciences, as part of the FETCH4 effort, and has an ACMAP proposal that was deemed selectable.

Dr. Anderson was also selected as a PI/Team Member for HAQAST (Health and Air Quality Applied Sciences Team), in which his project aims to develop a near real time surface ozone product as well as a short-term ozone forecast using machine learning and observations from the TEMPO satellite. He has been working with representatives from multiple air quality agencies (e.g., Georgia Department of Natural Resources, LADCO, WESTAR, NESCAUM) to identify the ozone-related needs of various regions across the country. He is currently developing a machine learning model to create a preliminary version of the ozone data product.

Dr. Anderson will finish and submit his manuscript on primary OH production in the coming months. He will also begin work, expanding on a previous project, to constrain OH concentrations in the extra-tropics, as well as work with colleagues from NASA JPL comparing

various satellite-constrained OH products. He will continue developing the near real time ozone product for his HAQAST work, and present and participate in the first HAQAST meeting in November 2025.

JUNHUA LIU

Sponsor Luke Oman / Code 614 / Task 014

Dr. Liu has been working with Dr. Luke Oman to implement two chemical gas species, hydrogen cyanide (HCN) and methyl cyanide (CH₃CN), into the GMI chemistry mechanism, which is widely used in GEOS-CCM/CTM simulations. She incorporated the relevant reactions, photolysis processes, wet and dry deposition, as well as specified emissions from biomass burning and anthropogenic sources for these two species. She also evaluated HCN and CH₃CN chemistry within a GEOS-CTM simulation using satellite observations in the stratosphere and aircraft campaign data in the troposphere. The model generally reproduces observed HCN and CH₃CN. These species have now been added to the GMI mechanism, and she is preparing a report on this work.

Dr. Liu has been working with Dr. Oman and scientists from the NASA OMI group to investigate the controlling factors behind observed interannual variations in stratospheric NO₂, using GMI MINDS replay simulations as a diagnostic tool.

Dr. Liu provides model chemistry evaluations for new simulations conducted by the NASA GMI and GEOS-CCM groups, including several new benchmark and sensitivity runs. Dr. Liu has also been working with GESTAR II colleague Dr. Sarah Strode on the development of the Quick-Chem Ozone module, running and evaluating Quick-Chem ozone sensitivity simulations. In addition, she provides ozone evaluations using ozonesonde data.

Dr. Liu will continue working with Dr. Oman on various GMI tasks, including adding more species to GMI, such as acetone, providing chemistry evaluation for new benchmark simulations, and running sensitivity simulations for the GMI mechanism. Work will continue with NASA OMI group to identify the controlling factors on the observed interannual variations of stratospheric NO₂ using GMI MINDS replay simulation as a diagnostic tool and prepare a manuscript.

As Co-I, Dr. Liu will work with GESTAR II colleague Dr. Amir Sourì on his selected TEMPO proposal: Beyond HCHO/NO₂: A Comprehensive Investigation of Hourly-Varying Ozone Production Rates and Their Sensitivities to Weather, Chemistry, and Emissions. She will validate GEOS-GMI-Hi simulations using a range of data sources, including LEO satellites, TEMPO, and *in situ* observations. She will keep supporting Dr. Bryan Duncan's group on model evaluations with satellite data, *in situ* measurements, and sensitivity runs. Additionally, Dr. Liu will work as a co-I for three selectable proposals (listed in the appendices), contingent on funding availability.

SARAH STRODE

Sponsor Bryan Duncan / Code 614 / Task 015

Dr. Strode contributes to the development of a quick chemistry component of the GEOS model. The goal of this component is to allow computationally efficient simulation of key tropospheric constituents including OH and ozone. Dr. Strode worked on the quick chemistry ozone, testing different methods of defining ozone production and loss with the goal of improving the

agreement between the quick chemistry ozone and that simulated by the GMI chemistry mechanism.

Dr. Strode is a co-author on two submitted papers that used coupled atmosphere-ocean GEOS simulations. She also provided output from the MINDS GEOS-GMI simulation extracted at station locations to the Network for the Detection of Atmospheric Composition Change (NDACC) and compared simulated ozone to observations.

Dr. Strode contributed to the Intelligent Long Endurance Observing System (ILEOS) project. She presented a poster about ILEOS at the 2024 American Geophysical Union (AGU) meeting, focusing on two case studies illustrating the utility of ILEOS for combining inputs from multiple data sources to select high priority targets for scientific observations of atmospheric constituents.

Dr. Strode plans to continue working on the development of quick chemistry within the GEOS model. She also plans to work on the evaluation of model results with space-based and ground-based observations of trace gases including ozone and NO_x. She plans to attend and present at the upcoming NDACC symposium and the American Meteorological Society (AMS) meeting.

FEI LIU

Sponsor Joanna Joiner / Code 614 / Task 019

Dr. Liu has been working to estimate anthropogenic emissions of air pollutants and greenhouse gases based on both satellite and model data. Her research has primarily used observations from Aura OMI, sentinel 5p TROPOMI and TEMPO. She has developed a comprehensive NO_x emissions database for major US cities based on TROPOMI NO₂ data, which helps to improve the performances of air quality models. She has enhanced CTM-Independent SATellite-derived Emission estimation Algorithm for Mixed-sources (MISATEAM) developed under the same task. This refinement extends the applicability of MISATEAM to data from the geostationary satellite TEMPO. The anticipated results from the TEMPO-based analysis are expected to provide crucial insights into the diurnal variations of urban NO_x emissions and their lifetimes.

This task is slated to end on November 30, 2025.

STEPHEN STEENROD

Sponsor Luke Oman / Code 614 / Task 041

Mr. Steenrod made many important improvements to the GMI chemistry package in the GEOS Chemistry Climate Model (GEOSCCM). A major improvement was the development of a new mechanism that brings the reaction rates and products up to the latest NASA-JPL standards for use in atmospheric studies, JPL Publication 19-5. He also included updates to the chemical mechanism to improve our mesosphere representation. The two main improvements for mesospheric chemistry are to include the photolysis reactions that involve Lyman-alpha radiation and to add a more complete reaction list for the HO_x chemistry. Development also continued on the new smaller, faster mechanism that focuses on the stratospheric ozone chemistry. Mr. Steenrod also updated the kinetics mechanism generating software package (KMG) to fully support the latest changes in the GEOSCCM model structure. Mr. Steenrod also added new capabilities to the GEOSCCM, such as more closely coupling the aerosols directly

from the GOCART2G and CARMA modules into the GMI kinetic and photolytic chemistry, and to allow for the aerosol optical properties to be calculated by the aerosol provider and to then be used in the calculation of the photolytic rates by FastJX for use in the GMI chemical mechanism. This facilitates several types of studies, including the Hunga Tonga-Hunga Ha'apai volcanic eruption or forest fire injections (PyroCb) of gases and aerosols, to study their effects on atmospheric chemistry. Mr. Steenrod ran several simulations that were used in AGU and AMS presentations by the principal investigators for those projects.

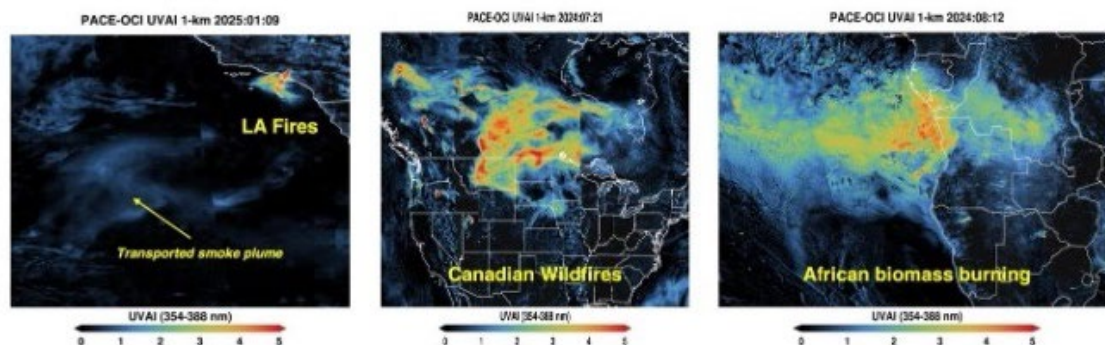
Mr. Steenrod will finish the changes needed to update the GMI chemistry module in the GEOSCCM to include the mesospheric chemistry. He will test and document the changes to the GMI mechanisms. He will continue work on the chemical effects of the Australian forest fires (Das-PI) and the aerosol coupling. At the end of September, Mr. Steenrod will retire from UMBC.

HIREN JETHVA

Sponsor Omar Torres / Code 614 / Task 047

This past year, Dr. Jethva focused on several different research topics. They include the Near-UV Aerosol algorithm and products; the Unified Aerosol Algorithm (UAA) as it applies to the Ocean Color Instrument (OCI) sensor on PACE, as well as the UV-VIS Multifilter Shadowband Radiometer for OCI aerosol absorption retrievals; and porting an above-cloud aerosol algorithm to the Dark Target-VIIRS Package.

First, Dr. Jethva worked on several aspects of the tasks assigned under the Near-UV (NUV) Aerosol algorithm and products. First, he conducted an in-depth analysis of the Collection 4 OMAERUV aerosol product spanning the two decades of observations (2004-2024), which includes validation, long-term consistency and accuracy check, global climatology, and regional time series record. He also conducted a similar analysis of the global, decadal near-UV aerosol product derived from the DSCOVER-EPIC sensor. Dr. Jethva also assisted his sponsor Dr. Torres with preparing and submitting a manuscript that required extensive data analysis and graphics preparations. The manuscript was submitted to the special issue of "Earth Observations from the Deep Space: 10 Years of the DSCOVER Mission" in the Frontiers in Remote Sensing. Additionally, he explored new capabilities of Oxygen-B band aerosol layer height and UV-SWIR Aerosol Index (and associated aerosol typing) added to the Near-UV aerosol algorithm applied to S5p-TROPOMI. His analysis demonstrated that UV-SWIR Index was quite effective in most situations for differentiating carbonaceous smoke from mineral dust aerosols. These new additions, along with the characterization of aerosol loading above clouds, make the TROPOMAER algorithm the most advanced among those applied to the predecessor sensors (TOMS, OMI, EPIC).



Maps: Unprecedented view of UV absorbing aerosols in terms of UV Aerosol Index at ~1.1 km from PACE-OCI instrument.

Second, Dr. Jethva assumed a great responsibility in finalizing the near-UV part of the Unified Aerosol Algorithm (UAA) developed for its application to the Ocean Color Instrument (OCI) sensor aboard the PACE satellite. He thoroughly checked and tested the UAA App ensuring integrity and accuracy. Before finalizing the App for its delivery to the PACE processing team, he added the Oxygen-B band capability for retrieving the effective aerosol layer height. This latest addition will further enable a relative evaluation of the same quantity derived from the near-UV observations. Furthermore, he prepared and wrote the near-UV relevant parts of the planned manuscript, along with data analysis and graphics preparation, led by Dr. Lorraine Remer (UMBC).

Dr. Jethva's third research topic is funded by the PACE Validation Team for collecting the ground-based, remote sensing observation of aerosol absorption from the UV and visible regions (UV-VIS) Multifilter Shadowband Radiometer (MFRSR) sensor, which is currently deployed at Santa Cruz station in Tenerife Island. Previously, the same instrument was operated at the Izaña Observatory between 2019-2023. Dr. Jethva was responsible for modifying the original inversion code by introducing the new capability of simulating the randomly oriented spheroidal dust particles. He also tested and ran the inversion package to produce the MFRSR+AERONET combined inversion product using observations from both the Izaña and Santa Cruz locations. He completed processing of the entire observation record collected at Izaña and wrote a manuscript describing the calibration procedure, algorithm, and derived results on the UV-VIS spectral aerosol absorption. At present, the manuscript is with co-authors for edits and suggestions.

Fourth, Dr. Jethva finalized the integration of the above-cloud aerosol retrieval capability into the Dark Target (DT) aerosol algorithm for both MODIS and VIIRS sensors. This work required adoption of the research algorithm developed and tested during the previous year to the operational version of the DT App. Currently, the App is now with the members of the DT team responsible for the final delivery to the SIPS-Atmosphere processing unit.

As lead author, Dr. Jethva plans to submit three manuscripts in the coming year. Also, the processing of the ongoing UV-VIS MFRSR observation record will continue for the Santa Cruz location. Dr. Jethva expects and plans to receive and process similar datasets from the two additional locations of Bozeman, Montana, USA, and Yonsei University, Seoul, South Korea. He expects to begin working on developing the near-UV aerosol algorithm for the TEMPO sensor, which will require initial testing, analysis, and validation activities. Additionally, as PI, Dr. Jethva will kick-off various activities proposed in the newly funded proposal selected under the ROSES-

2024 call: The Science of PACE. For his work on PACE-OCI validation, he will continue working on processing, analyzing, and delivering the UV-VIS shadow band radiometer data collected at the Santa Cruz site in Tenerife Island. Dr. Jethva also will work on a paper describing the inversion procedure, retrieval examples, and multiyear spectral aerosol absorption record collected at Izaña Observatory site.

FENG LI

Sponsor Luke Oman / Code 614 / Task 064

Dr. Li has led the assessment of the NASA Goddard Earth Observing System - coupled atmosphere-ocean general circulation model (GEOS-AOGCM) for suitability for decade-to-century long climate integrations. He has performed a thorough analysis of a preindustrial simulation and an abrupt $4\times\text{CO}_2$ simulation to evaluate the equilibrium climate sensitivity (ECS) and climate response to the abrupt $4\times\text{CO}_2$ forcing. It is found that the GEOS-AOGCM has a reasonable ECS of 2.6 K and reproduces the expected atmospheric and oceanic response to the idealized CO_2 forcing. Therefore, the GEOS-AOGCM is well suited for long-term climate research. Dr. Li has submitted a first-author manuscript to Journal of Geophysical Research and the paper is under review.

Dr. Li will revise and publish his first-author paper entitled “Evaluating the Coupled GEOS-AOGCM for Climate Research: Response to an Abrupt Quadrupling of CO_2 Forcing” in Journal of Geophysical Research.

JIN LIAO

Sponsor Thomas F. Hanisco / Code 614 / Task 070

Dr. Liao has been working on using airborne observations, satellite data, and box modeling to investigate atmospheric composition and processes. Dr. Liao is completing a project that compares satellite HCHO retrievals with integrated HCHO columns from ATom airborne observations. Her first-author paper, “Validation of formaldehyde products from three satellite retrievals (OMI SAO, OMPS-NPP SAO, and OMI BIRA-IASB) in the marine atmosphere with four seasons of Atmospheric Tomography Mission (ATom) aircraft observations”, was published in Atmospheric Measurement Techniques in January 2025.

Dr. Liao has been analyzing data from the ASIA-AQ field campaign, with a focus on combining *in situ*, box modeling, and satellite observations to study ozone production regimes. She compared constructed columns derived from *in situ* measurements with GEMS satellite HCHO and NO_x columns and also examined their diurnal patterns. The results were presented in the 2024 AGU Fall Meeting.

Dr. Liao also continues to work on integrating *in situ* measurements and photochemical box modeling to improve satellite-based assessment of ozone production regimes. She ran The Framework for 0-D Atmospheric Modeling (F0AM) box model with Asia-AQ DC-8 *in situ* measurements as inputs to simulate ozone production and classify NO_x - or VOC-sensitive regimes. Her analysis revealed a linear relationship between VOC reactivity and NO_x at maximum ozone production rates in seven Asian cities, except for Seoul, which is influenced by lower photolysis rates. She also found that the HCHO yields from VOCs oxidation are unexpectedly similar across these seven Asian cities, suggesting that VOC reactivity can be effectively mapped to HCHO concentrations given OH abundance, HCHO photolysis rate, and

reaction rate coefficient of OH with HCHO. Such relationships provide a basis for refining ozone sensitivity diagnostics from satellite HCHO/NO₂ ratios and for constraining VOC concentrations using satellite HCHO data. An abstract describing this work has been submitted for presentation at the 2025 AGU Fall Meeting.

Dr. Liao is preparing an AGU presentation on integrating in situ measurements and photochemical box modeling to enhance satellite assessment of ozone production regimes and is in the process of drafting a manuscript on this work. Additionally, Dr. Liao will begin to work on a funded TEMPO proposal titled “Impact of Measured Formaldehyde Profiles from Pandora Instruments on TEMPO Retrievals”.

JERRY ZIEMKE

Sponsor Natalya Kramarova / Code 614 / Task 074

Dr. Ziemke has been responsible for developing tropospheric ozone data products from NASA-involved satellite measurements. Earth Probe Imaging Camera (EPIC), Ozone Monitoring Instrument (OMI), and Ozone Mapping and Profiler Suite (OMPS) satellite instruments are all operational at the current time. Dr. Ziemke has included these measurements together with coincident MLS profile ozone and MERRA2 (profile ozone and meteorological fields) for deriving both short- and long-record tropospheric ozone data products. All satellite tropospheric ozone products are available from either the NASA AVDC (<https://avdc.gsfc.nasa.gov/>) or NASA Goddard tropospheric ozone website (https://acdext.gsfc.nasa.gov/Data_services/cloud_slice/). The EPIC tropospheric ozone product provides maps of tropospheric ozone every 1-2 hours and is available from the NASA Langley ASDC.

In the coming months, Dr. Ziemke plans to continue the development of tropospheric ozone products with new added improvements including boundary-layer, clouds, and aerosol adjustments. Dr. Ziemke is also involved in the evaluation of the many ozone data products generated in Code 614. He will continue to attend and contribute to all of the Code 614 regular meetings on the development of products, such as SBUV, OMI, OMPS, EPIC, TOMS, Ozone, etc. products. Also, Dr. Ziemke will continue to attend upcoming large-attendance meetings (in person or virtual) for DSCOVR, AGU, AMS, EGU, the Quadrennial Ozone Symposium and other meetings deemed relevant. He will continue to contribute to the writing and analyses for journal papers and reports, including the current international Tropospheric Ozone Assessment Report-II (TOARII).

GHAFFAN TAHA

Sponsor Glen Jaross / Code 614 / Task 084

Dr. Taha has been working to improve the SNPP OMPS LP aerosol algorithm, focusing on enhancing aerosol retrieval during large volcanic eruptions and improving the short wavelengths retrieval. The newly developed L2 aerosol products were just released to GES DISC. He also led the development of Near Real Time (NRT) aerosol products, which resulted in the public release of SNPP and N21 NRT aerosol profiles to LANCE. The data are also available in NASA Worldview. Additionally, he developed the N21 aerosol profile data products, which were released to GES DISC. Dr. Taha is working on improving the OMPS LP SNPP and N21 L3 monthly gridded aerosol products, and hopes to release them soon. He was a co-lead author on the 2024 BAMS State of the Climate report, Chapter 2, Stratospheric Aerosol, and a co-author on

the APARC Hunga Volcanic Eruption Atmospheric Impacts Report and Executive Summary, which will be published by the end of the year. Furthermore, Dr. Taha adapted the OMPS aerosol algorithm to work on the new limb instrument, ARGOS, which is planned for launch aboard the STRIVE mission.

Dr. Taha plans to process and release a new version (v2.5) of the OMPS-N21 LP L2 and L3 aerosol products. He also plans to analyze the SNPP/N21 OMPS aerosol negative bias and possible improvements for the N21 products, such as implementing empirical straylight corrections.

ZHINING TAO

Sponsor Mian Chin / Code 614 / Task 087

Dr. Tao continues to work on multiple projects of which he serves as PI or co-I. Specifically, he led the effort to investigate the long-term effects of wildfire on regional hydrology. Under his oversight, the GOCART aerosol scheme in NU-WRF has been updated to include nitrate production/removal, a two-moment microphysics scheme that has been integrated into NU-WRF and coupled with the newly updated GOCART aerosol module, and the development of burnt LULC based on satellite observations to better understand the impact of wildfires has been completed. The year-long simulations, with the purpose of understanding the feedback between burnt land and atmosphere and their cascading effects on regional precipitation and hydrology, have been completed; the final analysis is under way. He used observations and modeling to develop enhanced fire emissions and examine the impact of the prescribed fire on local air quality and fire smoke transport. He conducted a NU-WRF modeling study of the impact of anthropogenic aerosols on regional air quality and meteorology over North American and Asia. In addition, Dr. Tao led and contributed to the development and submission of several research proposals to NASA and NOAA.

In the next 3 months, Dr. Tao will focus on analyzing the modeling results and wrapping up two projects funded by the NASA MAP program. He will also start to draft the manuscripts related to the aforementioned projects.

DONGCHUL KIM

Sponsors Hongbin Yu & Mian Chin / Code 614 / Task 088

Dr. Kim's research is on aerosol modeling using GEOS/GOCART and NU-WRF. His main focus is to improve understanding of the global and regional dust processes and distribution. He has been contributing to a NASA/MAP project (PI: M. Chin) in the area of NU-WRF model development. Dr. Kim is leading a modeling experiment to better understand the dust optical depth at 550 nm and 10um from different remote sensing and model data as a part of the AEROCOM (Aerosol Comparisons between Observations and Models) experiment. The work was presented to the AEROCOM 2024 workshop. The results of the Alaskan dust study were presented at the AGU Fall meeting (Dec. 9-13, 2024), Washington, DC.

Dr. Kim will continue working on the current tasks including AEROCOM dust optical depth in thermal infrared wavelength intercomparison experiment, dust mineralogy study, the Alaskan dust, and dust settling velocity study.

HUI SHENG BIAN

Sponsors Mian Chin & Pete Colarco / Code 614 / Task 127

Dr. Bian has been researching atmospheric aerosols and their impacts on air quality and climate. Using CMIP6 model results and reanalysis data, she investigated recent decadal trends in the North Pacific westerly jet (NPWJ) under various atmospheric forcings. Some of these findings are summarized in a submitted paper. Dr. Bian also led a study using the NASA ASIA-AQ field campaign and the GEOS model to investigate the impact of simulated aerosols using different oxidant fields.

The oxidant fields were provided by the GEOSchem chemistry scheme, but in different temporal modes (*i.e.*, online and offline), and by two in-house chemistry schemes (*i.e.*, GMI and GEOSchem). Her other work includes supporting atmospheric convection studies during the ACCLIP campaign period and conducting various GEOS model dust studies to investigate dust events flowing from the Namibian coast into the Atlantic Ocean.

In the coming months, Dr. Bian will continue to conduct experiments proposed in the ACMAP project. She will also continue to support the ASIA-AQ post-campaign analysis by studying aerosol chemistry.

LARRABEE STROW

Sponsor James Gleason / Code 614 / Task 136

The Climate Hyperspectral Infrared Radiance Product (CHIRP) is a radiance product that combines AIRS and CrIS into a homogeneous time-series of radiances with a common spectral response with radiometric offsets among AIRS, CrIS-SNPP, and CrIS-J1 removed. This is produced at the GES DISC in standard netcdf granule format. The JGR-Atmos. paper led by Dr. Sergio DeSouza-Machado and co-authored by Dr. Strow, “Geophysical trends inferred from 20 years of AIRS infrared global observations,” introduces a powerful method for very accurately deriving atmospheric (temperature, humidity, etc.) and surface temperature trends *directly* from radiance trends, bypassing Level 2 retrievals. These retrievals can be contaminated by a variety of effects, including bleeding of incorrect a-priori information into the trends and cloud-clearing errors. Here they retrieve the geophysical trends directly from the radiance trends, and this article shows the resulting high accuracy and extremely good agreement with ECMWF ERA-5 and GISSTEMP (surface trends). The article was based on AIRS (L1c). Using CHIRP, these time series can be extended across instruments; however, cloud-processing of full Level 1 data for multi-decadal trends is extremely slow using netcdf granules. To this end, Dr. Strow and team have been able to re-store the CHIRP dataset into full time-series data in 3x5 lat/lon groupings using a cloud-native data format, zaar. This allows users to read full mission data very quickly directly from AWS S3 buckets and perform trend analysis. The amount of compute time and analysis complexity for these types of measurements is orders of magnitude smaller than other approaches.

A key issue is to intercompare the AIRS and CrIS temporal stability. In previous work, they have shown that AIRS (at least 414 channels) is stable to $\sim 0.002\text{K/year}$. Here, AIRS stability was compared to CrIS (SNPP) using simultaneous nadir overpasses (SNOs) over the 2015-2021 time period. They computed the SNO differential drift between these two instruments (using AIRS V5 L1 calibration) as shown in Figure 1.

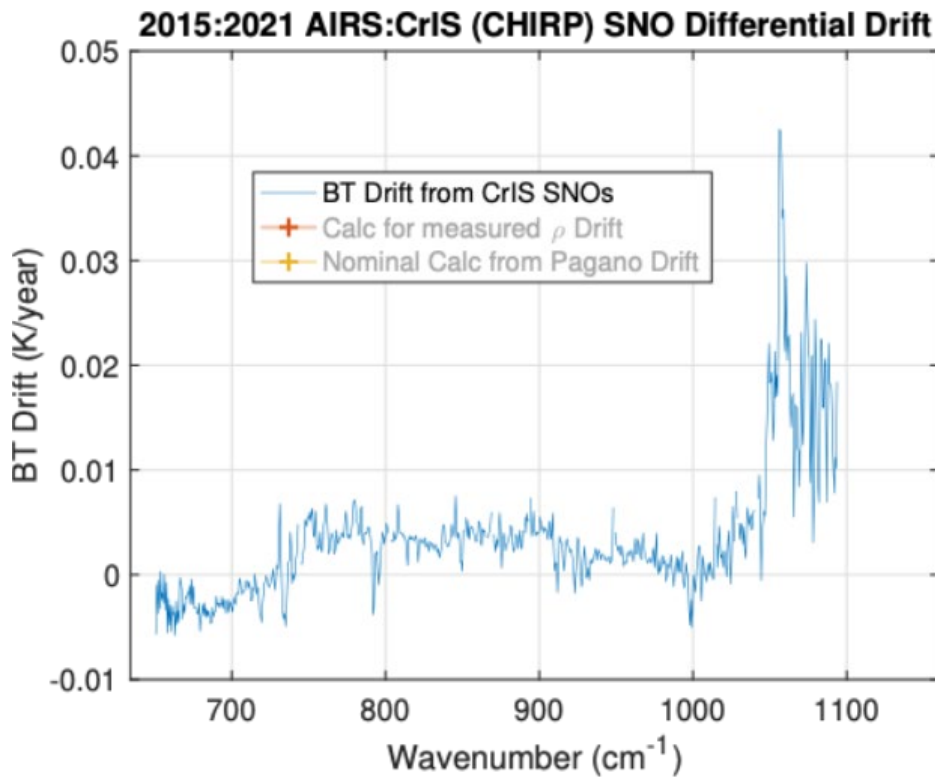


Image: SNO differential drift between AIRS and CrIS using CHIRP format.

This drift is likely due to AIRS polarization drift that is not included in AIRS V5. The AIRS Project has one method for measuring this drift that they believe has uncertain errors. Instead, they used the actual L1c data (clear tropical scenes collected over 20 years) to derive any drifts in the polarization (reflectivity product ρ) by examining the bias between ECMWF calculation and the observations as a function of scan mirror angle.

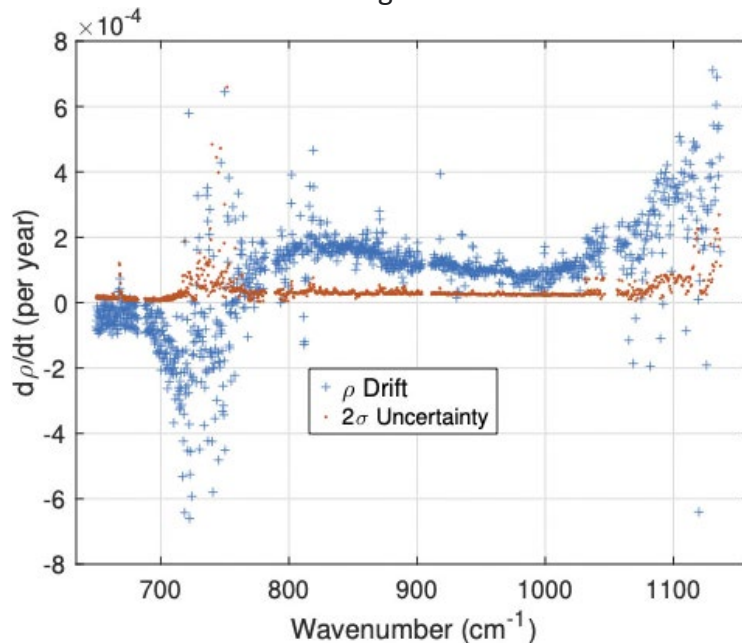


Image: ρ drifts retrieved from AIRS ECMWF biases

Comparisons of Figures 1 and 2 show that the observed SNO drifts roughly follow Dr. Strow's team's retrieved drift in ρ .

Finally, they computed the drift (for the AIRS array near 1100 cm^{-1} only) and compared the measurements to those that were put into the AIRS V8 Level 1b product. The AIRS rho corrections used the absolute drift in the cold scene counts, which Dr. Strow considers an unreliable approach. In any case, note that their retrieval of the drifts in rho is absolutely independent of the SNO intercomparisons. Thus, if CrIS is stable, then they have confirmed their approach to the drift in the AIRS rho polarization parameter.

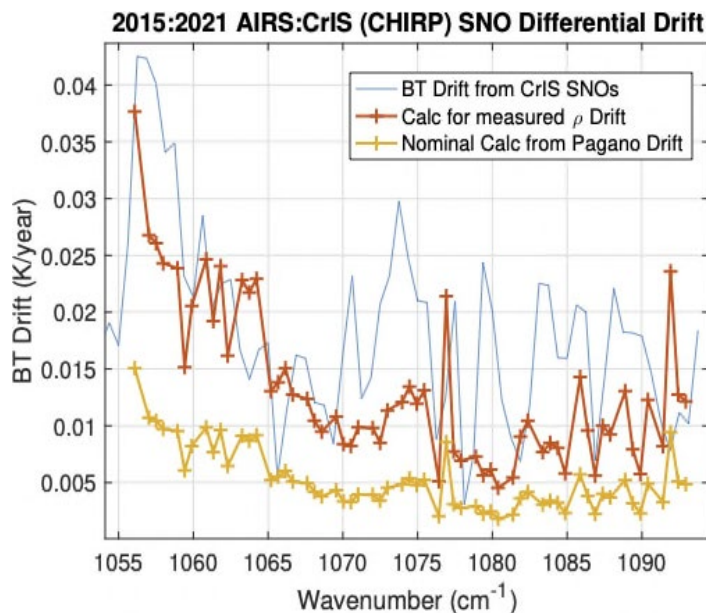


Image: including computed drifts in rho.

The CrIS and CHIRP RTAs were slightly improved by using a more diverse, newer set of regression profiles from ECMWF: one is the ECMWF 83 set, the other is from the SAF 704 data set.

Dr. Strow and his team will continue to conduct data analyses using the Climate Hyperspectral Infrared Radiance Product (CHIRP).

ANNE THOMPSON

Sponsor Ryan Stauffer / Code 614 / Task 138

Dr. Thompson spent the year working on three projects: Ozone trends using ozonesonde and other ground-based ozone datasets; Satellite & Field data related to NO₂ emissions from oil and natural gas (ONG) activity; and, ozonesonde data collection & analysis (SHADOZ, Beltsville, Wallops), quality assurance studies.

For the first project, “Ozone trends using ozonesonde and other ground-based ozone datasets,” the studies that began the previous year on global ozone trends from “ground-based” instruments, part of the TOAR II HEGIFTOM activity (Harmonization and Evaluation of Ground-based Instruments of Free Tropospheric Ozone Measurements), were completed. Two papers were submitted in November 2024; one is published and the second is in press. Both papers cover free tropospheric (FT) ozone trends using data from the HEGIFTOM database from 2000 to 2022. Working with SHADOZ-funded partners D. Kollonige (SSAI) and R. Stauffer (GSFC/614), Dr. Thompson supplied most of the analyses and figures for the first paper that showed null to moderate FT ozone trends except over SE Asia. Dr. Thompson also worked with Drs. Kollonige

and Stauffer to provide a comprehensive trend evaluation of FT ozone in the tropics with 26 years of SHADOZ data and selected IAGOS commercial aircraft ozone profiles. This new paper (Thompson, Stauffer, Kollonige et al.) also was submitted in November 2024 and is in review with Egusphere.

In the latter study, the GSFC Multiple Linear Regression model (MLR) was used to conduct several sensitivity studies. First, the earlier trends paper (Thompson et al., JGR, 2021) was updated with SHADOZ profiles from 2000-2023; a comparison between 22-year and 26-year periods isolated COVID impacts. Running the MLR with a 2000 start instead of 1998 minimizes the effects of the 1997-1998 intense ENSO on trends; post-ENSO trends from Kuala Lumpur-Java are larger. Other sensitivities explored in T25 include comparing trends based on larger sample numbers and exploring differences computed with MLR and quantile regression (QR). As with the multi-instrument HEGIFTOM paper, MLR and QR methods were found to be complementary. Median trends are the same with both methods, but each one has advantages in terms of attribution and interpretation of the trends. Finally, comparison of SHADOZ tropospheric ozone trends with those from several satellite-based products shows the necessity of having independent data like sondes and aircraft for evaluation of satellite products and trends. The “bottom line” of T25, that includes more SHADOZ data than the HEGIFTOM papers, is similar: relatively small trends at all regions of the tropics, except for SE Asia. Indeed, using data from the 8 equatorial SHADOZ stations (within 15 degrees latitude, north and south), the entire FT shows a mean zero trend. These studies summarize 18 months of research, emphasizing the following again: pole-to-pole and east-to-west, FT ozone changes are small (0-4%/ decade) and negative in some cases; boundary-layer trends, most notably in SE Asia, are larger; and, studies claiming that growing emissions drive ozone trends in the tropics are oversimplified. (This also was seen in a study of Reunion SHADOZ sonde data (1998-2020; Millet et al., 2024) which Thompson helped co-author.) Arguments that 2-3 times/month sampling are inadequate are overstated. These results were presented in 2024 meetings: IGAC/CACGP (9/24); CEOS (10/24); SAGE III Science Team Meeting (10/24); AGU (12/2024); AMS (1/2025).

For the second project, Dr. Thompson worked with PI Dr. Stauffer and NPP Post-doc Dr. N. Fedkin on analyses of ship, land and satellite NO₂ measurements from 2004-2025 from satellite and the 2024 SCOAPE II campaign. The latter experiment consisted of Pandora and *in-situ* NO₂ from the 13-day Gulf Coast cruise on the Research Vessel Point Sur based out of LUMCON (Cocodrie, LA) in June 2024. Reference data on land are collected by our BOEM partners at a west-central Louisiana coastal site. The major ONG platform emitters, “hot spots” seen in TROPOMI, OMI and TEMPO, were compared. At this point, TEMPO and TROPOMI NO₂ data often diverge. TEMPO data agreed better with the land-based Pandora columns than with ship observations. Dr. Thompson believes more algorithm work is needed to optimize TEMPO NO₂ retrievals. The TROPOMI multi-year record of NO₂ hot spots defined targets for the GSFC GCAS instrument flown over the Gulf on the NASA G5 in early October 2024. An important discovery was that GCAS NO₂ columns from some drilling ships located adjacent to large platforms gave off stronger signals than the platform itself. Preliminary results were presented by Dr. Thompson (AGU, 2024) and publications are now being prepared, led by Drs. Stauffer and Fedkin.

Related to the third project, Drs. Thompson and Stauffer (SHADOZ PI) attended the 2024 IGAC/CACGP meeting in Kuala Lumpur (KL) in September 2024 and visited the Malaysian Meteorological station at the KL Intl Airport (KLIA) (see photo). Dr. Thompson spoke about tropical ozone trends and the IGAC/TOAR II activity. Working with UMBC graduate student Mr.

Joshua Richards, Dr. Thompson reprocessed the 20-year record of Howard Univ-Beltsville ozonesondes, which is now “homogenized.” Mr. Richards presented results at the 2024 AGU meeting; subsequently, he turned his work into a PhD prospectus that he successfully defended in May 2025 for advancement to candidacy. Dr. Thompson continues to work with ASOPOS Chair H. Smit (Research Center-Juelich, Germany) on improving and training for the “best practices” of ozonesonde research. They will prepare a manuscript for publication in a special collection honoring the history of long-term ground-based measurements that is due Dec. 2025.

In the coming months, one manuscript on ozonesonde quality assurance will be submitted to Earth & Space Science or JGR-Atmospheres; another two papers, one by Drs. Stauffer and Fedkin and one by Mr. Richards, will be submitted for publication.



Photo: Visit to Malaysian Meteorological Department (MMD) at KLIA (Kuala Lumpur Intl Airport) SHADOZ balloon launch site. Left: Station Manager, Electronics Technician, and Anne Thompson; Right: SHADOZ MMD team with Anne Thompson & PI Ryan Stauffer in middle.

KEITH EVANS

Sponsor Nickolay Krotkov / Code 614 / Task 159

Mr. Evans added a new region in central Asia to his web pages that monitor SO_2 because of anthropogenic SO_2 emissions. He created weekly reports of current worldwide volcanic SO_2 emissions using OMI, NPP-OMPS, JPSS1-OMPS and TROPOMI satellite data. Using data from the Democratic Republic of Congo volcanoes, Mr. Evans analyzed the SO_2 threshold used for determining the amount of SO_2 mass for the JPSS1-OMPS data, and it was determined to be 1.5.

At present, the NO_2 web site is in limbo. Mr. Evans is waiting for the collection-4 version of the OMI SO_2 data to be completed. Since automatic data image upload is no longer possible due to security, Mr. Evans must do this manually every day by using a PIV card or the RSA Tokens. He updated the web site every week to display SO_2 outflows and/or eruptions.

Mr. Evans will continue analyzing JPSS1-OMPS SO_2 threshold for other regions and study the sources of trace gases (SO_2 and NO_2) to answer the question of how natural and anthropogenic impact the local people and their environment. He will maintain the functionality of and add enhancements to the SO_2 and the NO_2 web sites as needed. SO_2 trajectory modeling capability

may be added to the NASA SO₂ site by Mr. Evans. He will be extending long-term monitoring of sulfur dioxide and nitrogen dioxide with new satellite instruments as they become available. Also, he will add AIRS SO₂ maps when SO₂ can be measured from AIRS satellite data.

NIGEL RICHARDS

Sponsor Natalya Kramarova / Code 614 / Task 143

Dr. Richards has been working on the validation of SNPP OMPS LP ozone profile measurements processed with the new NASA GSFC version 2.6 retrieval algorithm. In mid-2023, version 2.6 of the OMPS LP ozone profile retrievals was released, featuring improvements in calibration, the retrieval algorithm, and data quality. In this work, Dr. Richards utilized correlative data from other satellite instruments (SAGE III/ISS, ACE-FTS, MLS, and OMPS NP) and ground-based data for the period April 2012 - April 2024 to evaluate OMPS LP profile retrievals. He submitted a first-author manuscript to Atmospheric Measurement Techniques detailing the results of the SNPP OMPS LP version 2.6 ozone profile validation results. Dr. Richards has also been conducting work on the quality assurance of SNPP OMPS LP ozone, particularly considering a number of GPS anomalies that have occurred with the SNPP satellite, which negatively impacted the OMPS LP instrument.

Dr. Richards has continued work on the validation of NOAA-21 OMPS LP version 1 ozone profile retrievals, which is the second in the series of OMPS LP instruments and was launched in 2022. Dr. Richards will extend the validation of OMPS LP ozone to include more lidar stations and present this work at the NDACC symposium in October. He also will begin work creating a new long-term merged ozone record using MLS and OMPS LP data.

NADER ABUHASSAN

Sponsor Thomas Hanisco / Code 614 / Task 146

The primary objectives of the Pandora Project continue to include satellite validation and verification, advancing Earth system science, and supporting long-term monitoring of air quality and atmospheric composition through nationally and internationally deployed Pandora Spectrometer Systems. Pandora Spectrometer Systems (Pandoras) are compact, ground-based, passive hyperspectral remote sensing instruments designed to detect trace gases and aerosols. These instruments primarily measure total column concentrations of O₃ (ozone), NO₂ (nitrogen dioxide), SO₂ (sulfur dioxide), HCHO (formaldehyde), and BrO (bromine monoxide).

During the 2024–2025 reporting period, Dr. Abuhassan significantly expanded contributions to the project by leading and supporting instrument deployments both nationally and internationally, ensuring optimal setup and operation under diverse environmental conditions. These contributions included on-site and remote training of network operators to support consistent and high-quality data collection across the growing global network. In addition, Dr. Abuhassan assisted national and international scientific collaborators in analyzing Pandora data, interpreting instrument behavior, and applying best practices for quality control and calibration. This collaborative effort helped enhance the scientific output and application of the Pandora network in satellite validation, atmospheric modeling, and air quality assessments.

Another key focus this year was supporting the testing and evaluation of next-generation Pandora sensors, contributing to their design validation, performance, and field integration. Dr.

Abuhassan continued to provide laboratory and field support for the maintenance, refurbishment, and operational readiness of the existing Pandora fleet, along with expert consultations on calibration, deployment, remote monitoring strategy, and data processing workflows.

Dr. Abuhassan will continue to play a central role in the ongoing expansion and scientific advancement of the Pandora Project. Planned activities include supporting the deployment and testing of upgraded sensor systems, continuing international collaboration on data analysis and interpretation, and leading efforts further to standardize training and operational procedures across the network. These contributions aim to strengthen the project's role in satellite validation, atmospheric research, and global environmental monitoring.

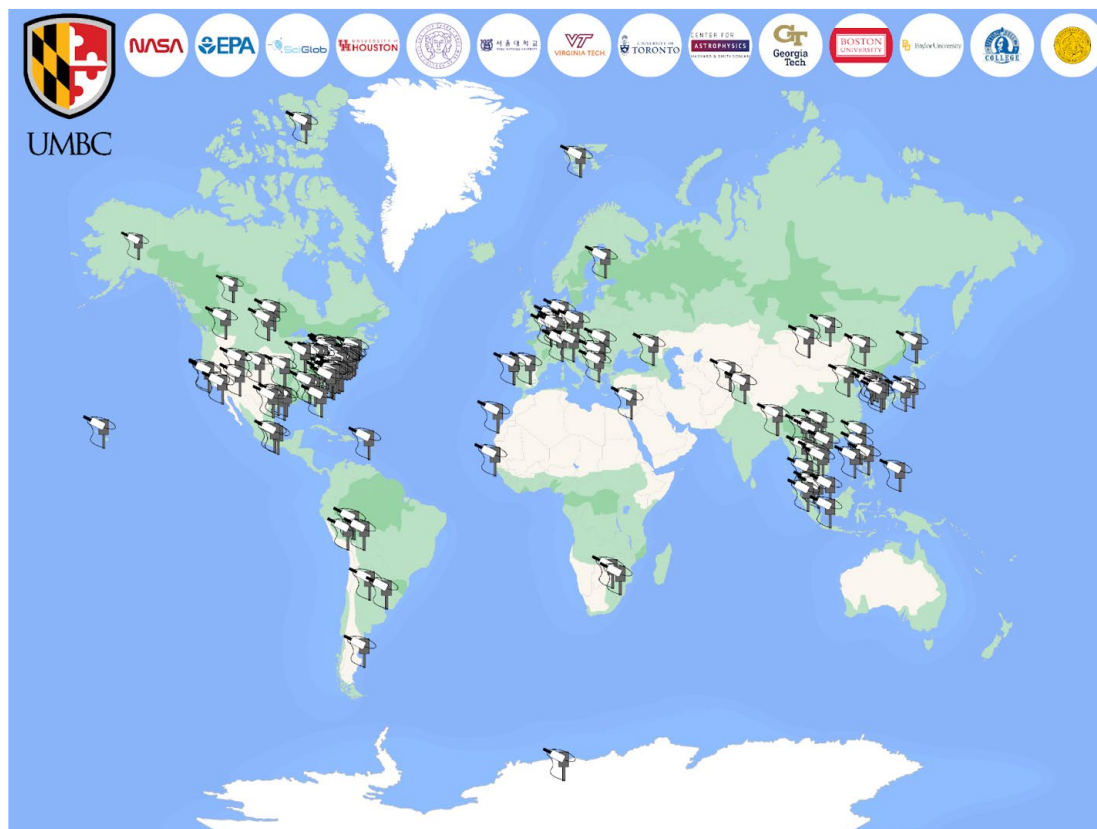


Image: Pandora/ Pandonia Global Network (PGN) Deployment Map

JASON ST. CLAIR

Sponsor Thomas Hanisco / Code 614 / Task 147

Dr. St. Clair divides his time between the In Situ Observations Laboratory and the Infrared Remote Sensing Laboratory of Code 614.

For the In Situ laboratory, Dr. St. Clair has supported multiple field campaigns this year. He is the UMBC PI for the NSF-funded GOTHAM field campaign, which studies air quality in the NYC metro region. UMBC/GSFC are flying the ISAF HCHO *in situ* instrument on the NSF C-130 aircraft in summer 2025 for GOTHAM. Dr. St. Clair also supported the SARP and MAGEQ field campaigns, planning the aircraft integration for the B200 flux payload aircraft, and serving as PI for the NO₂ and HCHO *in situ* instruments on board. He also served as platform scientist for the SARP West flights. For the MAGEQ flights that followed SARP, he operated EM27/SUN

spectrometers at three sites in Maryland (Towson, Howard Beltsville, and GSFC) to provide cal/val data for the NASA Langley G3 aircraft payload (MethaneAir and HALO, the Langley CH4 lidar).

Dr. St. Clair continues to spin up the Infrared Remote Sensing Laboratory at GSFC. Accomplishments this year include concluding the acceptance of the EM27 spectrometers and the high-resolution IFS 125HR spectrometer from Bruker, allowing closeout of the major instrumentation procurement. The renovation of Building 33's B309 was planned (with major involvement from Dr. St. Clair) and completed to serve as the home for EM27 spectrometers, with occupancy occurring in January 2025. He is working with a small local business (SciGlob) to design and build automated weather enclosures for the EM27s so that they can be deployed across the country with minimal operator involvement. The IFS 125HR spectrometer will be housed in a modified shipping container that will reside on the roof of B33. Dr. St. Clair worked with colleagues at Caltech and a mechanical engineer in 614 to design the shipping container modifications. The container was delivered to GSFC in July 2025 and currently sits near the loading dock of B33 as the team works to prepare it for installation of the spectrometer.

Dr. St. Clair will continue his involvement in the two labs, including mentoring a postdoc in the in situ lab to move an instrument development project forward there. He will support SNWG TEMPO flights in February 2026 and summer SARP flights next year, serving as PI of the CAFE HCHO and CANOE NO2 instruments. In the IR lab, he will continue developing the EM27 enclosure with SciGlob and begin deployment of instruments to the ground sites funded by a ROSES call last year. The integration of the IFS 125HR spectrometer will be completed and the shipping container lab will be installed on the roof of B33; additionally, the sun tracker enclosure design and fabrication will be completed. Dr. St. Clair will supervise and mentor the ESSIC postdoc and UMBC assistant research scientist who will comprise the IR lab workforce.

CATERINA MOGNO

Sponsor Peter Colarco / Code 614 / Task 172

Dr. Mogno advanced the assessment of uncertainties of the aerosol component in the NASA GEOS Chemistry Climate Model (GEOS-CCM). The focus was on examining the critical link between aerosol optical properties and mass loading, through extensive comparison with long-term satellite aerosol optical measurements, fine particulate matter datasets, and ground-based observations. Results pave the way forward for the aerosol module improvement in GEOS-CCM. This work also represents the first comprehensive assessment of GEOS-CCM's aerosol component against observational data. This work, which was conducted as part of the NASA Modeling, Analysis, and Prediction (MAP) Program, is completed, and a publication is in review with Atmospheric Chemistry and Physics. In addition, during the period Sep 2024 - Aug 2025 Dr. Mogno presented her work at three international conferences.

Dr. Mogno will continue to focus on improving the aerosol module of the GEOS model (GOCART2G), with a focus on the secondary inorganic components of nitrate and ammonium compounds in GEOS-CCM. She will present ongoing results at the Annual AeroCom meeting (October 2025, Paris, France). In FY26, she will begin to be involved in two new projects in applied science: as a trainer for the Applied Remote Sensing Training (ARSET) program focusing on Air Quality & Health trainings, and as a co-investigator in a ROSES Responsive Science

Initiative funded research project, focusing on producing a high-resolution reanalysis product for climate adaptation applications (MERRA 21C-3km).

APOORVA PANDEY

Sponsor Thomas Hanisco / Code 614 / Task 177

Dr. Pandey calibrates and analyzes Pandora instruments at the NASA Goddard Pandora laboratory. She identifies sources of measurement artifacts and provides feedback to the hardware team. She also prepares and validates Pandora retrievals of NO₂ and HCHO. She helped build and characterize ground-based *in situ* measurements that she deployed in Charles City, Virginia in June 2025 for a Pandora validation effort. Currently, she is working on implementing improvements to Pandora formaldehyde profile retrievals.

Dr. Pandey will use her recent findings to improve estimates of formaldehyde columns and vertical distributions from Pandora and apply these improved datasets towards validating observations from the TEMPO satellite. She will continue supporting instrument calibration and development at the Pandora lab.

DOYEON AHN

Sponsor Bryan Duncan / Code 614 / Task 179

Dr. Ahn has been leading two major research projects. The first focuses on developing a satellite-based method to monitor CO₂ emissions from global cities by leveraging synergies between NASA's OCO-3 instrument aboard the ISS and ESA's TROPOMI instrument. This approach emphasizes computational efficiency and a data-driven framework, enabling emissions estimates for a large number of cities worldwide. It is particularly valuable for cities that lack the resources to independently track their emissions, as it provides a satellite-based dataset that can also be used to evaluate local inventories. Dr. Ahn submitted a first-author manuscript to AGU Advances titled "Satellite-Based Analysis of CO₂ Emissions From Global Cities: Regional, Economic, and Demographic Attributes," which was featured in the special collection "Observing CO₂ From Space: A Decade of Progress from NASA's Orbiting Carbon Observatories (OCO-2 and OCO-3)." This study was done in close conjunction with two stakeholders: C40 Cities Climate Leadership Group Inc. and Global Covenant of Mayors for Climate & Energy. Dr. Ahn and team demonstrated that OCO-3 data can provide independent, satellite-based urban emission estimates to support decision-making at an annual scale.

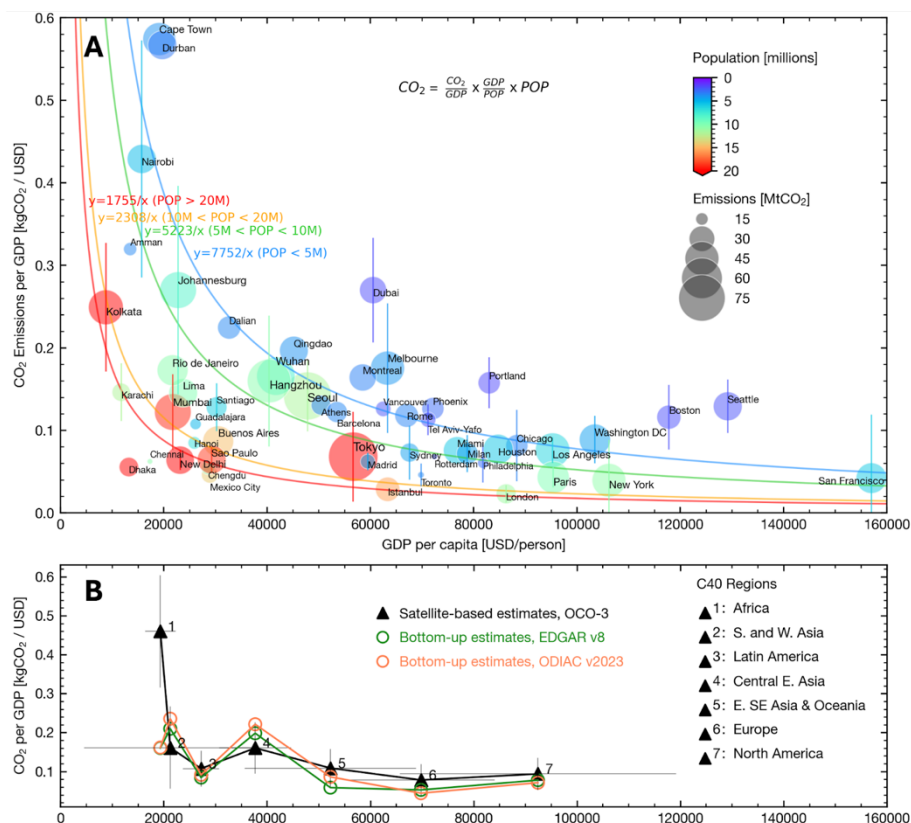


Image: Satellite-based CO₂ emission estimates for individual cities (top panel) are plotted against three components of the Kaya Identity (bottom panel): 1) CO₂ Emissions per GDP, 2) GDP per capita, and 3) population. [Ahn et al. (2025)].

The second project examines the sensitivity of the global methane (CH₄), carbon monoxide (CO), and hydroxyl radical (OH) system to perturbations in OH. This research uses the QuickChem model, developed in the NASA GSFC Atmospheric Chemistry and Dynamics Laboratory (Code 614), which applies machine learning techniques to infer OH concentrations from a range of dynamical and chemical input parameters. QuickChem has been integrated into the NASA GEOS model, allowing for comprehensive simulations of the coupled CH₄–CO–OH system. Dr. Ahn has completed the simulations and is now analyzing the results, with plans to submit a manuscript to Atmospheric Chemistry and Physics in Fall 2025.

Building on the satellite-based emission estimation framework, Dr. Ahn plans to expand coverage to a larger number of cities, incorporate additional satellite datasets (e.g., TEMPO NO₂), and generate annual or sub-annual emissions estimates for cities with sufficient observational coverage. Expanding the coverage to more cities will be completed by Fall 2025, and he will present the preliminary results at the OCO-2/3 Science Team Meeting that will be held in Fort Collins, CO in September 2025. Then, he will work on incorporating other satellite datasets in this framework, which is expected to be completed by Winter/Spring 2026. Dr. Ahn is currently in discussion with colleagues at 614 to determine the scope of satellite data to be incorporated. Finally, he will work on generating annual to sub-annual emission estimates for global cities where sufficient satellite observation is available. Once this estimate is available, Dr. Ahn is in conversation with the project scientist of OCO-3 mission, Dr. Abhishek Chatterjee of NASA JPL, and U.S. Greenhouse Gas Center to host this satellite-driven emission dataset to their information website (<https://earth.gov/ghgcenter>). In parallel, Dr. Ahn is advancing the hydroxyl radical (OH) modeling project and plans to submit a manuscript to Atmospheric Chemistry and

Physics in Fall 2025. Building on this work, he will lead the development of a model intercomparison project (MIP) focused on OH.

MICHAEL D. HIMES

Sponsor Natalya A. Kramarova / Code 614 / Task 205

Dr. Himes has primarily been working on machine learning (ML) applications to measurements from the Ozone Mapping and Profiler Suite Limb Profiler (OMPS LP).

Building on his ML-based near-real-time (NRT) aerosol data product derived from OMPS LP onboard the Suomi National Polar-orbiting Partnership (SNPP) satellite, Dr. Himes has developed and released a NRT aerosol product for OMPS LP onboard the NOAA-21 satellite. This work culminated in a publication in the Atmospheric Measurement Techniques journal. Additionally, Dr. Himes has developed imagery for both NRT products that have been integrated into NASA Worldview, enabling users to visualize aerosol alongside related products available in NASA Worldview, such as SO₂ concentrations and the ultraviolet aerosol index. Together, these NRT products and imagery empower users with the information necessary to respond to major volcanic eruptions and wildfires that reach the stratosphere, both for scientists to coordinate field campaigns and ground-based measurements to better understand those aerosols as well as for groups like the Volcanic Ash and Advisory Center to better inform safe aviation flight paths. The figure below shows an example of this imagery for an eruption that occurred in April 2024.

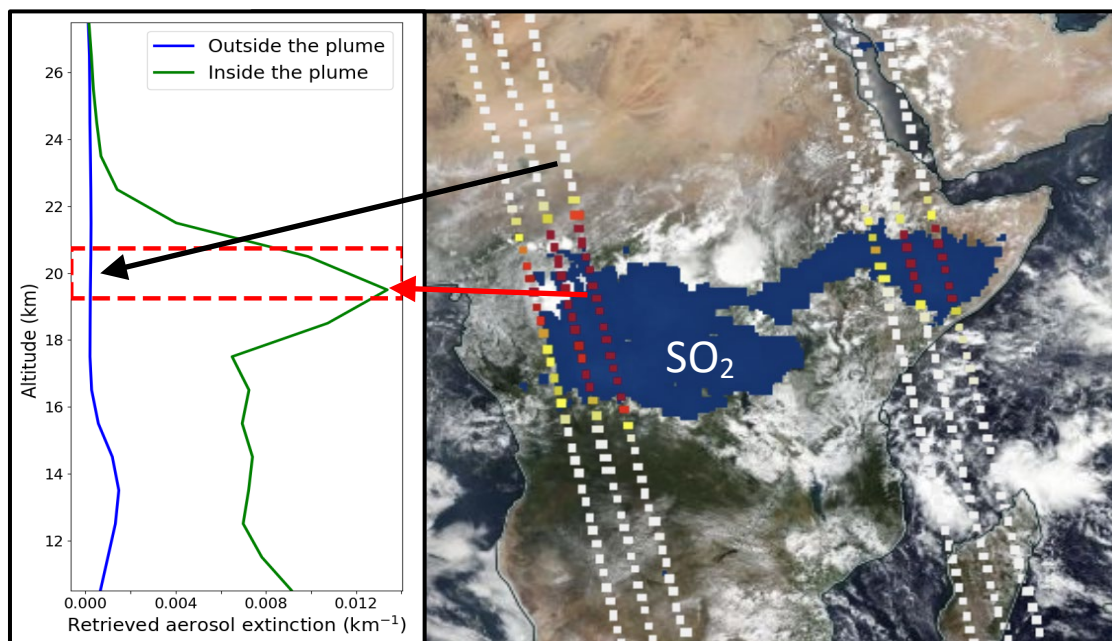


Image: Left panel: Aerosol extinction profiles for 2 measurement locations (one inside the Ruang aerosol plume, one outside the plume) to highlight the extinction enhancement in the upper troposphere and lower stratosphere from the Ruang aerosol. The red box denotes the altitude range shown in the right panel. Right panel: April 27, 2024, NASA Worldview visualization of aerosol extinction at ~ 20 km and SO₂ produced by the Ruang eruption that began on April 16, 2024, at 2°18'18"N, 125°21'54"E. The OMPS LP near-real-time stratospheric aerosol extinction between 19.5 – 20.5 km is shown along the satellite tracks as color dots ranging from white (low aerosol) to red (high aerosol), while the OMPS Nadir Mapper SO₂ column is shown as the dark blue swath over central Africa.

Dr. Himes established a ML methodology to retrieve water vapor from OMPS LP measurements, despite those previous efforts by other researchers suggesting it was not possible. Stratospheric

water vapor is important to understand and model various processes, particularly those related to stratospheric ozone and the Earth's radiative balance. His results show excellent agreement with MLS between 11.5 – 30.5 km, which contains the majority of stratospheric water vapor, and the SNPP-trained ML model is applicable to NOAA-21 OMPS LP without expensive retraining. This result is timely considering that the Aura Microwave Limb Sounder (MLS), which has provided the stratospheric water vapor record for the past two decades, is planned to end in the coming months with no planned successor. His work enables the MLS water vapor record to be continued, albeit for a narrower range of altitudes, until a successor to MLS can be launched. Dr. Himes has developed software to produce a data product for OMPS LP onboard both SNPP and NOAA-21, and Dr. Himes has prepared a manuscript on this work that is currently being finalized based on input from coauthors. The data product is expected to be released near the end of this reporting period, which will coincide with the manuscript's submission to the Atmospheric Measurement Techniques journal.

Dr. Himes explored a ML approach to retrieve aerosol particle size distributions (PSDs) from simulations produced by Dr. Parker Case as a proxy for OMPS LP measurements. To date, aerosol PSDs are impossible to retrieve via passive sensors like OMPS LP due to the computational complexity involved in modeling PSDs during retrievals. Preliminary results on Dr. Case's synthetic data set suggest that ML can disentangle this problem and successfully retrieve aerosol PSDs from OMPS LP measurements in a fraction of a second, but further work is required to validate these results using real measurements.

Dr. Himes collaborated with Dr. Alexei Lyapustin and GESTAR II colleague Dr. Sergey Korkin (613/UMBC) to refine Himes' methodology to replace lookup tables (LUTs) with a more accurate ML model. LUTs face multiple limitations (e.g., number of parameters, hardware requirements) that are circumvented by using ML. This approach is applicable to OMPS, but it also has far-reaching implications, as LUTs are used across the Earth sciences for countless retrieval products. Dr. Himes also collaborated with Zachary Fasnacht, Dr. Joanna Joiner, and others on a ML approach to ocean color retrievals from the Tropospheric Emissions: Monitoring of Pollution (TEMPO) instrument. A paper was submitted on this work and is currently under review.

Finally, Dr. Himes continued improvement of the ML algorithm to retrieve NO₂ from OMPS LP measurements that he started prior to joining GESTAR II in late June 2024. However, until recently there has been insufficient data to fully validate the results, and the project has been on hold. Dr. Himes is awaiting the data necessary to finish validation of these results and expects to obtain them later this year.

In the coming months, Dr. Himes expects to successfully publish the paper on retrieving water vapor from OMPS LP, produce imagery of the water vapor products for NASA Worldview, submit one or more proposals to the NASA ROSES INNOVATE program, and begin a new ML-focused project related to remote sensing of surface ozone from satellite measurements. Dr. Himes also expects to complete validation of the NO₂ retrieval method for OMPS LP, submit a paper on this work, and, if successful, release a data product. Finally, if time permits, Dr. Himes will continue the investigation into retrieving aerosol PSDs from OMPS LP to better assess its feasibility when applied to real data.

JOHANNA CANET

Sponsor Glenn Wolfe / Code 614 / Task 208

Since joining GESTAR II in February 2025, Dr. Canet has performed lab calibrations for GSFC instruments to support operation. Dr. Canet also supported the NASA Student Airborne Research Program (SARP) project with instrument integration of GSFC instruments on the Dynamic Aviation B200 aircraft platform. She also supported the NSF NCAR Greater New York Oxidant Trace Gas Halogen and Aerosol Airborne Mission (GOTHAAM). Dr. Canet participated in instrument integration for the GSFC ISAF formaldehyde instrument on the NSF C-130 aircraft platform and operated the instrument through the full campaign in Long Island, New York.

Dr. Canet will continue to work on instrument lab calibrations and will participate in upcoming NASA field campaigns. She will analyze the GOTHAAM data and prepare a related manuscript. Dr. Canet also will assist in the analysis of SARP data.

OLEG DOUBOVIK

Sponsor Mian Chin / Code 614 / Task 213

In the frame of this task Dr. Dubovik has been working on studying “Aerosol retrieval, aerosol physical and optical properties, inverse modeling, and harmonization between aerosol retrievals and models”. He collaborated with GSFC aerosol scientists in Code 610.1 (GMAO), 613 (Climate and Radiation Lab), 614 (Atmospheric Chemistry and Dynamics Lab), and 618 (AERONET group). In recent years, the GRASP (Generalized Retrieval of Aerosol and Surface Properties) team led by Dr. Dubovik was working on the retrieval approach aimed to provide the information about aerosol components as part of satellite derived products. For example, GRASP/Components approach was developed and described in the paper by Li et al (2019) to derive quantitative information about partitioning of aerosols with different chemical compositions as part of the properties retrieved from observations with high information content, such as those of AERONET or multi-angular polarimeter POLDER. The approach demonstrated promising results; however, it is evident that only a limited number of aerosol parameters can be retrieved from remote sensing observations and defining “Aerosol components” or “types” is ambiguous in the sense that they can have multiple definitions. Dr. Dubovik’s work during this task was focused on addressing this ambiguity. Specifically, he worked on comparing remote sensing-based aerosol type products from POLDER/GRASP and AERONET/GRASP with the NASA GEOS/GOCART model simulations of aerosol composition; then, he addressed questions, such as 1) how useful are the remote sensing-derived aerosol components for model evaluation and improvement; and 2) how may models help remote sensing teams improve their classification of aerosol components and types? Under the task, Dr. Dubovik, in collaboration with NASA colleagues, has made a quantitative comparison of one year (2012) of the POLDER/GRASP globally derived aerosol optical properties, such as AOD and AAOD, as well as mass of seven distinct aerosol types including BC, BrC, Iron, and the Soluble and Insoluble components of fine and coarse modes. The obtained result showed very encouraging correspondence of modeled and retrieved results. For example, the below figure illustrates comparison of the NASA GEOS/GOCART simulation for BC and BrC with GRASP retrievals for July 2012.

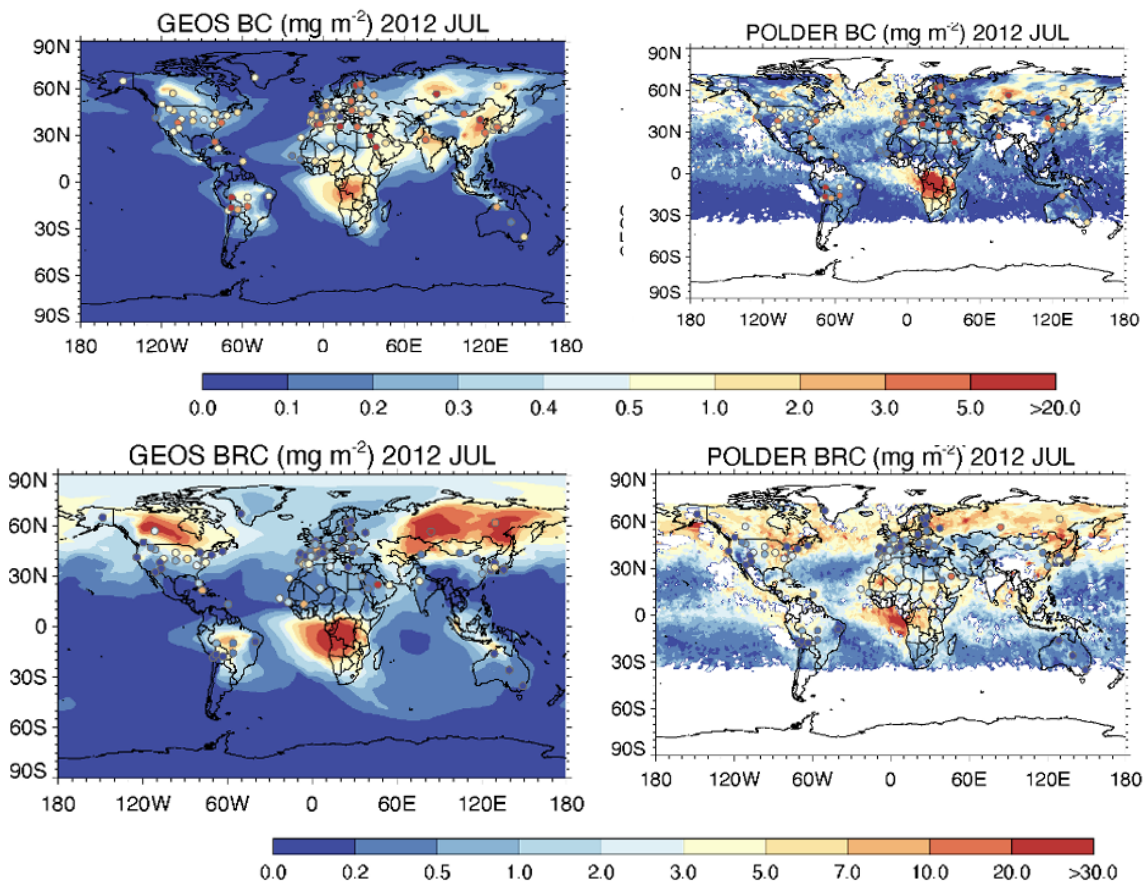


Image: The comparison of POLDER-3 and AERONET (noted by circles) GRASP/Components result from retrieval with NASA GEOS/GOCART simulations. Upper panel: comparison for BC monthly mean for July 2012. Lower panel: comparison for BrC monthly mean for July 2012.

As shown in the above figure, the overall patterns and magnitudes of BC and BrC aerosol mass agree. This is rather remarkable, since the modeling and retrieval results are completely independent. In addition, the modeling results are driven by meteorology and transport processes described by a very large number of parameters while the remote sensing is driven by a much smaller number of retrieved parameters while relying on actual observations.

During the next few months, Dr. Dubovik is planning to improve and complete the comparisons and provide the conclusions regarding the achievements of remote sensing detection of aerosol composition. Dr. Dubovik also plans to provide suggestions on further harmonization and optimization of GRASP/Components retrieval and how the remote sensing retrieval of aerosol composition can be used by the modeling community. Results from these studies are planned to be presented at the 24th AeroCom/13th AeroSat workshop to be held 13–17 October 2025 at the Université Paris-Saclay in France. He also intends to prepare the journal article using the results obtained.

KANGHYUN BAEK

Sponsor Can Li / Code 614 / Task 216

Dr. Baek has been working on the evaluation and improvement of ozone retrievals from the Ozone Mapping and Profiler Suite (OMPS) on SNPP and NOAA-20. Dr. Baek's research has focused on the development of soft calibration techniques, with the goal of reducing cross-track biases and improving the consistency of NOAA-20 retrievals with Suomi-NPP data. These efforts

have been extended to assess the broader impacts on total ozone retrievals, the aerosol index, and downstream applications relevant to geostationary missions.

In addition, Dr. Baek has contributed as a co-author to multiple peer-reviewed publications in 2025. These works include studies on seasonal variations in PM_{2.5} levels in Hong Kong associated with tropical cyclones, long-term tropospheric ozone observations from DSCOVR EPIC, and initial validation results for TEMPO and GEMS total ozone products using ground-based networks. Dr. Baek has also been involved in ongoing collaborative efforts to improve GEMS ozone profile retrievals and to conduct cross-validation of GEMS ozone products with Pandora and other satellite measurements.

Looking ahead, Dr. Baek will continue to refine the soft calibration approach for OMPS/NOAA-20 and expand its application to larger datasets, including seasonal and regional analyses. Dr. Baek will also evaluate the implications of this calibration methodology for geostationary missions such as GEMS and TEMPO, with a focus on validation and cross-mission consistency. In early September, Dr. Baek will present his invited talk entitled “Development of Soft Calibration for OMPS/N20 and Its Implications for GEMS and TEMPO Applications” at the GEMS Science Meeting hosted by NIER in Seoul, South Korea.

PAUL A. NEWMAN

Sponsor Natalya Kramarova / Code 614 / Task 222

Dr. Newman co-chairs with Dr. Natalya Kramarova the GSFC polar ozone research group, including a weekly group meeting that follows the development of the Antarctic ozone hole and Arctic ozone depletion, and coordinates research and publications on ozone depletions. As part of this group, Dr. Newman prepares a 10-30 slide presentation for a weekly on-line Tuesday meeting showing the behavior of the Antarctic ozone hole and Arctic ozone depletion. This work also supports the NASA Ozone Watch web site (<https://ozonewatch.gsfc.nasa.gov>). In 2024, there were more than 10 million accesses to the ozonewatch website, with more than 2 petabytes (2,000 terabytes) of downloads of data and images. He also built a web site on the quasi-biennial oscillation (QBO) that has become an international asset for understanding and monitoring this phenomena (https://acd-ext.gsfc.nasa.gov/Data_services/met/qbo/qbo.html).

As part of his ozone science work, Dr. Newman built a website to help in establishing new stations for monitoring ozone depleting substances (ODSs). The Montreal Protocol is an international agreement that controls ODSs. Because of treaty violations, the Parties to the Montreal Protocol want to enhance regional monitoring of ozone depleting substances. In February 2024, Dr. Newman helped organize the on-line “Workshop on costs of atmospheric monitoring of gases controlled under the Montreal Protocol”. As a follow-on to this work, Dr. Newman [created images](#) that show both emissions and wind patterns that can be used to select stations.

Dr. Newman has led an international effort on the January 2022 Hunga volcano eruption under the auspices of WCRP/APARC. This Hunga assessment will be published in December 2025 under the auspices of the World Climate Research Program. The report’s final drafts are completed, and it is now being technically edited. Dr. Newman helped organize the report’s final in-person review and writing of the executive summary (10-12 June 2025, Boulder, CO). The Hunga Report will be released at the American Geophysical Union’s Fall meeting in New Orleans

in December 2025. Dr. Newman also helped organize a session at the AGU meeting on the Hunga research.

Dr. Newman has organized the “Stolarski Symposium” for the January 2026 AMS annual meeting in Houston, TX. He will give an invited talk, “On the Breakup of the Antarctic Ozone Hole”, at the Network for the Detection of Atmospheric Composition Change Symposium (27-30 October 2025, Virginia Beach, VA, USA).

RANDY KAWA

Sponsor Glenn Wolfe / Code 614 / Task 223

Dr. Kawa is an affiliated research scientist, whose research activities focus on greenhouse gas (GHG) fluxes and their connection to carbon cycle science. Key tasks include analyzing and integrating data from airborne field campaigns and satellite observations, as well as using this information to improve carbon cycle models. Dr. Kawa also mentors junior researchers in mission planning and data analysis, and co-authors publications, all while participating in national meetings to share findings and foster collaboration. These efforts directly support the work of the GSFC In Situ Observations Laboratory and the U.S. Greenhouse Gas Center.

ADDISON COLWELL

Sponsor Glenn Wolfe / Code 614 / Task 231

Ms. Colwell was a student researcher focusing on understanding the surface–atmosphere exchange of carbon dioxide, methane, and ozone in subtropical wetlands. Observations from the NASA BlueFlux project demonstrate how gas fluxes are influenced by land surface characteristics, seasonal patterns, and tidal dynamics. A key component of her research was exploring the relationship between ozone and CO₂ exchange to distinguish stomatal versus non-stomatal ozone uptake and assess potential plant damage. All datasets are, or will be, publicly available through NASA data servers, and resulting publications will be shared in peer-reviewed open-access journals in compliance with SPD-41a.

SASWATI DAS

Sponsor Thomas Hanisco / Code 614 / Task 237

Dr. Das joined GESTAR II in September 2025. Dr. Das will analyze observations of climate-forcing trace gases and their co-emitted species (e.g., NO₂, CO) using data from ground-based remote sensing networks and aircraft in situ measurement campaigns. These measurements complement current and future satellite observations (e.g., OCO-2, OCO-3, GOSAT-2, GHGSat, CO2M, TEMPO, GeoXO), as well as flux tower and ground-based in situ networks, to improve our understanding of emissions sources and atmosphere-biosphere interactions.

Dr. Das’ potential research topics for this task include: 1) validation of total column satellite data products; 2) validation of inverse modeling inventories; 3) evaluation of urban fluxes and emission sources; 4) evaluation of natural system fluxes; and 5) improving instrumentation and observational strategies.

PAOLO DE MATTHAEIS

Sponsor Emmanuel Dinnat / Code 615 / Task 016

Dr. de Matthaeis' work falls in the framework of estimating sea surface salinity from space, for study of large-scale ocean processes and climate change, using measurements from the Soil Moisture Active Passive (SMAP) radiometer and the Aquarius instruments. Activities focus on minimizing the various errors in the brightness temperature measurements acquired over the ocean to perform a reliable retrieval of sea surface salinity. During the reporting period, Dr. de Matthaeis contributed to investigations on the geolocation of SMAP data and the measurement of the dielectric constant of sea water. He is also part of the RFI (Radio Frequency Interference) SMAP team and regularly presents his work in its bi-weekly online meetings. Among the aspects that he has been focusing on is the analysis of observed interference and reporting to the subject experts so the sources can be identified and removed. Results of his work are included in several conference papers. He also continued the analysis of data acquired by the airborne Scanning L-Band Active Passive (SLAP) radiometer. Finally, Dr. de Matthaeis was Chair of the IEEE GRSS Frequency Allocations in Remote Sensing Technical Committee, and he contributed to presentations on the protection of remote sensing instruments for Earth Observation from RFI and related regulatory issues.

In the coming months, Dr. de Matthaeis will continue his work on errors affecting sea surface salinity from space, in particular RFI and the analysis of the SLAP measurements. In particular, he is working on 1) an improved version of the RFI maps for the SMAP radiometer published on the NASA Salinity website, based on the latest version of the SMAP data products, and 2) producing a list of locations of SMAP radiometer RFI sources.

CHRISTOPHER SHUMAN

Sponsor Compton Tucker / Code 615 / Task 089

A key aspect of Landsat Extended Acquisitions of the Poles (LEAP) is the use of the Landsat satellites' thermal infrared sensors (TIRS and TIRS-2). These sensors measure heat, allowing scientists to "see" and track changes in ice and ocean features in the dark. Dr. Shuman has highlighted the value of this data, noting how the contrast between cold polar ice and the warmer ocean waters is clearly visible. This capability is crucial for understanding processes like ice formation, decay, and the movement of sea ice.

The Landsat program has been collecting images of the Earth for over 50 years. Dr. Shuman has co-authored articles explaining how LEAP acquisitions are extending this record, providing valuable new data that augments our understanding of polar systems and climate change.

In addition to his scientific research, Dr. Shuman has been actively involved in promoting this work. By supporting media interest and promoting the LEAP images at events like the AGU meeting, Dr. Shuman has helped to communicate the importance of cryospheric science and the impact of climate change to a broader audience.

Dr. Shuman retired from UMBC at the end of December 2024.

ELIZABETH ULTEE

Sponsor Denis Felikson / Code 615 / Task 202

In support of the NASA Sea Level Change Team working group on “Integration”, Dr. Ultee has contributed to experimental design for observational constraints on globally integrated sea-level change products. Dr. Ultee has installed and tested the Framework for Assessing Changes to Sea level (FACTS) on NASA’s Discover high-performance computing platform. Dr. Ultee and sponsor Dr. Felikson collaborate on the Ice Sheet Model Intercomparison Project, for which Dr. Ultee coded a bias-correction workflow and produced a test dataset. Dr. Ultee also supervised a student intern who developed a glacier module for the Cryosphere Model Comparison Tool, which facilitates the comparison of glacier models with satellite observations.

In support of the Data Land Ice initiative, Dr. Ultee compared the output of a high-resolution GEOS simulation of glacier accumulation and ablation against satellite observations of glacier mass change. This assessment revealed regional patterns of over- and under-estimation between GEOS and the observations; ongoing analysis seeks to determine the causes of the mismatch.

Dr. Ultee’s externally funded research focuses on glacier dynamics. She leads an NSF-funded field observation program to determine the drivers of glacier acceleration in Greenland. In May, Dr. Ultee deployed GNSS receivers, meteorological sensors, and time-lapse cameras at Sermeq Kujalleq glacier. Dr. Ultee has been supervising a postdoctoral scholar at the University of Oslo through a Research Council of Norway project, focused on improving the representation of iceberg calving in global glacier models.



Image: Field work in Sermeq Kujalleq (Kangia), Greenland performing a field installation on the ice sheet with GNSS antenna, receiver box, solar panel, and temperature sensor. Credit: Elizabeth Ultee.

In September 2025, Dr. Ultee will return to Greenland to recover field instruments from Sermeq Kujalleq, near Ilulissat. Dr. Ultee will continue analysis of high-resolution GEOS output to support a publication in preparation with the GMAO and Cryosphere labs. In October, she will give an invited seminar at the University of Texas at Austin.

DAVID LE VINE

Sponsor Nathan Kurtz / Code 615 / Task 234

Dr. Le Vine, an affiliated research scientist, attended the GSFC Salinity Team meetings every Wednesday to support research on the measurement of the dielectric constant of seawater. This ongoing work is crucial for understanding and accurately measuring ocean salinity.

This past year, Dr. Le Vine made significant contributions to the Soil Moisture Active Passive (SMAP) mission, demonstrating deep involvement and expertise in its scientific and technical operations. A key achievement was the presentation of a research paper, "Cold Sky Calibration and Radiometer Calibration," at the SMAP Science Team Meeting in San Gabriel, CA. This work highlighted critical advancements in a core aspect of the mission's data accuracy.

Dr. Le Vine participated in multiple SMAP Science Team Committees. This included regular attendance and contributions to the Algorithm Development Team (ADT), the main Science Team (DAART/ST), and the Radio Frequency Interference (RFI) Team, all of which are vital to the mission's ongoing success and data quality.

CODE 616: OCEAN ECOLOGY LABORATORY

SUSANNE CRAIG

Sponsor Bryan Franz / Code 616 / Task 004

From September 2024 to March 2025, Dr. Craig continued her work as the Science Lead for the PACE mission's system vicarious calibration (SVC). In September 2024, Dr. Craig applied for and was successful in obtaining two internal Goddard sources of funding on which she is the PI: 1) a Science Task Group (STG) award titled "An open science, community-driven approach to assemble benchmark datasets for machine learning algorithms to predict ocean ecology", in collaboration with GESTAR II colleague Dr. Ian Carroll, and 2) a Strategic Science award titled "The role of oceans in the Earth system: Preparing the oceans community for the 2027 Decadal Survey." In March 2025, PACE SVC became operational (*i.e.*, was no longer a research task) and Dr. Craig transitioned to working full-time on these two projects.

In addition, Dr. Craig has been working on the final stages of her NASA OBB-funded research project on which she is the PI. This has involved finalizing the machine learning models that have been developed to allow the prediction of phytoplankton community composition from ocean color. A pre-print describing one of the models has been published in anticipation of submission to a peer-reviewed journal in the coming weeks.

Upcoming plans include the continuation of the STG and Strategic Science activities. The STG work is highly synergistic with Dr. Craig's NASA OBB research, and it is anticipated that the datasets built through this activity will allow further refinement of the phytoplankton

community composition algorithm. She intends to continue with this activity with the end goal of creating a synthesis white paper and supporting publications in the peer-reviewed journal, *Oceanography*. Following on from the successful collaboration with commercial partner SciGlob, Dr. Craig intends to collaborate on a Phase I SBIR application with GESTAR II scientist and SciGlob CTO, Dr. Nader Abuhassan.

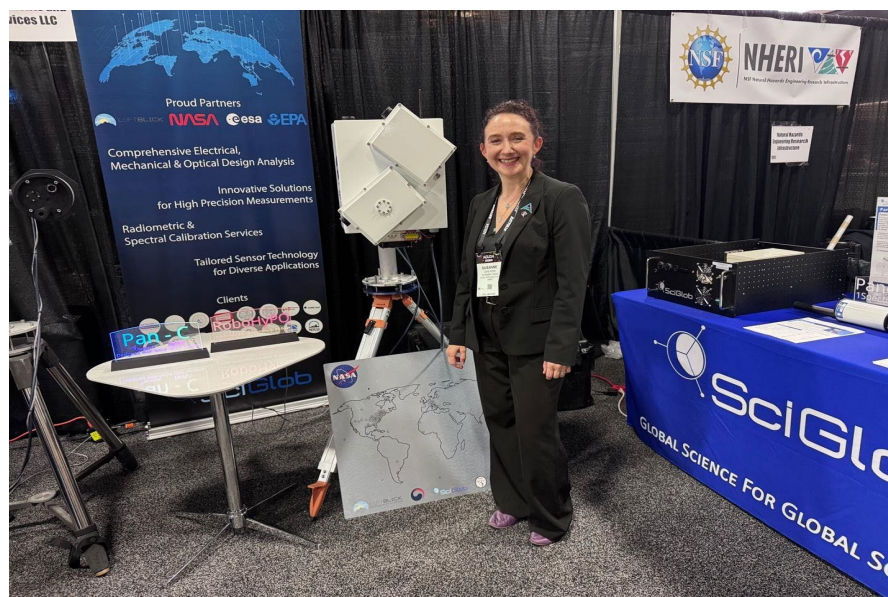


Photo: Dr. Susanne Craig (GESTAR II UMBC) at technology partner, SciGlob's, stall during AGU 2025, Washington, D.C. Featured is RoboHypo, a prototype hyperspectral radiometer. There is currently no such instrument available commercially. RoboHypo will act as a valuable source of validation data for NASA's PACE mission.

VIOLETA SANJUAN CALZADO

Sponsor Bryan Franz / Code 616 / Task 005

Dr. Sanjuan Calzado is leading the apparent optical properties (AOP) in-water processing for the PACE Validation Science Team (PVST). This involves implementing processing standards and software to provide in-water AOP validation data. She is routinely processing all in-water radiometry provided by PVST investigators and providing validation data for matchups with PACE OCI sensors. Dr. Sanjuan Calzado is also leading meetings with PACE PVST members and continuing to provide guidance to the community for radiometric standards and processing implemented for the PACE mission.

Dr. Sanjuan Calzado will continue to support all AOP activities for the PVST, including regular in-water AOP processing, code development and coordination with PVST scientists.

DIRK AURIN

Sponsor Antonio Mannino / Code 616 / Task 009

Dr. Aurin continues to lead the international HyperCP team to develop and improve the community processor designed for *in situ*, above water radiometric data acquired in support of satellite ocean color mission (*e.g.*, PACE) validation and ocean constituent retrieval algorithm development. HyperCP was once again selected as the processor for a field intercomparison campaign (FICE2025) at the Acqua Alta Oceanographic Tower (AAOT) in the Adriatic Sea near Venice, Italy in July. He collaborated with investigators from the last intercomparison campaign at AAOT (FICE2022) to produce a successful manuscript, which highlights the advantages of using HyperCP to adhere to Fiducial Reference Measurements for Satellite Ocean Colour (FRM4SOC) and NASA and IOCCG protocols. The FICE2025 campaign was combined with a two-

week training course for 25 international students (<https://pace.oceansciences.org/blog.htm>), bringing the total number of students trained by Dr. Aurin in HyperCP to 121 from 31 countries, including 16 students from a course taught in October at the Ocean Optics XXVII conference in Gran Canaria, Spain.



Photo: FICE2025 instructors (Dr. Aurin second from left of bottom row) and students gather for a group photo before the finale reception July 18, 2025 within the CNR-ISMAR (Italian Marine Sciences Institute) facility in Venice, Italy. A model of the Acqua Alta Oceanographic Tower stands in the lower right. Credit: Fernanda Giannini.

Dr. Aurin continued his work as subject matter expert for above water radiometry (AWR) data submissions to the SeaBASS archive, completing an additional 39 reviews and reports (34 associated with the PACE Validation Science Team (PVST)) to evaluate data quality for satellite mission validation and algorithm development, bringing the total number of completed reviews to 62. In further support of the PACE mission, Dr. Aurin worked with PIs from PVST to coordinate the calibration and full radiometric characterization of field radiometers at the Tartu Observatory, University of Tartu, in Estonia.

As part of the GLIMR Science Team, Dr. Aurin has conducted radiometric performance modeling for the HyperSpectral Imager (HSI) based on evolving estimates of HSI radiometric characteristics as the instrument was being built and tested at Raytheon. Sensitivity analysis of the impacts of signal-to-noise ratio and systematic uncertainty on primary science products, such as remote sensing reflectance, were presented regularly to the GLIMR team and demonstrated continued compliance of HSI performance with the mission baseline and threshold requirements.

Dr. Aurin continues to work as lead PI for the Chesapeake Bay node of the AERONET-OC radiometry system, coordinating with US Coast Guard, Maryland Department of the Environment, NOAA, and NASA colleagues to maintain the SeaPRISM AWR instrumentation on the tower in Chesapeake Bay, including a boat trip to climb the tower in September 2024 for swapping out the radiometer for calibration. Dr. Aurin will continue to lead the development of HyperCP accommodating analysis related to the recent field intercomparison campaign (FICE2025). Improvements include the integration of algorithms to estimate internal sensor working temperature from dark current measurements and the breakdown of individual contributions to measurement uncertainty including thermal response, dark current noise, non-linear response, straylight response, cosine response, glint correction, and environmental variability. He will participate in writing the manuscript evaluating these contributions to the overall uncertainty in field ocean color measurements, based on findings from FICE2025 to better inform satellite mission validation efforts going forward. In addition, new efficiencies to the HyperCP platform will be rolled out allowing end users to process their data more rapidly using look-up tables in place of fully expressed models.

As the construction and testing of the GLIMR HSI sensor continues, Dr. Aurin will be providing analysis regarding HSI's compliance with mission requirements and expand radiometric performance models to incorporate laboratory test results in place of preliminary best estimates for radiometric characteristics. He will also expand the model to test radiometric performance beyond the primary region of interest to all 19 regions slated as targets. This will include ongoing collaboration with the NASA Ocean Biology Processing Group to update low-level (L1B) imagery simulations and high-level (L2) processing with uncertainty budgets for principal ocean color products and adapting these workflows to GLIMR HSI from the PACE OCI framework in which they were initially developed. In addition, Dr. Aurin will begin reevaluation of the day-in-the-life modeling/scheduling for GLIMR imagery acquisition to include flexibility for geostationary orbital positioning in conjunction with solar-sensor geometry limitations. Also, he will lead a team to service the Chesapeake Bay node of the AERONET-OC network in September.

IVONA CETINIĆ

Sponsor Jeremy Werdell / Code 616 / Task 017

Dr. Cetinić has been serving as a Project Science Lead for Ocean biogeochemistry under PACE, and as such continued to support algorithm implementation and development. She also supports the validation of the biogeochemical suite of products, through data quality control and evaluation of algorithmic performance. As a part of the PACE-PAX mission to validate advanced PACE and ESA's EarthCARE, she participated in a field campaign in California in September 2024, coordinating and overseeing the ocean component of the experiment. Upon return, she has been assisting with the documentation, data submission and collaboration within and outside of the project. She is also coordinating the PACE Validation Science team, ensuring that the scientists funded have everything they need so their data delivery for PACE validation is correct and timely.



During the last year, Dr. Cetinić participated in several science meetings, occasionally served as a co-organizer, where she presented the updates from work noted above. She has been collaborating on several manuscripts, with four published and two accepted, and overseeing the work of interns, students, and postdocs (many are working on publications of their work). Dr. Cetinić had two proposals funded as a co-PI, and one (NSF-funded REU) of which is opening a possibility of bringing more students to the GESTAR II sphere, starting in Summer 2026. She spent two weeks in Maine, teaching the Ocean Optics summer class (NASA-funded). She has continued to support the outreach needs of the PACE project and NASA Earth Science, with this year's highlight the participation in the episode of a children's science show, [Wild Kratts](#).

In the upcoming year, Dr. Cetinić will continue to support the PACE mission, either through coordination and support of the field component or through algorithm development, implementation and validation. She is hoping to explore the new exciting science with PACE data, or work with collaborators on her other recently funded NASA project. She hopes to participate in occasional offsite meetings with her colleagues, the first of which is the Southern Ocean Biogeochemistry meeting in November 2025.

BRIDGET SEEGERS

Sponsor P. Jeremy Werdell / Code 616 / Task 029

Dr. Seegers was the Chief Scientist on Research Vessel (RV) Blissfully on the PACE-PAX validation field campaign. R/V Blissfully is a 30-foot sailboat with a crew of two who supported PACE-PAX from 6 Sept to 19 Sept 2024. Dr. Seegers was responsible for the science and logistics planning for the field effort that sampled 19 stations in the San Pedro Channel near the USC SEAPRISM oceanographic instrument on an offshore oil rig. RV Blissfully had an assortment of instruments and sampled variables focused on radiometry and plankton community composition. This research effort resulted in nine successful station match-ups with the PACE Ocean Color Instrument (OCI). Details about the day-to-day activities on RV Blissfully are available on the [NASA Earth Observatory blog](#). RV Blissfully data is archived in NASA SeaBASS. The [archived data](#) includes Hyperpro radiometric casts, Ap/Ad, and HPLC pigment results.



Photo: Crew of R/V Blissfully Bridget Seegers and Gordon Ackland. Credit: Bridget Seegers.

Other research activities included Dr. Seegers' continued role as the NASA lead for the Cyanobacteria Assessment Network (CyAN), working with interagency collaborators at the US Environmental Protection Agency (USEPA), NOAA, US Geological Survey (USGS), and US Army Corps of Engineers (USACE). The CyAN team continued to assess and deliver high-quality data on harmful algal blooms (HAB). In Spring 2025, the CyAN team completed a data reprocessing and released CyAN data version 6, which improved overall algorithm performance. Dr. Seegers advocates for and educates about the utility of the CyAN product to monitor for harmful cyanobacteria blooms in lakes and water bodies across the United States through panel discussions and conference presentations.

Dr. Seegers is a Co-I and part of a team with funding from the USACE for a proposal titled "Cyanobacteria Assessment Network: Inclusion of Sentinel-2 derived chlorophyll Year 1". This effort worked to expand satellite monitoring of inland water bodies by developing products compatible with the higher spatial resolution Multi-Spectral Instrument (MSI) data on the Sentinel-2 satellites. The proposal supported the hiring of a post-doc to be part of the research effort. Additionally, Dr. Seegers was the co-author on three submitted papers with lead authors from the Center of Disease Control (CDC), USGS, and USEPA. The papers are moving through the peer-review process.

Dr. Seegers will work with the CyAN Sentinel-2 team to submit a Sentinel-2 summary report to USACE in September. She will continue her work in developing water quality products for inland waters including new products from PACE OCI.

ANDREW SAYER

Sponsor P. Jeremy Werdell / Code 616 / Task 048

Dr. Sayer's task focuses on supporting the NASA Plankton, Aerosol, Cloud, ocean Ecology (PACE) mission, specifically the generation and validation of atmospheric (aerosol, cloud, gas) data products from the Ocean Color Instrument (OCI). In his role as PACE Project Science Lead for OCI Atmospheres, he's overseen the release and updating of several OCI atmospheric data products – specifically, cloud mask, cloud top height (both algorithms for which he led the development), cloud optical properties, and aerosol properties (work led by others). He has verified and shepherded these data products through several updates and reprocessings of PACE data this year, up to the most recent version 3.1. A particular focus has been cloud top height validation; he has one paper under review at a journal based on pre-launch analysis, and has developed the post-launch validation data processing chain with some initial results online (https://pace.odysseyallc.net/pace_cloud_top_height.htm). He has shared this work at various seminars and conferences, either presenting himself or as a co-author on others' presentations. More recently, he has been using airborne data collected during PACE's dedicated validation field campaign (PACE-PAX), as well as other relevant NASA (ARCSIX) and international (EarthCare field campaigns) experiments to broaden our understanding of PACE measurements and improve the quality of the data products.

In his role as Deputy PACE Science and Applications Team Lead, Dr. Sayer has worked with NASA-funded Science Team members to help them develop and integrate their atmospheric data products into the PACE data processing system. This involves extensive discussions with both scientists and the data processing and archive teams to understand each group's requirements and practical aspects of algorithm implementation. Along with the aforementioned cloud and aerosol products, one particular highlight has been working with Drs. Joanna Joiner (NASA/retired) and Zach Fasnacht (SSAI) to develop and apply techniques for monitoring NO₂ and O₃ to OCI data. OCI provides significantly finer spatial resolution than previous spaceborne sensors observing these quantities from space, improving the utility of these data for applications such as air quality monitoring/alerts, as well as providing these quantities as inputs into downstream data processing algorithms (e.g. atmospheric correction of land and ocean surface reflectances). This application goes beyond what was originally foreseen during PACE mission conceptualization.

Dr. Sayer plans to continue validating and documenting PACE OCI's aerosol and cloud data products. These results will be disseminated via the PACE website, presentations at the AGU Annual Meeting and elsewhere, and algorithm theoretical basis documents. He will begin to prepare and assist others in preparing peer-reviewed journal articles on these topics and perform revisions on his submitted paper on cloud top height validation. He also plans to use data from the European EarthCARE satellite, launched last year and now in routine operations, to evaluate PACE's cloud data products. Dr. Sayer will continue co-organizing the annual AeroCom/AeroSat meeting, which will be held in October 2025 in Paris, France (he expects to participate virtually).

INIA M. SOTO RAMOS

Sponsor Jeremy P. Werdell / Code 616 / Task 049

During this past year, Dr. Soto Ramos has been leading the field dataflow for PACE OCI validation efforts. This effort includes communication and coordination with all SeaBASS data submitters, especially the 24 PACE Validation Science Teams (PVST). This first step is critical to make sure data submitters are collecting and delivering data within the SeaBASS guidelines and within the

time requirements for NASA funding. After that, Dr. Soto Ramos works closely with the SeaBASS Team and data manager to confirm the data is archived and publicly available, and more importantly that the data is assigned to Subject Matter Experts (SME's) who will QA/QC the data and create a subset dataset with the data that meet the high data quality criteria for validation. Once the validation subset is ready, data goes into the last step of creating the matchups and plots and then publishing the results. Dr. Soto Ramos has coordinated and managed hundreds of datasets this past year that have gone into the full validation data flow. She holds a weekly meeting with the SME's and PACE Science Team, which leads to coordinating the efforts and guaranteeing no data is lost in the process. Dr. Soto Ramos assisted with the development of validation code and protocols, and coordinated meetings with the SMEs to ensure we are ready to validate all main data products. All these steps require using the Jira system for tracking and managing the datasets. One main goal of Dr. Soto Ramos has been to identify roadblocks in the validation data flow and work with the Team to find solutions. Once the validation results are ready, Dr. Soto Ramos coordinates with the PACE web development team the publication of the data on the PACE website. She arranged one-on-one meetings with the data submitters and PVST Teams to make sure they were ready to submit; also, she mediated all cases in which there were issues with the submitted data.

In addition to the validation efforts, Dr. Soto Ramos has been working on the testing and development of Harmful Algal Blooms (HAB) detection techniques for *Karenia* blooms using PACE data. This work has been used in a series of communications nuggets and has been presented at several PACE events. During the summer, Dr. Soto Ramos mentored a summer intern who continued the HAB detection effort and is currently preparing a manuscript.

During the next few months, Dr. Soto Ramos will continue the PACE validation efforts and extend the process into newer datasets. Regarding HAB detection, she and her colleagues will finalize a manuscript, publish a series of HAB detection codes that will be shared publicly, and continue expanding the research to other phytoplankton species.

**J. VANDERLEI MARTINS, XIAO GUANG (RICHARD) XU,
ANIN PUTHUKUDY**

Sponsor Bryan Franz / Code 616 / Task 115

Dr. Xu has been working with Dr. Vanderlei Martins to develop a validated, robust, and computationally efficient ground-based Level-1 processing system for UMBC's Hyper-Angular Rainbow Polarimeter 2 (HARP2) onboard NASA's PACE satellite. Launched in February 2024, the PACE satellite is designed to produce extended observations of ocean color, aerosols, and clouds. Dr. Xu has delivered several versions of HARP2 Level 1 processing software to the NASA PACE Science Data Segment, which are being used to generate operational PACE HARP2 L1A, L1B, and L1C products in the near real time. He and the HARP2 team have made efforts to substantially improve the geo-registration and radiometric/polarimetric performance of the instrument, providing science-level L1 products for the PACE community. In particular, the Version 3 Level-1 data processing system was delivered early 2025, which included updates and improvements in HARP2 straylight correction, wide field-of-the-view radiometric-polarimetric characterizations, and dynamic flatfield and dark current corrections. The new version has led to a substantial improvement in the HARP2 Level-1 data quality and has enabled the release of HARP2 Level-2 aerosol and cloud science products.

Dr. Puthukkudy has been overseeing the quality assurance of HARP2 data by comparing it with other instruments on the NASA PACE platform. This involves comparing HARP2's radiometric data with that from the OCI and SPEXOne instruments. The initial findings from lab calibration were documented and were applied to the radiometric and polarimetric calibration coefficients of HARP2. The polarimetric performance was tested and confirmed with SPEXOne observations. Dr. Puthukkudy is also working on implementing a new land and ocean aerosol retrieval algorithm compatible with HARP2. This team successfully delivered and tested the initial version of the Level 2 retrieval algorithm within the PACE SDS system. This algorithm enables the retrieval of aerosol and surface properties over both ocean and land surfaces.

Dr. Xu will continue to support the maintenance of the HARP2 Level-1 data processing system. He will continue characterizing and improving the HARP2 calibration and geo-registration based on the instrument's performance, and will provide relevant implementations to the software. He will assist with evaluating HARP2 data products and supporting the Level-2 science products from HARP2 observations. Dr. Puthukkudy will continue the implementation and testing of the level 2 retrieval algorithm, developed in collaboration with GRASP-EARTH, for near real-time processing of aerosol data from HARP2. He will continue to monitor both the radiometric and polarimetric performance of HARP2 in conjunction with OCI and SPEXOne, and plans to evaluate the long-term radiometric performance of the system using pseudo-invariant calibration sites (PICS). The anticipated Level 2 aerosol products will be hosted on NASA's OBDAAC.

Dr. Puthukkudy will ensure that the necessary software and technical support is provided to the PACE SDS team for implementation in the PACE operational environment. The next phase will focus on implementing retrieval quality flags and on developing an Algorithm Theoretical Basis Document (ATBD) to support end users. Additionally, it will leverage temporal information of the surface to constrain the retrievals, which will help improve surface characterization and, in principle, lead to higher quality aerosol retrievals. Further enhancements will include incorporating ESM (Earth System Model) aerosol components into the retrieval process.

IAN CARROLL

Sponsor Amir Ibrahim / Code 616 / Task 161

Dr. Carroll's work within the Ocean Ecology Laboratory (OEL) fulfilled key computations and algorithms for the performance of atmospheric correction (AC) and cloud masking (CM) for the Ocean Color Instrument (OCI) onboard the recently launched Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) satellite. Working with UMBC colleague Dr. Pengwang Zhai, author of a novel radiative transfer numerical model, Dr. Carroll completed the production of look-up tables for AC that are now used in production for OCI. Together with GESTAR II colleague Dr. Andrew Sayer, he also completed the development of a neural network (NN) model that is now providing the operational CM for OCI. Dr. Sayer and Dr. Carroll also jointly mentored a GESTAR II undergraduate fellow, who successfully applied to an REU program in Translational AI after presenting her project on dust aerosol estimation from space-borne thermal radiometry at the annual AMS meeting. With the launch of PACE, Dr. Carroll has become involved in several outreach activities, including the NASA Openscapes Mentors program and the PACE Hackweek.

Dr. Carroll will work in collaboration with GESTAR II colleague Dr. Susanne Craig to develop Continuous Integration and Continuous Deployment automations for secondary dataset

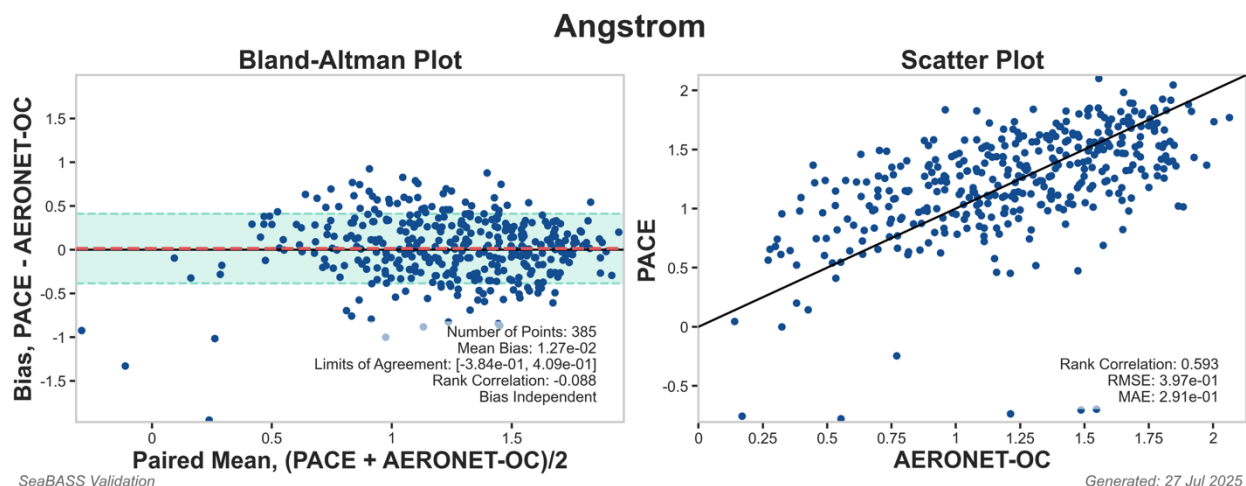
generation, making it easier for researchers to collaborate on preparing match-up datasets (i.e., simultaneous observations from in-situ and remote-sensing platforms). A continuing collaboration with GESTAR II colleague Dr. Violeta Sanjuan Calzado on developing the next-generation NASA bio-Optical Marine Algorithm Dataset (NOMAD) serves as a case study for the project with Dr. Craig.

JAMES ALLEN

Sponsor Amir Ibrahim / Code 616 / Task 174

Dr. Allen advanced a Bayesian framework that jointly retrieves atmospheric and oceanic parameters from Terra's MISR and MODIS sensors to improve information content and quantify uncertainties from all levels of algorithm retrievals. He finalized software that downloads, processes, and converts MISR Level-1B Ellipsoid data into a CF-compliant Level-1B NetCDF format used by the Ocean Data Processing System, making the data more accessible for algorithm development. He completed the end-to-end inference pipeline and is initiating validation against AERONET-OC matchups. He has significantly refactored a top-of-atmosphere radiance simulator, originally built for PACE prelaunch data simulation, to generate training datasets based on the current Ocean Color Science Software processing suite and adaptable to other sensor and algorithm configurations.

Dr. Allen also developed an intermediate processing pipeline that enables the PACE Validation Science Team to produce satellite–field matchups and band-wise summary statistics, including Bland–Altman and scatter plot visualization (image below), for display on the PACE validation website (https://pace.oceansciences.org/pace_data_matchups.htm). He also released user-facing tools and tutorials to support field validation and training, including an overpass-prediction site for planning PACE observations (SatSeer: https://oceandata.sci.gsfc.nasa.gov/sat_seer/), and a Help Hub tutorial on satellite–*in situ* matchups (<https://oceancolor.gsfc.nasa.gov/resources/docs/tutorials/>).



Over the next few months, Dr. Allen will vectorize the top-of-atmosphere simulator to efficiently generate neural-network training datasets, train a neural network to accelerate MODIS forward modeling within the Bayesian Inference workflow, and continue to publish updated PACE satellite–field matchup figures on the validation website, which now includes the hyperspectral observations being submitted by the PACE Validation Science Team.

SEAN FOLEY

Sponsor Kirk Knobelspiesse / Code 616 / Task 175

Mr. Foley's research activities for Task 175 are highly related to those of his Task 181 (Code 612); thus, his reports are nearly identical. His scientific focus has been to improve the characterization of 3-dimensional cloud structure from multi-angle sensors in orbit, focusing on the Hyper-Angular Rainbow Polarimeter (HARP2) aboard the Plankton, Aerosol, Cloud-ocean Ecosystem (PACE) mission. He has two primary research threads: an unsupervised machine learning approach based on neural rendering and a sparsely supervised approach. These approaches have complementary strengths and may eventually be incorporated into an ensemble approach to 3D cloud reconstruction.

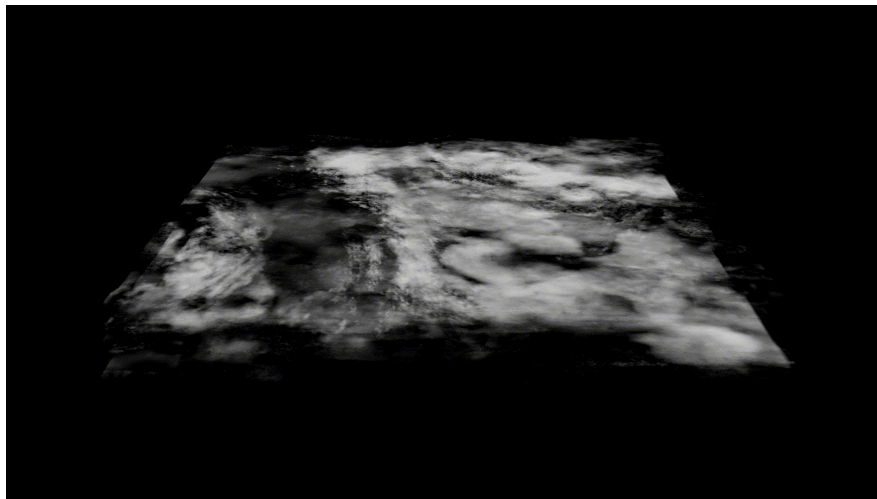
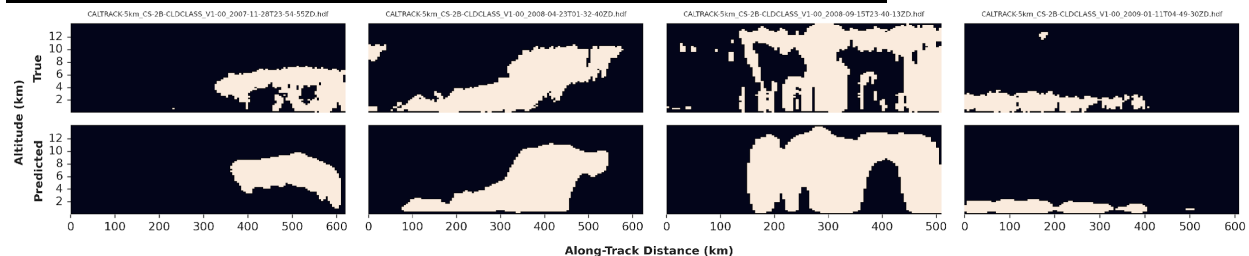


Image: Left: an animation of a volumetric cloud field extracted from a HARP2 granule with neural rendering, demonstrating the unsupervised approach to cloud reconstruction.

Bottom: a figure from (Foley et al. 2024), demonstrating results of a sparsely supervised approach on held-out data.



For the unsupervised, neural rendering approach to 3D cloud reconstruction, Mr. Foley greatly improved his code base to be robust and easily extensible. He made countless algorithmic improvements, brought the runtime per granule down from 24 hours to approximately 12 minutes, greatly improved the organization of the code, implemented validation using co-incident observations from a different satellite, and communicated his work through various presentations to audiences at NASA, UMBC, and elsewhere. Mr. Foley developed this software on his own, completed a New Technology Report, passed a lengthy series of reviews, and just signed an Intellectual Property Disclosure to transfer the new technology from MSU to NASA. The software should be publicly available and in the open source within the next few weeks. This is a novel and valuable approach that will help to improve the scientific community's understanding of clouds. He plans to submit a paper on the approach to a computer vision conference before the end of the year.

For the sparsely supervised approach, he made several strides. His paper "3-D Cloud Masking Across a Broad Swath using Multi-angle Polarimetry and Deep Learning" was published in Atmospheric Measurement Techniques. His related presentations have been well-received, and

his IRAD proposal for “3D Cloud Reconstruction in Multi-Angle Polarimetry with a Foundation Model” was funded. During this project, Mr. Foley has developed an approach for the adaptation of a pre-trained foundation model to multi-angle polarimetry using sparse supervision from a co-incident active sensor. He intends to submit a paper on this approach as part of the required deliverables for the IRAD. He and his team also submitted a step-1 proposal for a different, yet related IRAD proposal on the efficient fine-tuning of foundation models.

Beyond his core research focus, Mr. Foley has continued to serve as a SME on machine learning for other scientists in his lab and beyond. He has strengthened his connections with researchers throughout GSFC and at UMBC. He has also leveraged his software development skills to support various needs of his group, such as automating data acquisition during the PACE-PAX field campaign in 2024 or developing an automated approach to finding overlapping observations between PACE and the Earth Cloud, Aerosol, and Radiation Explorer (EarthCARE). His work on the latter led to his recent funding for “PACE and EarthCARE Synergy with MAAP.”

In last year’s annual report, Mr. Foley’s future plans included 1) further developing his work on neural rendering, 2) finishing his proposal to ROSES A.28 “Remote Sensing Theory”, 3) making improvements to his current neural rendering algorithm by achieving a speed-up in runtime, 4) better validating his results, 5) discussing his work at AGU in December 2024, 6) submitting a paper on this work to at least one computer vision conference, 7) adapting an existing foundation model to 3D cloud masking in multi-angle data, 8) continuing to aid others in his lab to understand and implement machine learning algorithms, and 9) helping with future events like the PACE Hackweek. Of these goals, he achieved all but goals 5 and 6. The ongoing delayed release of ROSES A.28 “Remote Sensing Theory,” affected certain work for which this would have provided funding. Since his funded IRAD proposal contributed a significant percentage of his annual funding, he shifted much of his time towards the foundation model project. He believes that the importance of those 2024-2025 contributions that were unplanned at the time of his previous report exceeds the importance of his as-yet uncompleted goals.

Mr. Foley will continue to seek new sources of funding for his work. The allocation of his time depends on the outcomes of his pending proposals. Final steps will be completed in the open-source release of his atmospheric neural rendering code, the code will be maintained, any valuable external contributions will be incorporated, and new features will be added as he improves the algorithm. He will submit a paper on the neural rendering approach to a computer vision conference. Identical details on his upcoming plans are listed in his Code 612 Task 181 report.

LORRAINE REMER

Sponsor Jeremy Werdell / Code 616 / Task 178

While Dr. Remer’s proposal was not selected for the PACE Science and Applications Team III, she was selected and led a group that had already submitted an algorithm to the Science Data Segment, which was in the process of becoming operational. Tasks were identified to get that algorithm over the finish line and NASA Headquarters agreed to fund those tasks. Funding went to Dr. Omar Torres (GSFC/614), who then oversaw the distribution of the “bridge funding”, including funding Dr. Remer through Task 178. With this funding, Dr. Remer and her team succeeded in delivering one more updated version of the algorithm that included bug fixes, cleaner documentation, and a whole new subroutine that produced aerosol layer height using

the Oxygen band methodology. The funding also enabled production of case study and monthly mean global images (provided here) for sanity checking and collocation matchups with AERONET for very preliminary evaluation and validation. This is the first NASA aerosol product that provides quantitative aerosol spectral single scattering albedo (SSA) (UV – Visible) with uncertainty of ± 0.04 , and the first operational derivation of quantitative aerosol optical depth (AOD) above clouds, the first operational aerosol layer height (ALH) from a passive sensor, and the first UV aerosol index (UVAI) at 1 km resolution. The group's success is being documented into what will be a journal submission, which will be converted to an Algorithm Theoretical Basis Document (ATBD).

J. VANDERLEI MARTINS, ANIN PUTHUKKUDY, BRENT MCBRIDE

Sponsor Jeremy Werdell / Code 616 / Task 178

Dr. Martins oversees the activities of the UMBC team supporting the HARP2 instrument in orbit, as well as the activities of the team regarding data processing and validation. During the past year, Dr. McBride supported the onboard operation of the HARP2 instrument as well as the monitoring of its performance since launch, by analyzing HARP2's solar and lunar calibrations, dark images, flat field, detector alignment, etc. Dr. Puthukkudy works on assessing the HARP2 instrument's performance in relation to the other two instruments on the PACE satellite.

Dr. McBride has collaborated with UMBC PhD student Rachel Smith, recently submitted a manuscript on cloud microphysical retrievals, and is working on another paper on on-orbit activities (solar and lunar calibration) plus vicarious trends from Earth view sites. In parallel, Dr. McBride has supported the development and pre-flight calibration of the AirHARP2 suite, a copy of HARP2 designed for integration on the NASA ER-2 research aircraft. In June - July 2024, Dr. McBride led the AirHARP2 calibration activities at NASA GSFC Radiometric Calibration Facility and GLAMR labs; he published this calibration work in Atmospheric Measurement Techniques (AMT), and recently submitted another paper to AMT that expands on that framework with HARP2 instrument data.

Dr. Puthukkudy is monitoring the PACE L1C data quality across 6 pseudo-invariant calibration sites (PICS) to assess HARP2 instrument performance relative to the other two instruments (OCI and SPEXone) onboard the PACE satellite. This monitoring conveys how HARP2's calibration is maintaining stability compared to the other two instruments. An interactive portal has been established for users to view intercomparisons of physical quantities measured by each instrument at the 6 PICS locations, enabling easy comparison (<https://pace-trend.esi.umbc.edu>).

Dr. Martins will continue to lead the effort on the operation and analysis of HARP2 on orbit. Dr. McBride will evaluate HARP2 calibration. Dr. McBride is currently affiliated with the UMBC Physics Department, which includes proposals for new special topics classes and stronger collaboration between the Earth and Space Institute and the Physics Department. Dr. Puthukkudy will apply spectral band adjustment factors to the HARP2 measurements to accommodate relative spectral response differences between instruments at different sites. Additionally, trending will be tracked over the instrument's lifetime, and if calibration corrections are needed based on this trending analysis, those corrections will be implemented in the next version of HARP2 L1 data.

J. VANDERLEI MARTINS

Sponsor Jeremy Werdell / Code 616 / Task 183

This task has supported the collection of airborne science measurements for the post-launch calibration and validation of retrievals from the PACE observatory, namely the PACE-PAX airborne campaign. The task includes preparation of the AirHARP2 aircraft payloads and their pre- and post-campaign calibrations, deployment, and data processing, as well as science analysis of the measurements. This task supported our team's participation in the PACE-PAX airborne campaign (<https://pace.oceansciences.org/campaigns.htm>) held September 2024, with the participation of the AirHARP-2 payload. The team will perform post-calibration activities and the production of level 1 data files.

This past year, Dr. Martins has led a team to pursue innovative science associated with the HARP2 multi-angle polarimeter delivered to NASA for the PACE mission. The overarching accomplishment since this task began in February 2023 has been to develop the hardware and software necessary to prove the calibration of this unique instrument, to implement this infrastructure and to apply it during the environmental testing of the PACE observatory with HARP2 fully integrated. HARP2's wide FOV optics presents a scientific challenge for characterization, and while there was a successful initial calibration campaign at Goddard in the Fall, that calibration was not done under space-relevant conditions. Transferring the laboratory calibration to space conditions for this type of instrument has never been done and is the focus of the research under this task. Success in this work will provide Earth science with high quality multi-angle polarimetric data from HARP2 and for generations of future Earth science missions.

Specific accomplishments to date include 1) completion and integration of the AirHARP2 payload in the NASA ER2 aircraft; 2) completion of extensive calibration exercises for AirHARP2; 3) completion of air worthiness review and integration of AirHARP2 to the ER2 aircraft; 4) participation in the PACE PAX aircraft campaign and the successful collection of ER2 data for one month in support of the PACE mission; and 5) processing the preliminary data for PACE PAX/AirHARP2 and submitted this for archival.

Looking ahead, future activities include the re-processing of PACE-PAX data sets based on post-calibration exercises as well as science evaluations of the cloud and aerosol data sets collected during PACE-PAX.

TESFA WORKU MESHESHA

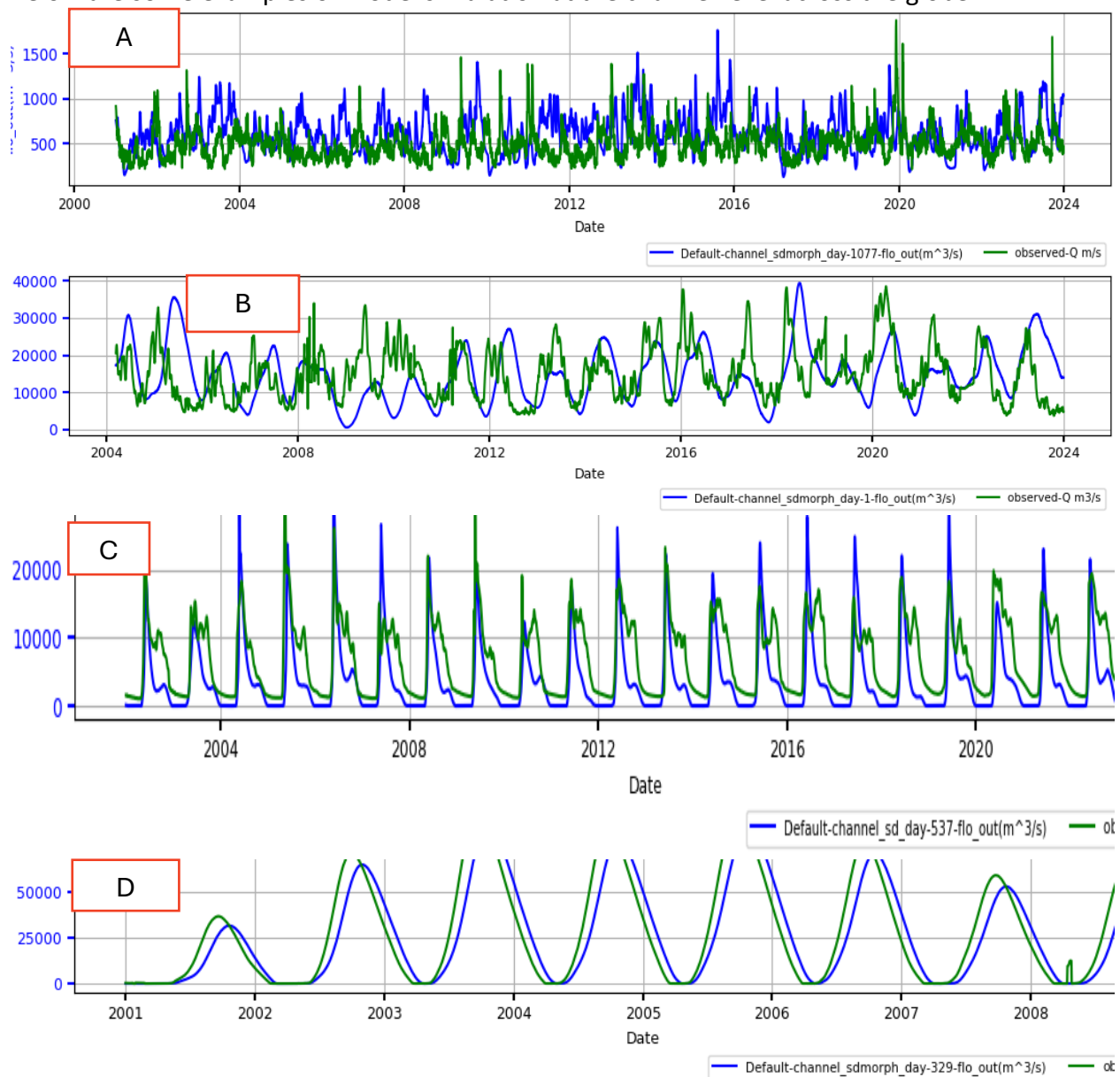
Sponsor Cecile S. Rousseaux / Code 616 / Task 192

Dr. Meshesha has made significant progress in estimating global-scale river discharge using QGIS and the SWATPlus hydrological model. He used 15s DEM resolution dataset from HydroSHEDS (<https://www.hydrosheds.org/products/hydrosheds>), which served as the primary input for this analysis. Given the computational intensity of the task, where a single project setup could take up to one month, the global discharge modeling work was strategically divided into 11 geographic zones to ensure efficiency and manageability. The zones completed include North America (USA), Africa, Alaska, Asia (Zone 1), Asia (Zone 2), Canada, Central America, Europe, Oceania, Russia, and South America.



Image: Global scale channel distribution

Below are some examples of model simulation at the channel level across the globe.



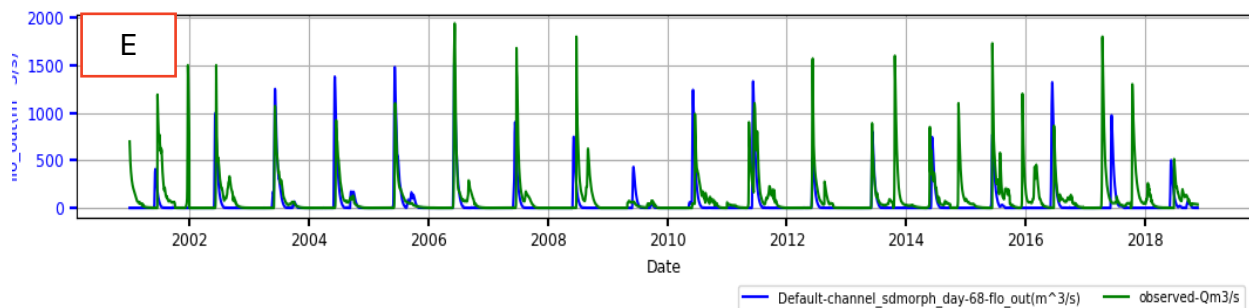


Image: Channel level model simulation output Oceania, Clutha_River_New Zealand (A), North America, Mississippi River at New Orleans (B), Yukon River (C), Europe, Kolyma_River (D), and Arctic (E).

Dividing the global discharge modeling into 11 zones brought several benefits. It enabled parallel and more efficient processing, improved the management of large data volumes, and supported more effective fine-scale modeling. This approach also made the global hydrological analysis more organized and scalable. However, the project also faced challenges. Software access delays slowed the timeline, and the processing proved to be memory-intensive on both local and virtual machines. Each zone demanded significant computation time, with about one month required per project, confirming the necessity of the zonal approach. Despite these obstacles, key outputs and progress were achieved. Global discharge estimates have been successfully calculated, exported in NetCDF format, and spatially matched with other models (carbon model), establishing a strong foundation for further hydrological and integrated modeling efforts.

In the coming months, the next phase of the project will focus on preparing observed discharge data from the Global Runoff Data Center (GRDC). This dataset will be used for model calibration and validation against the simulated outputs, strengthening the reliability of the global discharge estimates. With the hydrological discharge model already capable of simulating global discharge at the channel level, it is now ready to be coupled with the carbon model for integrated analysis. In addition to these upcoming tasks, results from this work are being shared with the broader scientific community.

KAMAL ARYAL

Sponsor Bryan Franz / Code 616 / Task 227

Dr. Aryal joined GESTAR II in August 2025 and will be working on aerosol and ocean color retrievals using multiangle polarimetric data from NASA's PACE mission. Dr. Aryal will validate the recently developed joint aerosol and ocean color retrieval algorithm, FastMAPOL/component (Fast Multi-Angular Polarimetric Ocean color/component), using polarimetric data from the PACE mission. The aerosol and ocean color optical properties retrieved from FastMAPOL/component using MAP data from UMBC's Hyper-Angular Rainbow Polarimeter (HARP2) and the SRON Spectropolarimeter for Planetary Exploration One (SPEXone) will be validated against the measurements from several AERONET-OC stations across the globe. In addition, Dr. Aryal will perform qualitative validation of other retrieval parameters such as volume fractions of aerosol components, ocean properties, wind speed, etc., across the globe. The retrieved aerosol and ocean color products from FastMAPOL/component will be compared against those from other algorithms as well as with Ocean Color Instrument (OCI) level 2 products. Dr. Aryal plans to attend the upcoming 2025 AGU Fall Meeting and publish a peer-reviewed journal article on the validation of FastMAPOL/component.

CODE 617: HYDROLOGICAL SCIENCES LABORATORY

JINZHENG PENG

Sponsor Jeffrey Piepmeier / Code 617 / Task 020

The SMAP (Soil Moisture Active/Passive) is one of four first-tier missions recommended by the U.S. National Research Council's Committee on Earth Science and Applications from Space, and the fully polarized L-band radiometer is one of the two spaceborne instruments to make global measurements of land surface soil moisture and freeze/thaw state. While measuring the input signal strength, unwanted emissions in the antenna sidelobe from the Sun, the Moon, the galaxy, the atmosphere, the ionosphere, and Earth are also received. The input signal strength needs to be calibrated by internal calibration sources, which also need to be calibrated (or validated) by external well-known targets, and the unwanted emissions need to be removed from the calibrated and Radio Frequency Interference (RFI)-free input signal.

Although the SMAP mission has been successfully operated in space in the past 10 years, it has encountered several anomalies (e.g. SAR failure, memory corruption, non-rotating antenna/ambient temperature cool down, miniature inertial measurement unit swap, etc.). These all have a potential impact to the radiometer's performance including calibration drift and geolocation (or antenna pointing) accuracy. In the past year, its overall performance of calibration drift and geolocation (or antenna pointing) accuracy has been re-evaluated. The results were presented in SMAP Engineering Review meeting 2025 and IGARSS 2025.

Dr. Peng also supports the operation of the SMAP mission by monitoring/reporting the SMAP radiometer status and the L1B_TB data quality weekly, and he also works with the Science Data System (SDS) and operation team to solve problems.

The PolSIR (Polarized Submillimeter Ice-cloud Radiometer) is a new NASA satellite mission. Its goal is to better understand the influence of ice clouds on the Earth's climate by studying ice clouds that form at high altitudes throughout tropical and sub-tropical regions. Two identical CubeSats with the radiometers (325 and 684 GHz frequency bands) onboard will provide crucial information about how ice clouds act in Earth's climate system. The launch of the two CubeSats is currently anticipated for 2027. The PolSIR radiometer is currently in the phase of I&T. Dr. Peng is working on the radiometer's calibration error budget. He has been comprehensively analyzing the radiometric performance of current/preliminary radiometer system design along with the unwanted impact from the environment factors (Sun, Galaxy, sources within the antenna's sidelobe, etc.). The analysis results of the radiometer calibration error budget are used to demonstrate the performance of the critical radiometer design against the requirements, and they will be used as guidance for the improvement of the subsystems design, pre-launch calibration activities and science algorithm.

The NASA HyMPI (Hyperspectral Microwave Photonic Instrument) project is developing a novel microwave sounder for Earth observation, aiming to provide high-resolution, hyperspectral data of the Earth's atmosphere. Utilizing photonic integrated technology, this instrument will enable more precise measurements of the atmosphere's state, including temperature, water

vapor, and other key variables. HyMPI is expected to improve weather forecasting and climate modeling by providing better data on the boundary layer and the Earth's radiation budget.

The microwave sounder is calibrated using an ambient target and LN2 as the two external calibration targets. A standing wave has been observed during the calibration. Dr. Peng has analyzed the standing wave and characterized the magnitude of the standing wave with ambient calibration look and the reflectivity of the ambient calibration target.

Dr. Peng will continue working on the SMAP radiometer project by supporting operation and SDS activities as well as submitting a manuscript for journal publication. Work will continue on the PolSIR radiometer project by updating the calibration error budget with lab measurements and providing support for I&T and calibration activities.

PRISCILLA MOHAMMED-TANO

Sponsor Rajat Bindlish / Code 617 / Task 020

NASA's Soil Moisture Active and Passive (SMAP) Mission is the first of a series of Earth Science Decadal Survey missions, which was launched January 31, 2015. The mission is providing global measurements of soil moisture and freeze/thaw state using L-band radiometry.

As part of the continued mission work, Dr. Mohammed was responsible for monitoring SMAP radiometer data by processing and observing instrument data from the L1A and L1B_TB products. Automated reports were generated to ensure normal instrument performance. Radio frequency interference (RFI) monitoring tools were run weekly to monitor RFI and algorithm performance.

Although SMAP operates within the protected Earth Exploration Satellite Service passive frequency allocation of 1400-1427 MHz, unauthorized in-band transmitters and out-of-band emissions have been causing interference to the SMAP microwave data. To reduce the impact, sources are identified and reported to the necessary administrations for enforcement of shutting down the sources. Reports were created for a different country each month and submitted to NASA personnel, who then submitted to necessary authorities. Follow-up responses were also provided to the spectrum office relating to any feedback received from administrations. Dr. Mohammed worked closely with OfCom from the United Kingdom, providing weekly data updates to aid identification of interference sources.

Dr. Mohammed serves as the point of contact and is the expert for RFI-related activities for the SMAP mission. Over the past year, activities included liaising with the Soil Moisture and Ocean Salinity (SMOS) mission team for coordination of reporting activities by both missions, and providing updated SMAP data to the spectrum office to be presented at various meetings such as the International Space Radio Monitoring Meeting.

Dr. Mohammed was also part of a team for the Instrument Incubator Program (IIP) project "Hyperspectral Microwave Photonic Instrument (HyMPI)" to advance toward the first in-space demonstration of an integrated microwave photonic system for future microwave radiometers. This past year, Dr. Mohammed worked on system modeling of the instrument, which assisted in instrument requirements and radiometer calibration. She developed radiometric performance tests and completed end to end calibration and system verification data analysis for the instrument in support of the completion of the IIP. Data analysis was conducted for the Conical

Scanning Millimeter-wave Imaging Radiometer Hyperspectral (CoSMIR-H). Since these projects ended during the reporting period, final report sections were also completed.

Dr. Mohammed will continue to monitor the SMAP radiometer and provide monthly RFI reports for SMAP; additionally, she will complete a journal article on SMAP RFI detection for the past 10 years. Dr. Mohammed is also supporting a rooftop test of the Hyperspectral Microwave Photonic Instrument (HyMPI) working on calibration of the observed data.



Photo: HyMPI collecting data on the rooftop of B33 to demonstrate capability. Priscilla Mohammed (first from the right) is working on calibrating data from this ground-based microwave/photonic spectrometer. Project PI: Antonia Gambacorta (2nd from the right). Photo: Victor Torres (lead engineer for HyMPI).

ROBERT EMBERSON

Sponsor Dalia Kirschbaum / Code 617 / Task 030

Dr. Emberson continues to engage with a wide range of different activities, research and programming; because of greater programmatic needs and reduced availability of grant funding at NASA during the past year, he has taken on a larger proportion of funding for his programmatic work. For research, he has led two projects as PI. The first, a NASA New Investigator Program project assessing soil erosion using satellite data, has closed out this year. The study provided highly novel research findings to analyze where and when agricultural soil is degrading around the world. From June 2024-Feb 2025, he brought on a UMBC student, Pranali Talla, as a student assistant to the project; this project was extremely successful and, for the first time, allowed the development of a global model of soil erosion impacts on hydrological systems. Dr. Emberson and Ms. Talla attended AGU in December 2024 to present the findings of the work, and a final paper capturing the entirety of the project is now in final draft form and expected to be submitted in September. This project has allowed for mentoring Ms. Talla, and Dr. Emberson has provided reference letters and support to her to help apply for future opportunities.

The second research project Dr. Emberson leads uses NASA's GEOS Seasonal to Subseasonal (S2S) forecast data to assess potential for extreme rainfall months in advance and the potential

connections to hydrological hazards. The S2S data used has been updated to the newest variation (version 3), and the project team is the first to test whether this brand-new data source can provide useful forecasts of extreme rainfall for hazard assessment. The Co-I team at the University of Wisconsin are already testing highly novel methods for this data to be used. This project was affected by personnel changes, with Co-Is unable to take part due to personal reasons plus the reprioritization of projects at GSFC to support new administration priorities. Nevertheless, an increased focus on the effects of Hurricane Helene and the predictability of extreme rainfall associated with this event has galvanized the team, and research publications are expected to be submitted this fall. A no-cost extension (NCE) was requested and granted in order for initially planned tasks to be completed.

For the remainder of his time, Dr. Emberson serves as the Associate Program Manager for NASA's Earth Action Disasters program. This is a multi-faceted role that involves financial and project tracking of funded projects, presentation and communication on behalf of the program. This year, Dr Emberson was made the lead for the Science to Action Portfolio of the program, which requires oversight and coordination of over 20 funded research projects. A significant part of this activity has involved helping coordinate the activities of these projects in alignment with the new administration's priorities along with ensuring effective implementation of state and local preparedness activities at NASA. Dr. Emberson helped organize a ROSES panel, providing extensive administrative support, and helped plan and execute a highly successful Science Team Meeting in June 2025 in Boston, MA. An additional primary activity was the production of a three-part ARSET training on landslides as a lead instructor, which was attended by over 1,000 participants during each of the three parts.

Dr. Emberson anticipates submitting two research publications before the end of September, one for each of his funded research projects. No ROSES solicitations in the current ROSES25 cycle are aligned with his primary research expertise, so he is looking for alternative options to secure future research funding. Dr. Emberson intends to begin planning and executing a new Disasters Program strategic engagement and outreach activity, taking place across a full year and including a large range of multi-format outreach material related to the funded research projects.

ELIJAH ORLAND

Sponsor Douglas Morton / Code 617 / Task 031

Mr. Orland has been serving the dual role within the NASA Wildfire Tracking Lab as a researcher investigating the links between active fire behavior and burn severity, and as an active developer of the Fire Event Data Suite. His research accomplishments include revising and resubmitting his publication "Near Real-Time Indicators of Burn Severity in the Western U.S. from Active Fire Tracking" in *Fire Ecology* as well as serving as co-author on the published paper "An observation-driven framework for modeling post-fire hydrologic response: Evaluation for two central California case studies" in *Water Resources Research*. He also is a co-author on another four papers, which are currently in review, and is preparing his next first-author manuscript exploring relationships between vegetation recovery and flood magnitude in the post-fire environment. He was featured in a total of 10 American Geophysical Union abstracts, including his invited talk titled "*The Influence of Fire Behavior on Burn Severity and Post-Fire Recovery.*"

Regarding software development, his contributions to the Fire Event Data Suite (FEDS) algorithm led to its inclusion as part of the NASA Earth Information Center exhibit at both NASA Headquarters and the Smithsonian National Museum of Natural History. Additionally, he worked with the NASA Visualization, Exploration, and Data Analysis (VEDA) platform team on their development of the Fire Events Explorer dashboard – a tool which visualizes FEDS algorithm outputs, allowing users to generate videos of fire spread and even download fire progression data (<https://earthdata.nasa.gov/dashboard/>).

Mr. Orland is heading into the next year with the goal to finish his manuscript (in progress), as well as expand his efforts on the FEDS algorithm to include all global forest fire tracking from 2012 – Present. He is additionally tasked with his next project: to generate a fire persistence product using VIIRS L1 active fire detection data, where he plans on delivering a preliminary version of this product approximately one year from now.

THOMAS STANLEY

Sponsor Dalia Kirschbaum / Code 617 / Task 032

Mr. Stanley revised the global landslide nowcast, which included ingesting SMAP L4 version 8 as well as managing the impacts of NASA's transition to the Earthdata cloud. He also assessed the effects on the nowcast of the upgrade to IMERG version 7. To enlarge the pool of potential responders during landslide disasters, he led a training on landslide modeling and satellite precipitation held at the USGS in Golden, Colorado. Due to the anticipated termination of the NCCS GIS portal, Mr. Stanley planned the transition to new infrastructure and processes for NASA landslide data. As a first step, he used Claude 3.5, a large language model, to develop a new version of the Landslide Reporter web application (<https://science.nasa.gov/citizen-science/landslide-reporter/>).

Mr. Stanley will investigate the relative strength of weather forecasts in predicting landslides in the eastern USA.

NISHAN KUMAR BISWAS

Sponsor Sujay V. Kumar / Code 617 / Task 033

Dr. Biswas has been working on the NASA Water View project. He has been co-leading hydrologic fluxes and streamflow estimation using hyper-resolution land-surface modeling and data assimilation of satellite information for the North American Land Data Assimilation System (NLDAS3) and HydroGlobe. The third phase of NLDAS-3 is currently in development, with the expanded spatial coverage to all of North America and Central America, improving spatial resolution to 1-km, reducing latency, upgrading land-surface modeling, and realizing the original vision of assimilating remote sensing data for near real-time insights. HydroGlobe represents an advanced land surface reanalysis, integrating many remote sensing datasets within the Noah-MP land surface model using the NASA LIS software framework. He also has been working on quantifying the impact of drought on reservoir storage across the world to identify the hotspots of human management. He led the Reservoirs chapter of the State of Global Water Resources 2023 and 2024 of the World Meteorological Organization.

Dr. Biswas envisions finishing the NLDAS3 HyMAP simulation. He also plans to complete a manuscript on the findings of HydroGlobe HyMAP simulation. In addition, he has two manuscripts (focused on reservoir operation and landslide forecasting) that need to be finalized

and submitted by the end of November. Dr. Biswas will start working on the Landslide mapping project funded by Pacific Disaster Center (PDC) in October 2025.

FADJI ZAOUNA MAINA

Sponsor Sujay Kumar / Code 617 / Task 057

Dr. Maina is advancing the development of the fine-scale North American Land Data Assimilation System phase 3 (NLDAS-3, a flagship project of NASA's Earth-Action program), a high-resolution precipitation and surface meteorology dataset designed for both retrospective and operational applications. This work leverages high-quality gauges, satellite, and model products, combined through advanced data assimilation techniques. She also leads the integration of the hydrologic model ParFlow into the NASA Land Information System (LIS) to enhance groundwater flow representation, thereby improving the interpretation of NASA's GRACE and GRACE-FO satellite data.

In parallel, Dr. Maina has investigated hydrological processes across South America, with a particular focus on the Andes. Her efforts have produced a new gridded precipitation dataset for the continent and deepened the understanding of interactions between surface meteorology and vegetation in the region.

Over the past year, Dr. Maina has published six first-author peer-reviewed papers, with a seventh currently under review, and has contributed to four additional peer-reviewed publications. Dr. Maina is finalizing the NLDAS-3 paper, which will be submitted to the *Journal of Hydrometeorology*.

Dr. Maina is completing a multivariate data assimilation study aimed at improving hydrological variable estimates over South America. Building on her modeling work, she will continue advancing the coupling between ParFlow and NASA LIS by developing new data assimilation tools. She has been invited to submit abstracts to both AGU and AMS, and in October she will deliver an invited talk at Johns Hopkins University in Baltimore, Maryland.

PUKAR AMATYA

Sponsor Dalia Kirschbaum / Code 617 / Task 063

Dr. Amatya is a Co-I on the NASA grant aimed at developing a landslide forecasting and mapping system for the eastern seaboard. For the first year of the project, Dr. Amatya transferred the SAR-density heatmap system developed in Google Earth Engine to Python. This enables processing over large areas without computing restrictions.

Dr. Amatya is a Co-I on the 3rd iteration of the High Mountain Asia (HMA) grant where the goal is to scale the landslide mapping and forecasting system for Nepal. Dr. Amatya's task was to develop a nationwide landslide mapping system using deep learning. He completed the development of the mapping system and delivered it to the end user. Tests are ongoing currently to produce annual landslide inventories. Dr. Amatya also travelled to Nepal to take part in a workshop, showcasing the mapping system and engaging stakeholders.

Dr. Amatya also is a member of NASA's application team looking at disaster debris detection using AI. He is leading the change detection task using very-high resolution optical imagery.

In addition to continuing research activities for the projects mentioned above, Dr Amatya will be starting work on two recently funded proposals. He is a PI on a project funded by Commercial Satellite Data Earth Science Research and Applications (CESRA) looking to develop a change detection-based landslide mapping system utilizing deep learning. Also, he is a Co-I on an Earth Surface and Interior (ESI) funded project looking at cascading hazard modeling in Turkey.

CHENG-HSUAN LYU

Sponsor Ed Kim / Code 617 / Task 073

Dr. Lyu prepared, coordinated, and completed putting together the Joint Polar Satellite System-2 (JPSS-2) Government version of the Calibration Data Book (J2 GCDB). This was created for public release and was still under review of the completed J2 GCDB D3 version, which is saved under the JPSS Management Information System (MIS), Low Earth Orbit (LEO) Division. This site provides access to CM-controlled JPSS Mission documents. This J2 GCDB document baselines the NOAA-21/JPSS-2 ATMS GCBD Version for public release. The review end date was August 12, 2025, which may be extended. Dr. Lyu supported the Sounder for Microwave-Based Applications (SMBA) poster with the NASA ATMS team. He also supported QS PLT (Post-Launch Test) plan discussions with colleagues.

For future plans, Dr. Lyu will continue supporting S-NPP, JPSS-1, and JPSS-2 on-orbit data analysis and monitoring the sensor performance from NEON QuickSounder, which is scheduled to launch in 2026. He will be involved with JPSS-4 Satellite level Thermal Vacuum (TVAC) integration and tests. He also will work in collaboration with MIT-LL, NOAA, and NG teams for the reviews and the planning of future QuickSounder and JPSS-3 ATMS SN306 pre-launch and post-launch calibration and validation activities. Work will continue with ATMS science team members, NASA colleagues, MIT-LL, NOAA, and UMD, on the final review of a government version of J2 Calibration Data Book (J2 GCDB). He also will support Sounder for Microwave-Based Applications (SMBA) procurement and technical analysis of hyperspectral data modelling and analysis.

JESSICA SUTTON

Sponsor Timothy Lahmers / Code 617 / Task 160

Over the past year, Dr. Sutton has been working on several projects. She was the second author of two accepted publications. One was a data paper focused on highlighting landslide inventories with a use-case example using GPM IMERG precipitation. The second was a comparative analysis using GPM IMERG V06 and V07 in areas of very high landslide susceptibility. She is awaiting reviews on a third paper focused on precipitation analysis in Ghana that resulted from the 2024 GPM mentorship program. Dr. Sutton was awarded a 2025 CIDER award from UMBC for a project focused on using ground-based radar for virga identification. She also wrote a research proposal for the 2024 PMM/CCST solicitation and a Step 1 proposal for the 2024 SERVIR solicitation. She is currently finishing up a paper focused on analyzing precipitation from different forecasts for the eastern United States during Hurricane Helene, which is supported by an internal grant from NASA. Dr. Sutton presented research at the 2024 PMM Science Team Meeting, the 2024 AGU Fall Meeting, an internal 617 lab meeting, and the Goddard Disasters monthly meeting.

Dr. Sutton will complete the precipitation forecast paper for Hurricane Helene and submit it for publication. She also will continue to analyze ground-based radar for virga identification. Dr. Sutton will work on the precipitation analysis for the sub-seasonal to seasonal forecast project. All these projects will be presented by Dr. Sutton at the 2026 AMS annual meeting.

CODE 618: BIOSPHERIC SCIENCES LABORATORY

CELIO RESENDE DE SOUSA

Sponsor Lola Fatoyinbo / Code 618 / Task 060

Dr. De Sousa has been assisting in the development of pathways for blue carbon projects in West Africa to access blue carbon finance and to promote regional cooperation for climate change mitigation and adaptation through the restoration, conservation, and sustainable use of mangroves at local, regional, and national scales. To accomplish this, he is developing a mapping and monitoring approach using remote sensing to evaluate the potential to put together Blue Carbon projects on the marine-protected areas in West Africa (from Senegal to Democratic Republic of Congo) for key stakeholders in Africa.

Dr. De Sousa finalized a comprehensive land cover and ecosystem classification for Gashaka Gumti National Park in Nigeria and the adjacent Tchabal Mbabo National Park in Cameroon. The classification effort produced a high-resolution (10-meter) thematic map that integrates spectral indices from Sentinel-2, elevation-based ecological zonation, long-term vegetation dynamics (NDVI median, standard deviation, and anomaly from 2015–2025), and in-situ forest inventory data. A binary classification strategy was employed, mapping each of the 13 land cover classes individually using a Random Forest classifier in Google Earth Engine, followed by probability-based selection to retain only high-confidence areas. To facilitate access and end-user engagement, the map and classification results were operationalized into a web-based application ([G-GAP \(Gashaka Gumti National Park Atlas Platform\)](#)). This app allows our partners in the park to interact with the data and visualize the mapped ecosystem types. A detailed classification report was delivered alongside the web application to Dr. De Sousa's project partners.

Dr. De Sousa has developed a detailed roadmap for national-scale land cover mapping and degradation assessment in Nigeria, aligned with both the UNCCD Land Degradation Neutrality (LDN) framework and the Restoration Opportunities Assessment Methodology (ROAM). The methodology uses a combination of Sentinel-2 and Landsat imagery to produce land cover maps for 2015, 2020, and 2025, along with NDVI-based productivity trends spanning 2000–2025. These layers will feed into a two-indicator degradation assessment, flagging areas of potential restoration or degradation. The resulting products, which will be delivered as GeoTIFFs, GEE assets, and an interactive web app, are designed to support AFR100 goals (African Forest Landscape Restoration Initiative) and guide future ROAM implementation in the country.

For the ANI Foundation, Dr. De Sousa is advancing efforts to estimate cattle presence and density within Gashaka Gumti National Park using very high-resolution satellite imagery. Following discussions with ANI and the provision of spatial bounding boxes for monitoring areas, he conducted a detailed search of the MAXAR archive for recent imagery with <50 cm resolution and minimal cloud cover. The archive showed limited usable coverage, especially for the March–May 2024 window. As a result, Dr. De Sousa initiated a tasking request through

NASA's Commercial Satellite Data Acquisition (CSDA) program; this request was approved, and the first batches of imagery have already been downloaded. These data will be used to map visible cattle and associated land-use patterns, helping ANI monitor human-induced pressures across the park. For the BlueSeeds organization, Dr. De Sousa developed a mangrove stratification layer to support fieldwork planning and biomass sampling in Guinea-Bissau. The stratification integrates two complementary approaches: 1) a threshold-based method using a 5-meter canopy height cutoff, consistent with national definitions for forest in Guinea-Bissau, and 2) a Random Forest classification trained on spectral and structural indicators of vegetation density. This dual-layered stratification allowed BlueSeeds to target areas of tall mangroves more efficiently and ensure coverage across zones with varying structure and degradation levels. This layer is also being ingested into the existing app for Guinea-Bissau.

Over the next quarter, Dr. De Sousa will focus on finalizing and delivering key geospatial products and advancing field-support tools for multiple partners. In Nigeria, Dr. De Sousa will complete the production of the 2025 national-scale land cover map, finalize the NDVI productivity trend analysis, and integrate these layers into the two-indicator degradation assessment. The resulting datasets will be formatted as GeoTIFFs, GEE assets, and incorporated into an interactive web application to support AFR100 objectives and guide ROAM-based restoration planning. For ANI, Dr. De Sousa will process newly acquired very high-resolution satellite imagery from the NASA CSDA program to detect visible cattle and map associated land-use patterns in Gashaka Gumti National Park. This analysis will feed into a geospatial monitoring framework for quantifying human-induced pressures across the park's ecosystems.

MINJEONG JO

Sponsor Batuhan Osmanoglu / Code 618 / Task 082

Dr. Jo has been conducting evaluations of commercial small-satellite data through NASA's Commercial Satellite Data Acquisition (CSDA) program. The CSDA program, initiated by NASA's Earth Science Division (ESD), was established to identify, assess, and acquire commercial satellite data for Earth science applications. The rapid growth of the satellite industry, in particular Earth observation, has been marked by the expansion of commercial constellations, advances in sensor technologies, higher spatial resolution, and shorter revisit intervals. These developments make commercial data a valuable complement to government-operated satellite missions. Within this framework, Dr. Jo's research has centered on two primary objectives: 1) coastline mapping and inundation detection using synthetic aperture radar (SAR) amplitude imagery, and 2) quality assessment of commercial SAR data, with a particular focus on Umbra imagery.

For the first research objective, Dr. Jo served as a Co-Investigator on the project "Tracking Sea Level Rise in American Samoa with Ultra-High-Resolution SAR Imagery: An Umbra Feasibility Study." This study aimed to characterize local manifestations of sea level rise and flooding in American Samoa using high-resolution Umbra SAR data. Inundated areas and coastline changes were mapped using a standard thresholding-based water classification algorithm applied to SAR backscatter intensity. Prior to classification, an Enhanced Lee filter was applied to reduce speckle noise while preserving key image features, such as edges and boundaries. An adaptive threshold was then determined for each image to classify pixels as either water or non-water, producing a binary water mask. While the project team found that Umbra data were not consistently reliable for flood detection due to geolocation issues, they identified a valuable

secondary application: the ultra-high resolution of Umbra imagery enabled detailed coastline mapping, particularly for bright, sandy beaches. For the second research objective, Dr. Jo is evaluating the quality of data provided by the Umbra X-band SAR constellation, with a focus on both radiometric and geometric performance. The assessment is primarily being conducted using Sensor Independent Complex Data (SICD) Level 1 products.

Dr. Jo expects to complete the evaluation of Umbra X-band SAR constellation data by the end of September 2025, after which the quality assessment report will be finalized and published, following an internal review process. Dr. Jo will continue working on the CSDA project to evaluate commercial SAR data, focusing on the InSAR capability assessment, geometric, and radiometric assessment.

THOMAS ECK

Sponsor Pawan Gupta / Code 618 / Task 085

Mr. Eck performed sun channel calibrations utilized for measuring aerosol optical depth (AOD) for the NASA/GSFC portion of the AERONET global network. Additionally, he participated in analysis of various techniques for the calibration of sky radiance measurements, including the direct sky radiance transfer technique for estimating solid view angle and comparing to laboratory integrating sphere measurements. He also assisted in the analysis of AERONET AOD data made from direct measurements of the moon, including characteristics of day versus nighttime AOD data due to calibration and cloud screening. He continued conducting research into airborne mineral particulate optical properties from multi-year AERONET monitoring at many globally distributed dust sites. Spectral absorption properties, size distributions and spectral AOD are being analyzed.

Mr. Eck plans to attend the AGU fall meeting in New Orleans, LA from December 15-19, 2025 to give a presentation on optical properties of airborne dust. Additionally, he will continue writing a journal paper on his dust properties research. He will continue assisting in the analysis of Lunar AOD measurements from AERONET and in assessing sky scan retrievals of aerosol optical properties that include spectral directional radiances and AOD for the additional wavelengths of 340, 380 and 1640 nm.

ANTHONY CAMPBELL

Sponsor Temilola Fatoyinbo / Code 618 / Task 109

Dr. Campbell has been working to understand and communicate coastal change, with respect to how it impacts biodiversity, resilience, carbon, and humans living in the coastal zone. He has worked as part of the Coastal Observatory, a cross-center partnership, to update global maps of salt marsh change and incorporate these into VEDA visualizations. He has led the BioREACH project, one of a dozen BioSCape field campaign projects. In that role, he has presented four related talks, and the project team has submitted three manuscripts for publication. This project has entered a fourth no-cost-extension year. Dr. Campbell has contributed to a coastal resilience grant, examining the impact of bathymetry on flood modeling in Central America. In collaboration with Conservation International, he has led mapping of Cambodia's seagrass beds with remote sensing, increasing the mapped seagrass extent in the country by nearly tenfold. He has also served as a scientific advisor on a seagrass mapping project led by The Nature Conservancy and an ESA blue carbon project.

Dr. Campbell will be attending the International Blue Carbon Scientific Working Group to share results on seagrass mapping in September. As PI, he will submit an A.7 proposal in October.

PETYA CAMPBELL

Sponsor Christopher R. Neigh / Code 618 / Task 122

Dr. Campbell's task encompasses work on five projects: South Central and Eastern European Regional Information Network (SCERIN), Science and Technology Education for Land/Life Assessment (STELLA) low-cost, DIY handheld instruments, the Surface Biology and Geology (SBG) team, and the Satellite Needs Working Group (SNWG) plus Reflectance Evaluation for Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) satellite.

Over the past decade, Dr. Campbell has been coordinating the work of the "GOFC-GOLD, South Central and Eastern European Regional Information Network (SCERIN)" as the USA Coordinator, working closely with the SCERIN Coordinators in the EU. She co-organized and co-led the hybrid SCERIN Workshop, which was held September 9-11, 2024 and was attended by numerous members from 15+ countries. The next SCERIN workshop will be held jointly with MedRIN in Burgas, Bulgaria, in Spring 2026, in coordination with a Trans-Atlantic training (TAT) for students and young professionals.

In 2025, Dr. Campbell contributed to the scientific and outreach use of the STELLA instruments and data, and for advising the development of the instrument and data processing tools. She participated in field measurement efforts using STELLA in both Maryland and Kansas.

For her work with SBG, Dr. Campbell has contributed continuously for the advancement of hyperspectral remote sensing at GSFC and worldwide. At GSFC, she is contributing scientific support for the advancement of the NASA SBG mission study as a member of the GSFC Team and Algorithm WG Member. Over several years, Dr. Campbell has installed automated field spectrometers at multiple flux sites (e.g., tundra, prairie, agricultural, and forested ecosystems) to measure reflectance and solar-induced fluorescence and to observe the changes in the spectral responses with vegetation function. During 2024-2025, she participated in the collection of field measurements and seasonal spectral time series at Konza, KS; OPE3, MD, and SERC, MD. She worked together with Dr. Huemmrich to assemble and analyze the collected time series of data.



Photo: Petya Campbell installing a MoniPAM in a cornfield in the Beltsville Agricultural Research Center.



Photo: Petya Campbell in the field installing a FloX on a flux tower at the Konza Prairie in Manhattan, KS.

For her work with SCERIN, upcoming plans for Dr. Campbell include meeting with the Bulgarian hosts and the GOFC-GOLD, MedRIN and TAT leads and coordinators to discuss the dates and activities to conduct in 2025-2026 to prepare for the joint SCERIN and MedRIN Workshop. Regarding STELLA, Dr. Campbell will meet with the STELLA team to finalize the collections of measurements, start working on a manuscript describing the findings, discuss ‘field protocols’ for data collection and processing, and plan the efforts and developments for 2025 -2026. Dr. Campbell will continue to work with the NASA SBG team and will analyze the collections from 2024-2025 for the deciduous forest at SERC, MD, OPE3 cornfield in Greenbelt, MD, and tall grassland prairie at Konza, KS. Currently, Dr. Campbell is preparing a research paper, summarizing the results from the analysis of the time series for tundra and boreal forest, which will be ready to be published in 2025. She is using the time series to develop prototype products for the forthcoming ESA/FLEX and NASA/SBG satellite missions and will present the findings at AGU2025.

In 2024 and 2025, Dr. Campbell participated in the Satellite Needs Working Group (SNWG) assessment as a subject matter expert (SME) in the Land Cover/Land Use team, conducting interviews and assessments for seven SNWG tasks, in the evaluation of the needs and the discussions of new solutions and what went well and what should be changed in preparation for the 2026 assessment. She plans to contribute to the lessons learned survey to help identify common issues.

Regarding the NASA/PACE Reflectance Evaluation, Dr. Campbell, who has extensive experience with imaging spectrometer data, has completed the processing and analysis of the PACE imagery and Fluorescence box (FloX) time series collected during the spring and summer over the tallgrass prairie in Konza, KS. Looking ahead, she will work with Dr. Huemmrich to enrich the

collection to augment the PACE and FLoX collections with additional data from 2025, and with corresponding flux observations.

ARIF RUSTEM ALBAYRAK

Sponsor Batuhan Osmanoglu / Code 618 / Task 133

Mr. Albayrak, an Associate Research Engineer from UMBC with Code 618, applies machine learning and data fusion techniques to Earth observation for various projects, including disaster response. He serves as Co-Chair of the ITU/UN “AI for Natural Disaster Management” Data Working Group and contributes to NASA Earth Science Disasters Program. This year, Mr. Albayrak advanced several projects, including work on the *HydroSAR Next* initiative with the Alaska Data center, which develops new approaches for SAR-based flood monitoring and prediction, along with work as Co-Investigator on AK FirE-SAFE: Alaska Fire Event Situational Awareness From Earth Observations, where he is implementing segmentation and prediction algorithms for wildfire monitoring in Alaska. He is supporting the AIST proposal Deep View, which applies deep learning methods to Chesapeake Bay water quality. In addition, he continues to mentor NASA interns on projects involving machine learning infrastructure for disaster response, fostering the next generation of researchers in Earth science and AI.

In the near term, Mr. Albayrak’s primary goal is to complete his first author manuscript, which is currently under review with *IEEE Geoscience and Remote Sensing Magazine*, following a successful white paper evaluation. As a next step, he plans to collaborate with Code 618 colleagues to integrate AI/ML algorithms into drone-based projects, with the aim of advancing edge-sensor capabilities and combining these approaches with remote sensing data for improved disaster monitoring.

K. FRED HUEMMRICH

Sponsor Jon Kenneth Ranson / Code 618 / Task 134

Dr. Huemmrich is a member of the Science and Applications Team (SAT) for NASA’s Plankton, Aerosol, Cloud, and ocean Ecosystem (PACE) mission. Although the primary objectives for PACE are directed toward the study of atmospheric and oceanic processes, by providing frequent global moderate-resolution hyperspectral observations, PACE can produce a new generation of remotely sensed products addressing key science questions on terrestrial ecosystem productivity, function, and biodiversity. Dr. Huemmrich represents the remote sensing land community on the SAT and is working to define potential terrestrial products from PACE. Following the launch of PACE in February 2024, Dr. Huemmrich has been working with the PACE data to examine global and seasonal patterns of foliar pigment indices, now available for the first time. He helped to establish the PACE Land Users Group (PLUG) to encourage community use of PACE data in terrestrial studies.

Dr. Huemmrich will work on studies on the use of PACE spectral reflectance data to describe forest biodiversity and seasonal patterns of foliar pigments. He will continue to advise and support evaluation of PACE terrestrial data products and participate in the PACE Land Users Group.

GIUSEPPE ZIBORDI

Sponsor Pawan Gupta / Code 618 / Task 151

Dr. Zibordi contributed to the implementation of a provisional Version-4 of the AERONET-OC database. This provisional Version-4 is expected to best support the creation of near real-time high-quality matchups for the validation of satellite ocean color data products. The provisional data benefit of the application of advanced fully automated quality control procedures implemented the following metrology principles: novel spectrally dependent sea surface reflectance factors determined through Monte Carlo simulations to accurately account for sun-glint and reflected skylight contributions; corrections for bidirectional effects applicable to any water type; ranking of each radiometric data product in view of supporting the creation of matchups with quality suitable for diverse applications. Additionally, Dr. Zibordi contributed to the completion of an absolute radiometric calibration facility for marine optical instruments at the Ocean Ecology Laboratory (NASA GSFC Code 616).

During the coming months, Dr. Zibordi will continue to further assess the provisional Version-4 AERONET-OC data and to publish the related methodologies in a peer-reviewed paper.

K. FRED HUENNRICH

Sponsor James Mackinon and David Harding / Code 618 / Task 158

The Concurrent Artificially-intelligent Spectrometry and Adaptive Lidar System (CASALS) project is combining lidar descriptions of topography and vegetation structure with visible to shortwave-infrared spectral imaging of foliar biochemistry to improve descriptions of forest function, productivity, and stress responses. Machine learning (ML) approaches are being applied to merge these diverse data types and evaluate the significance of different inputs. For the development of datasets for training and testing the ML approaches, Dr. Huemmrich has worked with eddy covariance flux tower observations, advised on the use of spectral vegetation indices, and helped to choose the array of input variables. He also aided in the interpretation of the modeling results.

Supporting this effort, Dr. Huemmrich has been involved in ongoing discussions of approaches for linking terrestrial vegetation three-dimensional structure with physiological function. The structure of canopies affects the changing light environment in vegetation as the sun angle changes throughout the day, so an analysis of diurnal observations of changes in productivity and foliar pigment concentrations is useful in describing interactions of canopy structure and plant physiological responses. Dr. Huemmrich has examined diurnal and seasonal change in spectral vegetation indices, canopy light environment, and productivity for corn and soybean crops at different times in the growing season.

As funding becomes available, Dr. Huemmrich will continue to advise, discuss, and analyze the research findings from this task in the coming months.

AMENI MKAOUAR

Sponsor Christopher S. Neigh / Code 618 / Task 166

Dr. Mkaouar has been advancing methods for improving digital surface models (DSMs) by fusing stereo-photogrammetry and spaceborne LiDAR data, leveraging physics-based simulations to

overcome challenges with real-world datasets. Using the DART and PVLAD models, Dr. Mkaouar developed ASP-ready stereo and LiDAR datasets in collaboration with the DART team and Dr. Tiangang Yin's team, enabling advanced stereo–LiDAR fusion experiments. Her work also focused on improving GEDI geolocation accuracy through waveform-matching and 3D radiative transfer modeling. These efforts contributed directly to algorithm development for the upcoming Surface Topography and Vegetation (STV) mission.

Her research output includes a 2025 peer-reviewed article published in *Science of Remote Sensing*, and an IGARSS 2025 conference paper. Dr. Mkaouar presented a poster at JACIE 2025 titled “Advancing Digital Surface Model Derivation in Forested Environments Through the Simulation and Fusion of Satellite Stereophotogrammetry and LiDAR Data.” In addition to publications, Dr. Mkaouar actively disseminated her work at major conferences. She presented at AGU 2024 and IGARSS 2025 (see photos); additionally, she delivered an invited online seminar to the University of Boumerdes, Algeria. In July 2025, Dr. Mkaouar completed a research stay at CESBIO in France, strengthening international cooperation and enhancing alignment of simulated and real datasets for georeferencing. Dr. Mkaouar is a co-Investigator on a ROSES proposal (selectable, pending funding) and a collaborator on another proposal.



Photo: Dr. Mkaouar giving an oral presentation at IGARSS 2025, Brisbane, Australia, August 2025. Credit: Shashank Bhushan.

In the next few months, Dr. Mkaouar plans to complete her ongoing work and submit a new manuscript for publication. Dr. Mkaouar will be giving two talks in the coming months. In October 2025, she will present “Towards More Accurate Digital Surface Models in Forested Landscapes: Simulating and Merging Satellite Stereo and LiDAR” at SilviLaser, in Québec, Canada. Her second talk, “Advancing Multi-Sensor Fusion for Vegetation Structure Mapping: A Physics-Based Simulation, Processing, and Analysis Framework for Spaceborne LiDAR and Optical Stereo Images”, will be given at AGU 2025 in December 2025.

SEOHUI PARK

Sponsor Pawan Gupta / Code 618 / Task 173

Dr. Park has been working on creating a pipeline system for monitoring ground-level PM_{2.5} concentration using geostationary satellites (TEMPO and ABI) and model outputs through Deep Neural Network (DNN), with the Continental United States (CONUS) as a study area. Dr. Park has tested other machine learning techniques (*i.e.*, Random Forest (RF) and light gradient boosting machine (LGBM)) and compared them with a DNN model. Her key finding was that the TEMPO radiance data significantly affected the estimation of ground-level PM_{2.5} concentrations (the DNN model performance improved by using TEMPO data). These discoveries are presented in her recent publication in the journal ES&T Air (Park et al., 2025). In her paper, she described the five-month TEMPO-including model results. Recently, Dr. Park updated the DNN model with a one-year study period and fire information (*i.e.*, fire radiance power (FRP)), since wildfire is an important source of PM_{2.5} concentration in CONUS. With such an extended study period (one-year), a long-term analysis is now available, especially annual and seasonal spatiotemporal patterns. For the assessment of the model performance with and without FRP data, Dr. Park found that the DNN model performance in areas with FRP values is significantly better than in areas without FRP values. This analysis is ongoing.

Dr. Park will focus on the update to the main model of the pipeline system for technically improving model performance by applying new approaches.

AHMED KHAN SALMAN

Sponsor Pawan Gupta / Code 618 / Task 173

Dr. Salman joined GESTAR II in the summer of 2025. He will conduct research on atmospheric aerosol properties, perform satellite retrieval of aerosol properties, and validate satellite datasets with AERONET and air quality networks. He will perform air quality monitoring and forecasting, and the application of machine learning for surface air quality estimations and forecasting, using satellite datasets for environmental justice case studies, as well as working with the end-user organizations to implement space-based solutions in their decision making.

Dr. Salman will contribute to the NASA HAQAST project on air quality monitoring in Africa to support stakeholder decision making. He will develop machine learning models for near real time estimation of AOD and PM_{2.5} using FCI data from Meteosat 12 focused on VIS and NIR bands. The work will include quantifying uncertainties to improve product reliability and applying transfer learning to address the limited size of FCI training data. Models will be trained first on ABI data from GOES-R and then fine tuned with FCI data over Africa. Validation will be carried out using AERONET for AOD and ground stations for PM_{2.5}.

JUNHYEON SEO

Sponsor Pawan Gupta / Code 618 / Task 173

During this reporting period, Dr. Seo advanced his machine-learning-based PM_{2.5} forecasting from research to sustained operations. Three-day forecasts are now disseminated via a NASA website and actively used by a broad set of stakeholders and collaborators, including U.S. embassies and consulates worldwide, national partners in Africa, and the University of Chicago's EPIC AQ team, for situational awareness and planning. He disseminated results through a poster

presentation at AGU 2024, a Lightning Talk at the internal NASA AI/ML Showcase, and an invited seminar at EPIC AQ that launched an ongoing data- and methods-sharing collaboration. He also published one peer-reviewed paper as first and corresponding author in AGU's Earth and Space Science and co-authored a second paper in ACS ES&T Air.

In parallel, Dr. Seo led the AERONET-low-cost sensor effort from data collection to initial modeling. Over the current deployment, the team successfully acquired multi-site datasets and developed an initial air-quality estimation model; site-level estimates have been prepared for sharing with AERONET stations. The network was expanded with many additional Clarity nodes, with further sensors procured and new sites being onboarded to broaden spatial and environmental coverage. These activities underpin ongoing calibration research with Clarity (machine-learning-based approaches) and a manuscript is now in preparation. Dr. Seo serves as Co-Investigator on the newly funded NASA's Health and Air Quality Applied Sciences Team (HAQAST, new generation) African Air Quality Explore (AAQE) project, contributing to the development of an Africa air-quality monitoring framework through data integration, QA/QC workflows, and early prototypes that bridge operational forecasts with low-cost observations.

Over the next period, Dr. Seo will finalize and submit manuscripts documenting the improved accuracy of the PM2.5 forecasting model and the machine-learning calibration of low-cost sensors; operationalize the distribution of site-level AERONET air-quality estimation values and continue developing interpolation/extrapolation methods to fill gaps across AERONET data levels; expand the low-cost network across multiple new sites while validating calibration against reference monitors; and, deepen collaborations with the World Bank, AirQo (Rwanda), EPIC AQ, and UNEP by formalizing data-sharing pipelines and delivering joint analyses and publications. He will contribute to the AAQE by helping to deliver an easy-to-use, NASA-powered online tool that integrates historical trends, near-real-time satellite imagery, air-quality forecasts, and harmonized local-satellite information for African countries, alongside model tuning to local environmental features to maximize relevance for health and policy decisions.

RITIKA PRASAI

Sponsor Pawan Gupta / Code 618 / Task 201

Ms. Parsai completed the web application with additional functionalities. Ms. Parsai also finalized the machine learning model for AOD550 time series imputation using MERRA-2 data. She also wrote a research paper for submission to a peer-reviewed scientific journal and conference proceedings. Ms. Prasai's task ended in February 2025.

SYLVIE ALEXANDER

Sponsor Shawn Serbin / Code 618 / Task 214

Ms. Sylvie Alexander is a student who has been developing and leading comprehensive educational and training initiatives for NASA Code 618, spearheading outreach efforts that engage a multitude of audiences ranging from elementary students to professional scientists. Some of Ms. Alexander's recent contributions include co-hosting remote sensing workshops for youth, using FLIR (Forward Looking Infrared) cameras through a collaborative multi-agency partnership, and co-managing the CORN (Calibration, Observation, and Research in Nature) training program, which equips Code 618 scientists with hands-on field instrument training. Additionally, she has supported educator development and strengthened stakeholder

collaboration through NASA's Science and Technology Education for Land/Life Assessment (STELLA) initiative.

NATALIA L. QUINTEROS CASAVERDE

Sponsor Shawn Serbin / Code 618 / Task 217

Dr. Quinteros Casaverde spent two weeks at the Smithsonian Tropical Research Institute (Gamboa, Panama), as an active member of the AVUELO campaign, supporting the field campaign collecting leaf spectral transmittance, during the AVIRIS-3 flights. The AVUELO campaign aims to increase the representation of tropical ecosystems in Land Surface Models and Biodiversity Monitoring. Currently, Dr. Quinteros Casaverde is working on data curation of the spectral datasets and other activities, such as supporting other scientists involved in different parts of the campaign. Dr. Quinteros Casaverde also has been participating in the Science and Technology Education for Land/Life Assessment (STELLA) working group, testing prototypes and suggesting improvements for STELLA 1.2 along with other scientists. She has been participating in conversations with the International Herbarium Scanning Working Group about applications of imaging spectroscopy in herbarium specimens and the creation of a standardized protocol to collect spectral reflectance from delicate herbarium specimens.

Dr. Quinteros Casaverde will continue her participation in both the AVUELO campaign, investigating relationships between remotely sensed and direct metrics of biodiversity, and the STELLA working group, working on applications in herbarium imaging spectrometry. Additionally, she will work in joint applications of G-LiHT and AVIRIS data for the study of ecosystem functioning.

NIAMA BOUKACHABA

Sponsor Lahouari Bounoua / Code 618 / Task219

Dr. Boukachaba supports the Biospheric Sciences Laboratory's ongoing research on land surface - atmosphere interactions, with a particular initial focus on the surface climate impacts of urbanization. Her work leverages the Simple Biosphere Model (SiB2) and contributes to broader efforts to understand the role of urban land use in shaping climate patterns at regional to global scales.

Over the past six months, Dr. Boukachaba's work has focused on three key areas. First, regarding Monthly Climate Diagnostics, Dr. Boukachaba developed a systematic framework for generating monthly composite plots of surface energy, moisture, and temperature variables across multiple urban land-use configurations. The tools she created apply variable-specific scaling and transformations, allowing for consistent and interpretable comparisons across different surface types and geographic regions. Second, for Urban and Land Area Analysis, Dr. Boukachaba implemented efficient methods in Python and Fortran to compute global and zonal statistics of land and urban surface areas from high-resolution gridded urban fraction datasets. Her approach uses fractional thresholds and geographic masks to define valid land areas, supporting downstream diagnostic and modeling analyses. And, third, regarding Model-Data Integration and Workflow Organization, she contributed to the integration of model outputs by organizing composite diagnostics with consistent spatial structure, improving reproducibility across the processing workflow and facilitating synthesis for climate model evaluation.

These efforts align with the Lab's broader mission to improve scientific understanding of land surface processes in the Earth system. Dr. Boukachaba's contributions support ongoing research aimed at advancing modeling tools to assess land use and urbanization impacts on surface climate.

In the upcoming period, Dr. Boukachaba will concentrate on evaluating the performance of the SiB2 land surface model by comparing its outputs against eddy covariance flux tower observations from the FLUXNET network. This evaluation aims to rigorously assess the model's capacity to simulate seasonal and diurnal dynamics of key surface fluxes, including latent heat, sensible heat, and gross primary production. This work will provide critical insights into model strengths and limitations, guiding improvements in simulating biogeophysical processes influenced by urbanization. The findings will contribute significantly to advancing our understanding of surface energy and carbon exchange dynamics across heterogeneous landscapes.

As part of our ongoing efforts to enhance land surface modeling accuracy, Dr. Boukachaba is generating downscaled MERRA-2 atmospheric forcing data at a high spatial resolution of 5 km for the years 2010, 2015, and 2020. These datasets will serve as key driver inputs for the SiB2 to enable detailed simulations of land-atmosphere interactions over targeted regions. By leveraging the improved spatial detail, this work aims to capture fine-scale variability in surface temperature, radiation, humidity, and other meteorological variables critical for realistic modeling of biophysical processes. The selected years represent climatologically distinct periods that will support assessments of interannual variability and climate impacts on vegetation and surface fluxes. This dataset generation is foundational for subsequent SiB2 model runs and will enhance the fidelity of our climate impact assessments and digital twin platform applications.

SUJAN NEUPANE

Sponsor Pawan Gupta / Code 618 / Task 220

Mr. Neupane is a UMBC graduate student working on processing level 2 satellite datasets and creating higher resolution daily/monthly level 3 datasets for the NASA research community. Specifically, he has worked with Suomi NPP, Aqua, NOAA-20, and Terra satellites, and VIIRS and MODIS instruments. Additionally, Mr. Neupane processed data from the above satellites/instruments from 2000 to 2025, and they have already been published in NASA's Goddard Earth Sciences (GES) Data and Information Services Center.

The new datasets are as follows:

- [SNPP VIIRS High Resolution Level 3 daily aerosol data](#)
- [NOAA20 VIIRS High Resolution Level 3 daily aerosol data](#)
- [MODIS AQUA High Resolution Level 3 daily aerosol data](#)
- [MODIS TERRA High Resolution Level 3 daily aerosol data](#)
- [SNPP VIIRS High Resolution Level 3 monthly aerosol data](#)
- [NOAA20 VIIRS High Resolution Level 3 monthly aerosol data](#)
- [MODIS AQUA High Resolution Level 3 monthly aerosol data](#)
- [MODIS TERRA High Resolution Level 3 monthly aerosol data](#)
- [ReadMe for these datasets](#)

Mr. Neupane has been working on using machine learning to predict global PM2.5 using MERRA2 satellite atmospheric features as inputs and OpenAQ PM2.5 as targets for training machine learning models, effectively mapping satellite global features with ground-based PM2.5 sensor measurements. The technical aspect of this project will be completed by September, and then he will start working on the related manuscript.

KRISTEN LEWERS

Sponsor Shawn Serbin / Code 618 / Task 224

Ms. Lewers was a student researcher who supported NASA-funded efforts related to the remote sensing of terrestrial and coastal/aquatic ecosystems and biodiversity. This included supporting the NASA Biodiversity and Ecological Conservation scoping study, the Biospheric Sciences Laboratory G-LiHT instrument, and NASA's Surface Biology and Geology Mission. She contributed to the development of technical software engineering and version-controlled data science workflows related to creating analysis-ready data products based on NASA and other datasets, developing dashboards and other user-facing capabilities, applications and services. Ms. Lewers supported curating and integrating existing biodiversity databases into remote sensing scientific workflows leveraging airborne datasets, evaluating metrics, developing taxonomic translations across datasets, and helping to coordinate national and international biodiversity data synthesis efforts. Finally, she provided expertise in combining software engineering and ecological data synthesis and tool development to organize and lead biodiversity workshops focused on combining computational methods, remote sensing, and biodiversity research.

ELIZABETH MIDDLETON

Sponsor Jon Kenneth Ranson / Code 618 / Task 226

Dr. Middleton is an affiliated research scientist. She has supported the research project of Dr. Petya Campbell and the NASA/Virginia Tech collaboration, "Structure and Function of Ecosystems (SAFE)". Dr. Campbell's NASA/ESA collaborative project addresses plant physiological stress responses expressed in remote sensing signals, such as spectroscopy and chlorophyll fluorescence, primarily in support of ESA's Fluorescence Explorer satellite mission. A study based on the NEON network will be published in the December 2025 issue of Science of Remote Sensing. Another manuscript, led by Dr. Williams, is nearing completion, while Dr. Middleton has made significant contributions to its revision. Last year, a significant paper was published on the Earth sciences satellites (Ustin and Middleton, 2024).

BRIAN MARKHAM

Sponsor Shawn Serbin / Code 618 / Task 228

Dr. Markham is an affiliated research scientist. Dr. Markham will collaborate with scientists in code 618 and share his breadth and depth of knowledge with the Landsat program dating back to Landsat 1 and through to Landsat 9. Dr. Markham will work to transfer that knowledge to current junior and senior civil servants within the Landsat program, including the Landsat 8/9 Project Scientist and Calibration Lead, plus the Landsat Next Project Scientist, Instrument Scientist, and Calibration Lead. He will mentor GSFC employees on Landsat Next to provide insight and guidance on developing, finalizing, and verifying performance. As a collaborator, Dr. Markham provides support for evaluations of sensor performance and characterization of the

Landsat 8 and 9 sensors already in orbit. He supports the twice-yearly technical interchange meetings that are jointly held with our USGS Landsat Stakeholders. The GSFC Landsat Team relies on Dr. Markham's expertise to help address hardware anomalies with the current systems and for milestone reviews of Landsat Next.

KELSEY HUELSMAN

Sponsor Shawn Serbin / Code 618 / Task 229

Since joining GESTAR II as a Postdoctoral Researcher in March 2025, Dr. Huelsman has been developing workflows that support earth observations of biodiversity, particularly as they relate to NASA's G-LiHT (Goddard's LiDAR, Hyperspectral & Thermal) imaging system. These workflows allow for interoperability and analysis of aerial imagery and *in situ* vegetation data from multiple sources, including: 1) alignment to a common biological data standard, DarwinCore, 2) spatial pairing of *in situ* vegetation data from the National Ecological Observatory Network (NEON) and the Global Biodiversity Information Facility (GBIF), and 3) spatial pairing of *in situ* vegetation data and aerial hyperspectral data from NEON. Dr. Huelsman has submitted abstracts discussing these workflows and analyses to two upcoming conferences: the Living Data Conference in Bogota, Colombia in October 2025, and the American Geophysical Union (AGU) Fall Meeting in New Orleans, LA in December 2025.

Dr. Huelsman will be giving two related presentations at the Living Data Conference in October 2025. The first is an invited lightning talk titled "The road to interoperability: finding common ground among biological data providers," about the importance and process of aligning vegetation surveys to DarwinCore data standard, using data from NEON as an example. The second is a poster presentation titled "Use what you've got: Leveraging existing data to transform our understanding and management of biodiversity," which presents local biodiversity maps using NEON and GBIF data in concert, while accounting for differences in coverage and certainty. She plans to submit a manuscript to Ecological Informatics or Ecological Indicators that summarizes these analyses and feedback from the Living Data Conference. Dr. Huelsman will also present a poster at the AGU Fall Meeting in December titled "Combining multi-scale, multi-modal aerial and ground observations to understand and detect invasive plants," which will apply workflow #3 presented above to plant community composition and invasion.

NOURA ED-DAHMAN Y

Sponsor Lahouari Bounoua / Code 618 / Task 232

Dr. Ed-Dahmany's task started in September 2025. Dr. Ed-Dahmany's research involves carrying out the extraction of model output data for the land cover/land use change project in Morocco and analyzing the results to produce a scientific article. The analysis involves elements of the fluxes of the energy, water and carbon cycles at global scale. This will involve collaboration with different experts from the biospheric sciences laboratory as well as other disciplines, such as multi-scale remote sensing data, and local and regional drivers of plant thermal and hydrological stresses. The work will be performed in collaboration with scientists from the Biospheric Sciences Laboratory and the Hydrological Sciences Laboratory.

CODE 619: TERRESTRIAL INFORMATION SYSTEMS

SIOBAHN LIGHT

Sponsor Amy McNally / Code 618 / Task 215

Ms. Light was a student whose research includes the use of remote sensing datasets, earth system models and machine learning to answer questions relevant to agriculture, particularly in data sparse, food insecure locations around the world. She contributed to the development of the problem specification, gathering required Earth Observations (satellite and in-situ), data pre-processing, feature selection, exploration of different machine learning models, model training, parameter turning, and ultimately prediction of agriculture relevant variables.

CODE 672: HELIOSPHERIC PHYSICS LABORATORY

JAY HERMAN

Sponsor Adam Szabo / Code 672 / Task 155

As part of the EPIC project team, Dr. Herman published work that used the ultraviolet bands 317, 325, 340, and 388 nm to retrieve total column ozone (TCO) at different local times of the day. The derived EPIC TCO values from 2021 to 2024 agree well with those from the ground-based Pandora spectrometer instruments both on an hourly and weekly average basis. Dr. Herman showed that hourly EPIC TCO agrees within 2% and tracks the shape of the Pandora daily variation in most cases. Near-13:30 TCO data from the Ozone and Mapping Profiler Suite (OMPS) and the Ozone Monitoring Instrument (OMI) are also shown to agree with time-matched Pandora and EPIC TCO values. Dr. Herman also made comparisons with Version-3 hourly TCO retrievals from the US geostationary satellite TEMPO (Tropospheric Monitoring of Pollution) over two North American sites: Toronto, Canada, and Dearborn, Michigan. Long-term weekly Lowess average EPIC and Pandora TCO values agree to better than 2% as does the 3-week Lowess average of OMPS TCO. An analysis of Pandora TCO and 1 year of TEMPO V03 TCO suggests that noon TCO values are 2% to 5% larger than morning and afternoon values.



Image: EPIC (Earth Polychromatic Imaging Camera) views of the Earth in true color, the Moon, and Jupiter at 443 nm. Jupiter, although far from the Earth-Sun Lagrange-1 orbital location, EPIC still produces a strong signal of 28000 counts that can be used for analysis of its atmosphere. EPIC produces images in 10 narrow-band wavelengths from 317.5 to 780 nm.

Dr. Herman also led research into evaluating trace gases total column amounts: Ozone TCO, Nitrogen Dioxide TCNO₂, and Formaldehyde TCHCHO. As part of this work, Dr. Herman showed that their seasonal dependence can be observed using satellite and ground-based data from the OMI satellite and Pandora ground-based instruments. At most sites, Pandora data showed a strong seasonal dependence for TCO and TCHCHO and less seasonal dependence for TCNO₂. He also showed that OMI retrieves less TCNO₂ than Pandora over urban sites because of OMI's large field of view. In addition, he demonstrated that the seasonal behavior of TCHCHO is mostly caused by the release of HCHO precursors from plant growth and emissions from lakes that peak in the summer, as observed by Pandora and OMI.

Along with one of his colleagues as first author of a paper, Dr. Herman worked on deriving the time behavior of tropospheric ozone using observations from EPIC. While this paper was still under review, Dr. Herman derived the albedo of the Jupiter disk using EPIC data and successfully compared it with previous measurements. As part of the comparison, he conveyed that the UV albedo was overestimated in previous work because of the presence of stray light, while the visible wavelength channels agreed very closely.

In the coming months, Dr. Herman will continue his work as part of the EPIC project team, and he will continue to work on the paper that is under review.

CODE 61A: GEODESY AND GEOPHYSICS LABORATORY

MAGDALENA KUZMICZ-CIESLAK AND KEITH EVANS

Sponsor Stephen Merkowitz / Code 61A / Task 128

This past year, the NASA GSFC/JCET ILRS Analysis Center, under the leadership of Dr. Kuzmicz-Cieslak, continued its core mission of conducting daily and weekly analyses of Satellite Laser Ranging (SLR) data and combination products from the International Laser Ranging Service (ILRS) network. These products were consistently delivered to the ILRS archives at CDDIS and EDC, supporting the operational goals of the ILRS and contributing to the development and maintenance of the International Terrestrial Reference Frame (ITRF).

In addition to routine analysis, the team (Dr. Kuzmicz-Cieslak and Mr. Evans) provided essential support to the ILRS Central Bureau and the ILRS network of stations, performing validation and qualification tests for newly commissioned systems and those undergoing major upgrades. The team actively participated in monthly ILRS Central Bureau (CB) and bimonthly Quality Control Board (QCB) teleconferences, contributing to the coordination and oversight of ILRS operations.

Following the successful transition to the v80 and v180 product series in the previous year, the focus this year shifted to the development and refinement of the next-generation v90 and v190 series. These new versions continue to include the core geodetic satellites (i.e., LAGEOS-1, LAGEOS-2, ETALON-1, and ETALON-2) consistent with the configurations used in v80 and v180. In addition, they incorporate LARES-2 data to further enhance the precision and scope of ILRS contributions to ITRF2020 and future reference frames. The v90 series has been reprocessed

from August 2022 onward, while the v190 series began reprocessing in January 2024. Both are being prepared for operational submission.

The team continued production of the v85 series, which involves a comprehensive reprocessing of weekly SINEX files. The full reprocessing from 1993 through 2023 was completed in the previous year; in February 2025, the final delivery for the 2024 data was submitted, ensuring continuity and long-term geodetic consistency. The v280 and v320 series continue to be delivered on a weekly basis and are being refined for future operational use. The v280 series includes data from LAGEOS-1, LAGEOS-2, ETALON-1, and ETALON-2, while the v320 series extends this configuration by incorporating LARES-2. Both series support the delivery of station biases, contributing to improved network performance monitoring and product quality.

Furthermore, on behalf of the ILRS Central Bureau and the ILRS Analysis Standing Committee (ASC), the team has evaluated several ILRS stations, including Wettzell (7827), Zimmerwald (7810), and Herstmonceux (7840). These stations have either been newly commissioned or undergone major repairs or renovations of their range systems.

During Fall 2025, the NASA GSFC/JCET ILRS Analysis Center will focus on several key operational and research initiatives aligned with its ongoing support for the ILRS network and ITRF development. The team also will finalize the transition from the v80/v180 product series to the v90/v190 series. This includes validating the new series against historical solutions, integrating LARES-2 data, and ensuring consistency with ITRF2020 standards. Updated documentation and metadata will be prepared for submission to the ILRS archives. Quality control and validation activities will be conducted for Ishioka (7317) in Japan and NTSC (7329) in Xi'an, China, focusing on tracking performance, data quality, and adherence to ILRS standards. Feedback will be provided to station operators to support their readiness for full operational status. In parallel, the Analysis Center will assist with the reintegration of San Fernando (7824) in Spain and Hartebeesthoek (7501) in South Africa by reviewing recent data, applying updated validation procedures, and coordinating with local teams to facilitate their return to the ILRS network. Additionally, the team plans to update and improve its webpages to make it easier for users to find analysis products, validation results, and station performance information.

STACEY HUANG

Sponsor Jeanne Sauber-Rosenberg / Code 61A / Task 188

Dr. Huang completed her analysis on the contributions of commercial synthetic aperture radar (SAR) missions to NASA's Surface Deformation and Change (SDC) mission study recommended by the 2017 Decadal Survey. Dr. Huang published a peer-reviewed paper on these findings as first author, with co-authors spanning across two NASA centers, the Jet Propulsion Laboratory (JPL), and UC Irvine. The paper highlights the specific contributions of commercial SAR data to the future SDC mission, specifically with higher resolution and faster repeat imagery, and also outlines current drawbacks of the data that cannot meet NASA needs, including interferometry, global coverage, polarimetry, and long wavelength. Dr. Huang presented (virtually) the findings from the paper at the 2024 AGU Annual Meeting.

Dr. Huang also completed an analysis of post-seismic subsidence in the Samoan Islands since the 2009 Samoa-Tonga earthquake and implications for ongoing sea level rise in the region, with a team spanning NASA Goddard and JPL and using GPS/GNSS, tide gauge-altimetry, and interferometric SAR (InSAR) data. She published a peer-reviewed paper showing new high-

resolution subsidence trends of the Samoan Islands from 2015-2023, finding that subsidence is easing more quickly than previously expected, and finding that the capital cities of each island experience distinct subsidence behaviors, likely due to localized factors.

Finally, as a Co-I on a NASA Earth Surface and Interior (ESI) project studying crustal deformation and the implications for regional geohazards in the Kodiak-Katmai region of Alaska, Dr. Huang has produced preliminary horizontal and vertical displacement maps on both a local and regional scale using Sentinel-1 data for the Kodiak-Katmai region, requiring an innovative approach in difficult areas to reconcile errors in the digital elevation model (DEM) and subsidence over time.

In the coming months, Dr. Huang will refine the maps of horizontal and vertical displacement in the Kodiak-Katmai area and prepare a paper for submission to a peer-reviewed journal on the innovative processing method used to generate several maps. She will work with the PI and other Co-I on the team to analyze subsidence data with altimetry and gravimetric data to decouple sources of deformation including plate motion and glacial isostatic adjustment (GIA).

Dr. Huang will begin a new project under new sponsor Bryant Loomis to run simulations for the NASA-ESA MAGIC (Mass-change And Geosciences International Constellation) mission and the NASA Quantum Gravity Gradiometer Pathfinder (QG-GPf).

BRIAN D. BECKLEY

Sponsor Richard Ray / Code 61A / Task 207

Mr. Beckley is a member of the NASA Ocean Surface Topography Science Working Team and the NASA Sea Level Change Team. He has been monitoring Global Mean Sea Level (GMSL) estimated from satellite altimeter data via the NASA TOPEX/Poseidon, Jason-1,2, & 3, and Sentinel-6a Michael Freilich missions. He has developed a sea surface height (SSH) database facilitating the generation of a global SSH time series that spans over three decades providing current GMSL estimates staged at the JPL PODAAC and the NASA Sea Level Change Portal. Mr. Beckley provides multi-mission altimetry calibration/validation assessments via SSH variation comparisons with a global network of tide gauges in collaboration with subject matter expert Prof. Gary Mitchum (University of South Florida). His altimeter data analyses also support his NASA GSFC ATR's Ocean tide modeling and precise orbit determination (POD) studies. He has recently generated a revised GMSL hybrid estimate based on SSH variations referenced to the most precise JPL GPS and GSFC SLR+DORIS orbits. Mr. Beckley's GMSL results and supporting data have been cited in the last IPCC report and the current BAMS 2025 State of the Climate Report.

Looking ahead, Mr. Beckley is continuously updating and assessing the accuracy of GMSL estimates from the current Sentinel-6a mission and from reprocessed historical data. He is developing new mission database software and validation tools to assess future altimeter data from the Sentinel-6b satellite with a scheduled launch in November 2025.

KYLE GWIRTZ

Sponsor Weijia Kuang / Code 61A / Task 204

Dr. Gwartz has been working on developing methodologies to enhance our understanding of the geodynamo---the system consisting of Earth's electrically conducting fluid outer core and the

geomagnetic field it sustains. Specifically, Dr. Gwirtz works on the assimilation of observations of Earth's magnetic field into dynamic models of the geodynamo, to estimate the core flow and predict future magnetic field variations. This research has focused on testing and implementing ensemble assimilation methods, such as ensemble Kalman filters/smoothers and studying the impact of varying observation error estimates using, for example, Variance Component Estimation (VCE). In addition to working with NASA's high-end, Geomagnetic Ensemble Modeling System (GEMS), Dr. Gwirtz has developed an "entry-level" assimilation system for producing short-term geomagnetic forecasts and studying assimilation methodologies. He used this system to lead NASA's contribution to the geomagnetic field forecast of the 14th generation International Geomagnetic Reference Field (IGRF-14). Dr. Gwirtz is a first author on a paper recently submitted on the methodology of the entry-level system and the associated IGRF-14 forecast.

Dr. Gwirtz plans to continue projects to implement and test VCE and Ensemble Kalman Smoothing in GEMS, using both synthetic data experiments and hindcasting studies. Dr. Gwirtz also will continue to develop and experiment with the entry-level assimilation system as a tool for producing improved geomagnetic forecasts and prototyping new assimilation methodologies.

STUDENT PROGRAMS



Photo: Left is GESTAR visiting scholar Colorado State University PhD candidate Jennifer McGinnis with NASA astronauts Donald Pettit (left) and Nick Hague (right). Right is Saameeriny Kalapala at Open House event GSFC July 2025.

EARTH DAY SYMPOSIUM 2025

UMBC's 9th Annual Earth Day Symposium (EDS) took place on Friday, April 25, 2025, in the Physics Building, organized by a student planning committee led by Roshan Mishra and sponsored by the UMBC Physics Department and GESTAR II. The 2025 theme, "Emerging Scientists Amid Policy Change", framed a full day of talks, a panel discussion, an industry spotlight, and a poster session showcasing student research. A hallmark of this symposium is its tradition of being completely planned and executed by GESTAR II-supported graduate students, reinforcing leadership and event-management experience across the cohort. Opening remarks by Dr. Zhibo Zhang reviewed the history of EDS at UMBC (est. 2017), followed by invited contributions from university, NASA, and industry speakers. Highlights included guidance for early-career scientists from NASA's Dr. Jack Kaye, a missions overview by Dr. Amita Mehta, and an Industry Spotlight on Science and Technology Corporation (STC) led by alumnus Dr. Dylan Powell. The panel, "Navigating Change: Personal Journey," brought perspectives from Drs. Maria Molina, Henrique Barbosa, Anin Puthukkudy, and Maurice Roots, moderated by graduate student Hannah Seppala. The afternoon poster session featured diverse topics (aerosols, clouds, remote sensing, atmospheric dynamics), with UMBC e-gift cards awarded to top presenters. Prize winners were Emily Faber (1st) and a tie for 2nd between Hannah Seppala and Soumik Sarker. The event advanced GESTAR II's student-centered mission by combining research dissemination, mentoring, and networking with external partners. GESTAR II recognizes the graduate student committee—Roshan Mishra, Tony La Luna, Chetan Gurung, Eniola Oyedeji, Md Idris Ali, Ronghao Wang, Sharad Pandey, and Amanda Vieira dos Santos—for delivering a successful, well-organized day.



Photo: Clockwise from top-left: Dr. Amita Mehta; Dr. Dylan Powell; Dr. Jack Kaye; UMBC Ph.D. student Greema Regmi. Credit: A. Houghton.

GESTAR II GRADUATE STUDENT COLLOQUIUM SPRING 2025: TRANSITION FROM STUDENT TO EARLY CAREER SCIENTIST

To support graduating GESTAR II students as they prepare for the job market, GESTAR II hosted a special colloquium series in Spring 2025 focused on the transition from graduate student to early-career scientist. The series provided practical guidance on career planning, job searches, and the first steps after graduation.

Speakers and highlights

- Dr. Daniel Miller (613/UMBC) traced his path from graduate student to NASA NPP Fellow and described how he secured his first grant as a principal investigator.
- Dr. Adriana Rocha-Lima (UMBC) reflected on her journey as an international student and her progression to a tenure-track position in Physics.
- Dr. W. Reed Espinosa (NASA) shared lessons learned moving from UMBC to a research career at NASA.
- Dr. Dylan Powell and Dr. Chenxi Wang offered concrete advice on transitioning from academia to the private sector.

Impact

The colloquium improved students' readiness for interviews and proposal work, clarified career pathways across academia, government, and industry, and helped them build connections with potential mentors and sponsors.



GESTAR II UMBC GRADUATE STUDENT FELLOWSHIP

The GESTAR II UMBC Graduate Student Fellowship advances UMBC’s vision to be a top public research university by empowering emerging scientists to tackle mission-driven Earth system research alongside GESTAR II faculty and NASA Goddard collaborators. In 2025–2026, the fellowship was awarded to Roshan Mishra, a full-time Atmospheric Physics graduate student advised by Dr. Zhibo Zhang with collaboration from Dr. Yingxi Shi, for the project “Quantifying the Temporal Dynamics of Smoke Absorption Using Geostationary Observations,” which leverages cutting-edge satellite datasets to improve understanding of aerosol radiative effects and their implications for climate and air quality. The fellowship provides focused mentorship, access to world-class research resources, and a vibrant intellectual community that accelerates the transition from trainee to independent researcher. Valued at up to \$45,000 for one year, the award includes in-state tuition for up to ten credits per semester (with other fees the student’s responsibility), UMBC health insurance, and a competitive annual stipend, underscoring GESTAR II’s commitment to student success and to impactful, policy-relevant research that benefits society.

GESTAR II STUDENT WON NASA FELLOWSHIP

UMBC atmospheric physics Ph.D. student Greema Regmi, previously supported through GESTAR II, was awarded NASA’s prestigious FINESST fellowship in 2025 to advance her work on atmospheric dust and climate. Her UMBC story highlights the path from remote study in Nepal to campus research and co-mentorship with UMBC and NASA Goddard scientists, underscoring the strong UMBC–GESTAR II–NASA pipeline that prepares students for competitive national awards.

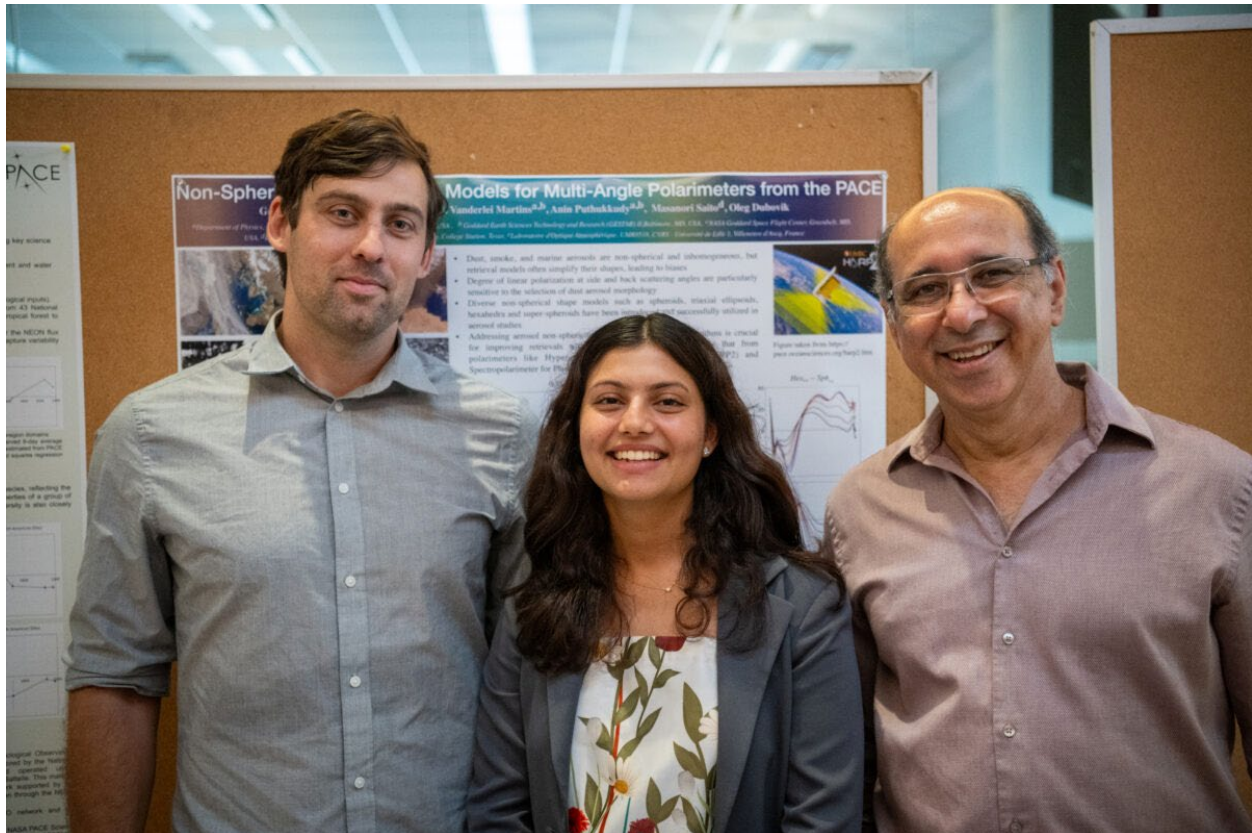


Photo: Reed Espinosa (left) and Vanderlei Martins (right) both have mentored Greema Regmi (center) during her Ph.D. at UMBC. (Brad Ziegler/UMBC). From UMBC News feature, [“From Nepal to NASA: A journey of resilience and discovery”](#).

AWARDS

EARTH SCIENCES DIVISION CODE 610

Task 235 / Compton Tucker

Dr. Compton Tucker was recently [elected to the National Academy of Sciences](#) (April 2025).

GLOBAL MODELING AND ASSIMILATION OFFICE CODE 610.1

Pamela Wales / Task 022

The Goddard Earth Observing System Composition Forecasting (GEOS-CF) team, including Pamela Wales, received a GMAO Peer Award for Scientific Achievement in December 2024.

Natalie Thomas / Task 027

On December 18, 2024, Natalie Thomas received a GMAO Peer Award for Collaboration.

Allison Collow / Task 051

Allison Collow was presented with the 2024 NASA Global Modeling and Assimilation Office Peer Award for Team Scientific Achievement (MERRA-21C Team), in December 2024.

Carl Malings / Task 129

Carl Malings was awarded the GMAO Group Scientific Achievement Peer Award for contributions to the GEOS-CF Team, at GSFC, in December 2024. Carl Malings was also awarded with the Certificate of Excellence from the GEO Health Community of Practice in Washington, DC, in December 2024.

Eun-Gyeong Yang / Task 163

Eun-Gyeong Yang received the NASA Goddard Space Flight Center (GSFC) Global Modeling and Assimilation Office (GMAO) Peer Award for Outstanding Contribution by GMAO member at GMAO Annual Peer Awards Ceremony in Greenbelt, MD, on December 18, 2024.

Meng Zhou / Task 185

Dr. Zhou was awarded Outstanding Contribution by a New GMAO member, Global Modeling and Assimilation Office, December 2024.

Christopher O'Dell, Andrew Schuh, and Scott Denning / Task 196

The Colorado State University Cooperative Institute for Research in the Atmosphere (CIRA) Research Initiative Award for 2024 was presented to Dr. Andrew Schuh for activities highlighted by the 2024 SSIM-GHG Summer School.

Viral Shah / Task 212

Dr. Shah received a GMAO peer-award for the GEOS-CF team in December 2024.

MESOSCALE ATMOSPHERIC PROCESSES LABORATORY CODE 612

Mircea Grecu / Task 055

Mircea Grecu received the Robert H. Goddard Exceptional Achievement Award for Outreach, for "exceptional efforts in increasing awareness and enabling use of GPM data for science and applications across stakeholders," on September 4, 2024.

Ali Tokay / Task 123

Ali Tokay was the recipient of the University of Maryland, Baltimore County's 2025 Research Faculty Excellence Award.

Colten Peterson / Task 182

Colten Peterson was awarded the NASA GSFC Climate and Radiation Laboratory Outstanding Scientific Achievement Award in February 2025. The award was received at the Climate and Radiation Laboratory's annual award ceremony at GSFC.

CLIMATE AND RADIATION LABORATORY CODE 613

Jae N. Lee / Task 114

Jae Lee was awarded the Scientific Leadership Award by NASA Climate and Radiation Lab for "outstanding leadership in Sun-Climate research/" in 2024.

Myungje Choi / Task 120

On February 7, 2025, Myungje Choi received Best 1st Author Paper Award for "a paper that advances MAIAC EPIC smoke properties as observational constraints for radiative forcing, air quality, and heal studies" from the NASA Goddard Space Flight Center (GSFC) Climate and Radiation Laboratory.

Mijin Kim / Task 165

Mijin Kim received an Accelerated Growth Award in January 2025.

Colten Peterson / Task 170

Colten Peterson was awarded the NASA GSFC Climate and Radiation Laboratory Outstanding Scientific Achievement Award in February 2025 at Code 612 Laboratory's annual award ceremony at GSFC.

Jianyu Zheng / Task 193

Jianyu Zheng received a 2025 Richard M. Goody Science Award for Outstanding Early Career Scientist in atmospheric radiation and remote sensing, at the 21st Electromagnetic and Light

Scatter Conference at Milazzo, Italy, in June 2025. Jianyu Zheng also received a Goddard Award, for Outstanding Scientific Achievement Award, at the Climate and Radiation Laboratory, Goddard Space Flight Center, Greenbelt, Maryland in February 2025.

Alexander Matus / Task 195

Dr. Matus received two NASA Awards: A Group Achievement Award for outstanding achievements with the ACCLIP Field Campaign and a Group Achievement Award for exceptional recognition with the IMPACTS Instrument Team.

ATMOSPHERIC CHEMISTRY AND DYNAMICS LABORATORY CODE 614

Hiren Jethva / Task 047

Hiren Jethva was recognized with the Best Senior Author Publication award conferred by NASA's Earth Science Division 2024 Peer Awards under the Differentiate Award category in December 2024. The award was for "demonstrating a synergistic approach to characterizing aerosol properties above clouds by the combined use of satellite measurements (CALIOP, OMI, MODIS) and airborne ORACLES campaign observations."

Anne Thompson / Task 138

Anne Thompson received the Honorary Member Award at the AMS Meeting in New Orleans, in January 2025. Dr. Thompson also received a Reviewer Award at AGU from the *JGR-Atmospheres*, in May 2025.



Image: Honorary Members at 105th Annual Meeting of the American Meteorological Society, in January 2025, at the New Orleans Convention Center. Credit: Anne Thompson.

Paul A. Newman / Task 222

Dr. Newman was made an Honorary Member of the International Ozone Commission, on April 16, 2025.

HYDROLOGICAL SCIENCES LABORATORY CODE 617

Robert Emberson / Task 030

Robert Emberson received the NASA Blue Marble Award, for Resilience or Climate Change Adaptation, in 2024.

OUTREACH

GESTAR faculty members have been actively involved in outreach throughout the year, including volunteering at public events, student mentoring, and speaking at local schools.

Photo: Dr. Dezfuli presenting his environmental children's book at Kensington Parkwood Elementary School.



EARTH SCIENCES DIVISION CODE 610

Task 221 / Assaf Anyamba

Dr. Assaf Anyamba presented to GLOBE High School Students, Land Remote Sensing: Connections, Evolution and Change, Presentation to [GLOBE - School of Earth and Environmental Sciences](#), June 11, 2025.

GLOBAL MODELING AND ASSIMILATION OFFICE CODE 610.1

Task 007 / Nikki Privé

Co-hosted an undergraduate student (Deborah Ezekiel) from Morgan State University as a GESTAR-II Student Fellow for the spring 2025 semester and summer period.

Task 051 / Allison Collow

Dr. Collow presented to kindergarten and first grade classes at Two Rivers Elementary School on what it is like to be a meteorologist.

Task 052 / Erica McGrath-Spangler

Erica McGrath-Spangler was a co-advisor (with Nikki Privé, Morgan State) to a GESTAR II undergraduate fellow from Morgan State University.

Erica McGrath-Spangler - Middle School Science Career Fair presenter, St. John the Baptist Catholic School Silver Spring, MD 16 April 2025

Task 059 / Eunjee Lee

Eunjee Lee served as a committee member for a graduate student (Sophea Rom Phy) at University of South Florida and attended his PhD proposal defense on August 8, 2025.

Task 061 / Young-Kwon Lim

Young-Kwon Lim served as a dissertation committee member for a PhD student from Bu-Kyung University in South Korea, offering guidance on a proposed dissertation topic focused on sea ice initialization and its influence on winter seasonal forecasting skill over the Northern Hemisphere using a coupled forecast system. He encouraged the student to publish a paper on the subject, which was subsequently accepted by the Journal of Climate earlier this year. Also, Young-Kwon Lim mentored a postdoctoral researcher from Oak Ridge National Laboratory, providing advice on a study examining internal climate variability and its impacts on the climate of High Mountain Asia.

Task 093 / Dhruva Kathuria

Dhruva Kathuria mentored an undergraduate student from Morgan State University as part of the GESTAR II undergraduate fellowship program. The student (Ajan Coleman) is working on retrieving and compiling leaf hyperspectral reflectance data along with the associated in situ measurements of multiple plant functional traits associated with chemical, physiological and structural properties of leaves from publicly available data repositories. The mentorship lasted from August 2024 to Spring 2025.

Task 129 / Carl Malings

Carl Malings served as mentor to a GESTAR II summer intern from Arizona State University, June through October 2024. The student worked on combining in-situ data with satellite retrievals and model outputs to study air quality challenges in the Phoenix area.

Carl Malings presented two guest lectures in April 2025 at an introductory air quality course at UMBC taught by Professor Charles Ichoku. The lectures were titled “Air Quality at NASA” and “Air Quality Data Fusion with Sensors, Satellites, and Models”.

Task 140 / Katherine Breen

Katherine Breen mentored a group of elite undergraduates in collaboration with the UCLA Institute for Pure and Applied Mathematics (IPAM), guiding their quantitative evaluation of a machine learning parameterization for vertical wind velocity against observational data; this work was the basis of her presentation at the AMS annual meeting.

[IPAM Research in Industrial Projects 2024.](#)

Task 162 / Amin Dezfuli

Amin Dezfuli serves on the committee of Ph.D. student Nathaniel Nwoke, University of Maryland Baltimore County, Department of Geography and Environmental Systems, 2025-present. Major advisor: Charles Ichoku. Amin Dezfuli delivered a guest lecture on “Role of large-scale climate dynamics: from atmospheric rivers to bird migration” in Prof. Ichoku’s class (Atmospheric Science), UMBC, Fall 2024. Amin Dezfuli visited Kensington Parkwood Elementary School in Montgomery County and gave an interactive presentation of his environmental children's book to kindergarten students. May 2025.

Task 176 / Janak Joshi

Dr. Joshi mentored one final-year undergraduate science student from George Mason University during the 2024 spring semester.

Task 196 / Scott Denning, Christopher O'Dell, and Andrew Schuh (Team CSU)

Andrew Schuh led the Summer School for Inverse Modeling of Greenhouse Gases (SSMI-GHG) at CSU in June 2024. <https://www.cira.colostate.edu/conferences/rmtgw/>

MESOSCALE ATMOSPHERIC PROCESSES LABORATORY

CODE 612

Task 055 / Mircea Grecu

Mircea Grecu mentored high-school student Anthony Przyzycki of River Hill High School, Clarksville, MD over the entire 2024-2025 school year.

Task 181 / Sean Foley

Sean Foley updated and contributed Jupyter notebooks to the [PACE Help Hub](#). These are publicly facing, highly visible, and persistent resources that increase the reach and impact of multi-angle data and machine learning for atmospheric remote sensing. Sean Foley used his subject matter expertise on machine learning to assist various interns with their research projects. Sean Foley's advice and public-facing tutorials on the usage of multi-angle data were used by contributors to an immersive art installation involving PACE at the Kennedy Center.

Task 182 / Colten Peterson

Colten Peterson mentored an undergraduate intern who was working at GSFC under his sponsor during Summer 2025. The project involved producing a cloud thermodynamic phase algorithm for an airborne imager flown during the NASA ARCSIX campaign. Dr. Peterson met with the intern frequently and helped the intern to further understand the basics of active and passive cloud remote sensing in polar regions, especially in the context of airborne science campaigns. The intern was taught how to process hyperspectral imagery into reflectance and to co-locate lidar-derived cloud profiles with the imager reflectances. Overall, the intern was able to evaluate cloud phase spectral tests on liquid and ice cloud scenes observed during ARCSIX, which resulted in a prototype cloud phase algorithm that is being further explored.

Task 233 / Wei-Kuo Tao

Dr. Tao attended the 130th anniversary of National Central University (NCU), Taiwan, on May 17, 2025, where he was also appointed as Chair and Professor of the Department of Atmospheric Physics at National Central University.

CLIMATE AND RADIATION LABORATORY

CODE 613

Task 012 / Manisha Ganeshan

Manisha Ganeshan mentored a graduate student from Pennsylvania State University (PSU), Alexis Cole, guiding her for her master's thesis project. Alexis' work explored the relationship between GNSS RO penetration and lower tropospheric moisture in the Arctic using multi-observational datasets. Alexis was funded using Dr. Ganeshan's 2022 and 2023 ROSES grants.

Task 035 / Cornelius Csar Jude H. Salinas

Jude Salinas was co-mentor/alternate mentor to the following NASA summer interns: Madison Stanford, Andrew Hodges, Rylan Malarchik and Marcus Guzman. The main mentor was Dong Wu.

Task 036 / Young-Kwon Lim

Young-Kwon Lim served as a dissertation committee member for a PhD student from Bu-Kyung University in South Korea, offering guidance on a proposed dissertation topic focused on sea ice initialization and its influence on winter seasonal forecasting skill over the Northern Hemisphere using a coupled forecast system. He encouraged the student to publish a paper on the subject, which was subsequently accepted by the Journal of Climate earlier this year.

Task 037 / Lipi Mukherjee

Lipi Mukherjee mentored student (Destiny L. Hallett) under MOSAICS - NMSU GSFC - BPSF56. This included meetings twice in a week during the period 6/2/2025 – 8/8/2025. Dr. Mukherjee was able to train them in using LibRadtran radiative transfer model. Trained them to use different atmospheric constituents like Ozone, water vapor and aerosols. Dr. Mukherjee taught them how to scale the runs on servers. Lipi Mukherjee interacted with an OSTEM intern (Rylan Malarchick) on a weekly basis to help and guide them in their research. This work is going to lead to a publication with Dr. Mukherjee as lead author. Lipi Mukherjee mentored student (Rodney Levendosky) under MOSAICS - NMSU GSFC - BPSF56. This included weekly meetings from January 2025 to the present. In this part, she explained to the students the findings of the twilight paper. Additionally, she explained and shared several codes relevant to the work. This work is also going to lead to a publication.

Task 040 / Daeho Jin

Daeho Jin provided a couple of lectures to several Korean high school students about the sciences of NASA GSFC in the GSFC Visitor Center. (10/08, 10/10 in 2024, 05/30, 07/15 in 2025)

Task 102 / Tamás Várnai

Tamás Várnai hosted a graduate student from Colorado State University, who visited for two weeks to collaborate with Dr. Várnai on improving a three-dimensional radiative transfer model.

Task 113 / Daniel J. Miller

Daniel Miller mentored UMBC PhD student Adeleke Ademakinwa as he finished his final dissertation project working on cloud droplet number concentration retrievals and the impact of retrieval artifacts due to 3D radiative effects. Daniel Miller serves on the Ph.D. Committee for Zaid Bakri at Michigan Technological University as well as mentoring another Michigan Tech Ph.D. student, Nithin Allwayin, on a common research project. Each of these projects relate to future collaborative research with colleagues at Michigan Tech that could receive NSF/NOAA funding – if not potential relevance to future NASA ROSES calls.

Task 114 / Jae N. Lee

Jae Lee mentored and served as an outside thesis advisor for Ane Peterson Dyrkorn's master thesis, "Water Vapour Changes after Hunga Tonga Volcanic Eruption" (Department of Physics, Norwegian University of Science and Technology (NTNU)). Jae Lee hosted a TSIS-2 booth, handed out new mission information and promoted NASA Sun-Climate Symposium at AGU 2024.

Task 132 / Yingxi Shi

Dr. Shi mentored two PhD students from UMBC and Towson University on their dissertation research. Dr. Shi is also part of the large outreach event hosting students visiting GSFC.

Task 170 / Colten Peterson

Colten Peterson mentored an undergraduate intern who was working at GSFC under his sponsor during Summer 2025. The project involved producing a cloud thermodynamic phase algorithm for an airborne imager flown during the NASA ARCSIX campaign. Dr. Peterson met with the intern frequently and helped the intern to further understand the basics of active and passive cloud remote sensing in polar regions, especially in the context of airborne science campaigns. The intern was taught how to process hyperspectral imagery into reflectance and to co-locate lidar-derived cloud profiles with the imager reflectances. Overall, the intern was able to evaluate cloud phase spectral tests on liquid and ice cloud scenes observed during ARCSIX, which resulted in a prototype cloud phase algorithm that is being further explored.

Task 195 / Alexander Matus

Dr. Matus led an international working group on hydrology and the global water cycle as an active member of the GEWEX Early Career Researcher workshop.

ATMOSPHERIC CHEMISTRY AND DYNAMICS LABORATORY CODE 614

Task 019 / Fei Liu

Fei Liu was invited to visit Departments of Atmospheric & Earth Science, the University of Alabama in Huntsville on Oct 29 – Nov 4 and give a talk in the department seminar.

Task 047 / Hiren Jethva

Hiren Jethva participated in a couple of panel discussions on the mainstream news media ([NDTV of India](#)) to discuss the agricultural biomass burning events and associated pollution over northern India. His work, mostly shared through X (formerly Twitter), was also cited by several news media agencies in India. Hiren Jethva's ongoing research work on the stubble burning in northern India was also referred to in this [NASA Earth Observatory article](#).

Task 138 / Anne Thompson

Anne Thompson served as Panel Member at the 2024 IGAC/CACGP quadrennial symposium, Kuala Lumpur, Malaysia on "The Future of Atmospheric Chemistry Research" 12 Sept. 2024. Anne Thompson presented a seminar at Dept Colloquium and Visit: Dept. of Atmospheric Sciences, Texas A & M, College Station, TX, 13 Nov 2024: "The SHADOZ (Southern Hemisphere Additional Ozonesondes) Network at 25 Years: Tropical Ozone Variability and Trends"

Task 147 / Jason St. Clair

The NASA SARP student program also provided an opportunity for mentorship of students, with about 25 students getting an opportunity to fly with GSFC instruments on research flights and talk with scientists about data and science careers when not flying.

Task 172 / Caterina Mogno

Caterina Mogno volunteered as student presentation judge at the American Geophysical Union (AGU24), Washington, DC, Dec 2024.

Task 177 / Apoorva Pandey

Apoorva Pandey participated in the NASA Student Airborne Research Program as a flight scientist for student flights. Apoorva Pandey also participated in multiple outreach activities at schools and colleges in Kigali, Rwanda, as part of establishing a new Pandora monitoring site.

**Task 179 / Doyeon Ahn**

Doyeon Ahn gave a lecture and led a discussion at “Public Health and the Environment” at the Young Southeast Asian Leaders Initiative (YSEALI) forum hosted by U.S. Department of State, September 30, 2024, Washington DC.

Task 205 / Michael D. Himes

Dr. Himes has informally mentored a motivated high school student that reached out via email expressing interest in remote sensing. Under the advice of Dr. Himes, the student has successfully carried out an investigation into atmospheric retrieval for their school’s summer science research program.

Task 208 / Johanna Canet

Dr. Canet mentored UMD graduate student Emily Hunt during the NSF NCAR GOTHAAM field campaign.

CRYOSPHERIC SCIENCES LABORATORY

CODE 615

Task 202 / Elizabeth Ultee

Mentored a student intern through the GSFC summer internship program. Visited two schools in Ilulissat, Greenland, and presented to more than 150 students. Completed museum residency at ILLU Science & Art Hub in Ilulissat, Greenland, which included open days for locals to visit the science team and discuss our work. Presented to an audience of 30 early-career researchers in Perú through an invited seminar with IWA – Young Water Professionals Perú.

Task 234 / David Le Vine

Dr. Le Vine was a member of the Student Paper Competition Committee at the International Geoscience and Remote Sensing Symposium (IGARSS) 2025. Dr. Le Vine was also a member of the Technical Committee, Ocean Salinity and Temperature, for IGARSS 2025.

OCEAN ECOLOGY LABORATORY

CODE 616

Task 004 / Susanne Craig

Susanne Craig continued the mentorship of a former summer student, Dorothy Grimmer, who is now a PhD candidate at Texas A&M University. Susanne Craig served as a science mentor during PACE Hackweek at UMBC, 3-7 August 2025. <https://pacehackweek.github.io/pace-2025/>.

Task 005 / Violeta Sanjuan Calzado

Dr. Sanjuan Calzado is PhD advisor to Marina Gutierrez, a student from the University of Las Palmas de Gran Canaria, Spain, with a PhD thesis studying primary productivity in the Weddell Sea, Antarctica.

Dr Sanjuan Calzado was lead organizer for the Ocean Optics XXVI conference in Las Palmas de Gran Canaria, Spain, from October 6th -11th 2024. This is the lead conference in hydrological optics and gathers every 2 years worldwide. This edition was proposed and organized by Dr Sanjuan Calzado, with record attendance of about 400 international attendees from 33 countries. The conference included short courses and workshops, over 50 oral, plenary and award presentations as well as over 285 poster presentations. Dr Sanjuan Calzado also gathered funding from local institutions sponsoring the event (<https://2024.oceanopticsconference.org/>).

Task 029 / Bridget Seegers

Bridget Seegers participated in outreach from Research Vessel *Blissfully* where she virtually visited three classrooms during the PACE-PAX field campaign. These [events](#) allowed students to see the research vessel and instruments and ask questions to a scientist about research and life as a scientist.

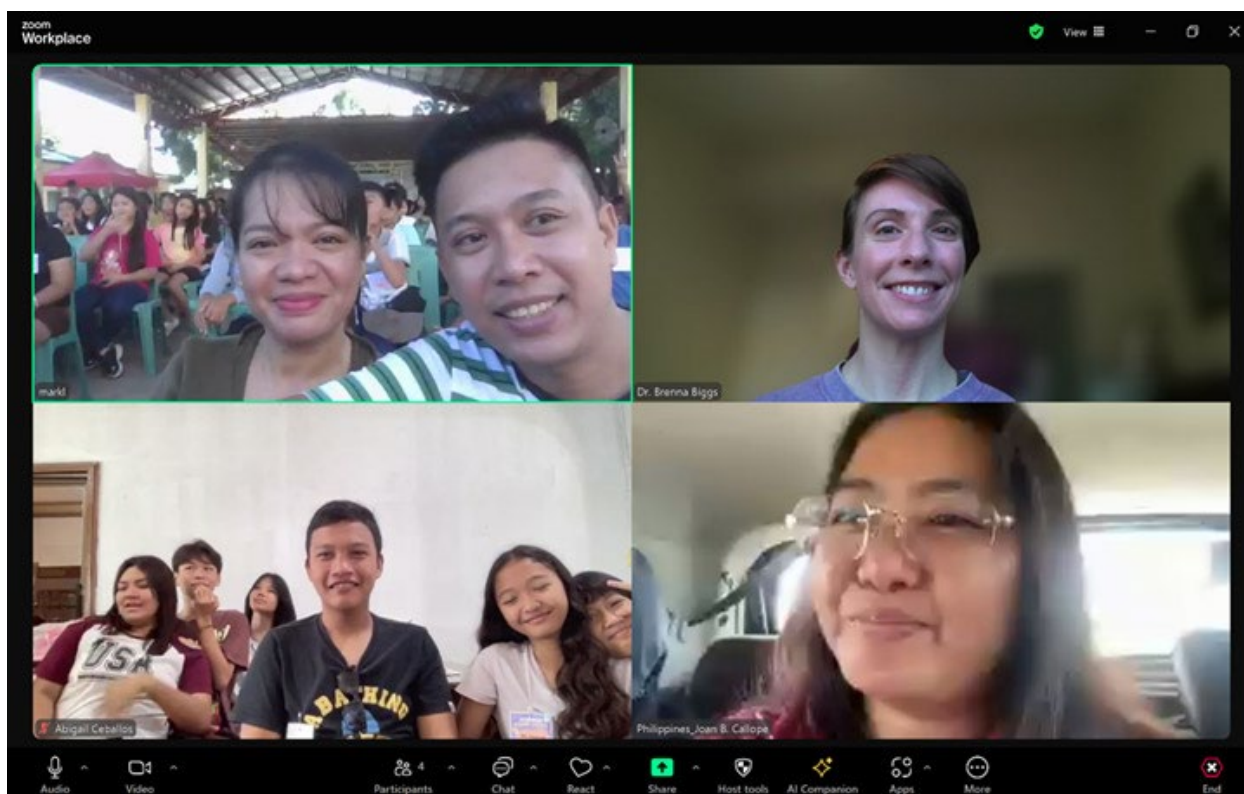


Photo: Students and faculty at Coloscaoyan National High School in the Philippines during a PACE-PAX outreach event. Credit: Brenna Biggs.

Bridget Seegers was invited as a NASA center representative with expertise to support a nearshore coastal water user needs assessment on behalf of the NASA Earth Action Water Resources Program. Bridget Seegers advised a post-doctoral researcher working on Sentinel-2 water quality products with funds she secured from a USACE proposal.

Task 048 / Andrew Sayer

Andrew Sayer was a mentor (jointly with Dr. Ivona Cetinić) of Jakob Werdell, a recent graduate, for a summer internship. Jakob investigated links between stratospheric aerosol anomalies and ocean color anomalies following up on our team's recent study [Franz et al. \(2024\)](#).

Task 049 / Inia M. Soto Ramos

Inia Soto Ramos mentored one full summer intern and assisted with the mentoring of another intern in Summer 2025. Inia Soto Ramos was an invited speaker and gave a virtual talk on April 29, 2025, to the Seminar for the Marine Plankton Diversity and Ecology class at [ASU Bermuda Institute of Ocean Sciences](#). On November 7, 2024, Inia Soto Ramos was an invited speaker for the IOOS DMAC Tech Webinar. Inia Soto Ramos presented at both PACE 100- and 500-days celebrations.

Task 161 / Ian Carroll

Ian Carroll was a co-organizer for the PACE Data Hackweek held at UMBC from Aug 3-7, 2025.

Task 017 / Ivona Cetinić

Ivona mentored four summer interns at NASA GSFC. Ivona also served on the Ph.D. committee for Lou Andres at Sorbonne Universite. Additionally, Ivona mentored Andy Henning, Charles Wallace, Cory Platt, David Rivers, Jessica Gochicoco, Sam Ippisch, Ivan Zlatanov, Satoshi Seida

(Tosh), John Wu, and Scotty Smith at Harvard University's Data Science Master Program. Ivona also mentored Post Doctoral researchers Max Beal and Anna Windle DiPaola with Jeremy Werdell at NASA GSFC.

Task 175 / Sean Foley

For the 2025 PACE Hackweek, Sean Foley was involved in various ways. He helped organize the event, updated his 2 former tutorial notebooks and contributed to 3 new tutorials, which are publicly facing and persistent resources that increase the reach and impact of PACE, and are highly visible on the [PACE Help Hub](#). He presented a demo with GESTAR II colleague Meng Gao on the usage of data from the polarimeters, and mentored / assisted participants with their projects. Sean Foley's advice and public-facing tutorials on the usage of multi-angle data were used by contributors to an immersive art installation involving PACE at the Kennedy Center.

Task 174 / James Allen

James Allen ran a tutorial session for the 2025 PACE Hackweek (<https://pacehackweek.github.io/pace-2025/>), introducing scientists to toolkits designed to download, collocate, and validate field and satellite observations at UMBC on August 4, 2025.

James Allen served as a mentor for PACE Hackweek 2025 participants developing Jupyter Notebooks for processing and visualizing PACE satellite data at UMBC, August 3-7, 2025.



Photo: Attendees, researchers, and faculty at 2025 PACE Hackweek, UMBC. Credit: James Allen.

Task 183 / J. Vanderlei Martins

The Task involves mentoring and experiential learning of graduate students: Noah Sienkiewicz has finished his PhD including data from this task, Rachel Smith has actually participated in the field campaign, on instrument calibration and on data analysis, and Nirandi Jayasinghe is using AirHARP-2 data for her work, both Ph.D. students in Atmospheric Physics program at UMBC. These students are placed in professional environments and function as peers with established instrument scientists stationed at UMBC and at Goddard, picking up knowledge, skills and experience along the way. The students are responsible for calibration, instrument operations, data collection, development of software infrastructure, analysis and interpreting results. These students also provided leadership for UMBC's Earth Day symposium, while Dr. Martins and

other professionals working on the Task participated in Earth Day with tours, demonstrations and sitting on the panel discussion. They are both participating actively in the PACE-PAX aircraft campaign and will help to coordinate the flight and instrument activities, as well as data processing and analysis.

HYDROLOGICAL SCIENCES LABORATORY

CODE 617

Task 033 / Nishan Kumar Biswas

Nishan Kumar Biswas participated and presented a talk as a keynote speaker on “Flooding in Bangladesh: A satellite perspective” in the special webinar: Bangladesh Recent Floods, Causes, Consequences, and Countermeasures organized by Bangladesh Environment Network on September 1st, 2024.

Nishan Kumar Biswas led a talk and networking event on “Capacity Building Training of Meteorologists for Development of Dynamic Landslide Early Warning System” at the Bangladesh Meteorological Department from July 28-31, 2025, Dhaka, Bangladesh supported by Regional Integrated Multi-Hazard Early Warning System (RIMES), Save the Children, and Caritas, Bangladesh.

Nishan Kumar Biswas mentored a group of four students from the Department of Water Resources Engineering, Bangladesh University of Engineering and Technology (BUET) in completing their undergraduate thesis on application of satellite remote sensing for water resources monitoring and assessment over Bangladesh.

Nishan Kumar Biswas served as a co-supervisor of the undergraduate thesis committee from the Department of Disaster Science and Climate Resilience of University of Dhaka, Bangladesh. The thesis was focused on the application potential of Surface Water and Ocean Topography (SWOT) over Bangladesh rivers.

Task 030 / Robert Emberson

Robert Emberson mentored UMBC student Pranali Talla as part of NASA New Investigator Program Studentship. Robert Emberson was the lead instructor, NASA ARSET Training Course: Landslide Monitoring and Risk Assessment Using NASA Earth System Data.

BIOSPHERIC SCIENCES LABORATORY

CODE 618

Task 109 / Anthony Campbell

Anthony Campbell is serving on Blake Steiner’s PhD committee at Old Dominion University. Anthony Campbell is serving on Pati Thakali’s PhD committee at the University of Wits, South Africa. He presented their work at AGU2024 and submitted his first manuscript to JGR: Biogeosciences. Anthony Campbell mentored a high school student through the NASA Neurodiversity Network (N3) internship program in Summer 2025. Anthony Campbell is

mentoring a Boston University PhD student who submitted their work on mapping salt marsh species in Plum Island, MA to AGU2025.

Task 122 / Petya Campbell

Dr. Campbell contributed to the STELLA outreach activities.

Task 133 / Arif Rustem Albayrak

Arif Albayrak mentored intern Saameeriny Kalapala, Graduate Student in Biological Data Science, Arizona State University. Project Title: Flood Extent and Water Level Estimation from SAR with Data-Model Integration (NASA Internship, 2025). Mr. Albayrak guided her research on Sentinel-1 SAR and QGIS for flood extent mapping. Use case: Study of the 2025 Texas Hill Country floods. This internship was finalized with UMBC Physics department talk.

Task 134 / K. Fred Huemmerich

Taught Special topics in Geography: Arctic Geography, GES302, UMBC, Fall 2024
Advisor for masters student at Virginia Tech

Task 158 / K. Fred Huemmerich

Fred Huemmerich has mentored two PhD students from Virginia Tech.

Task 217 / Natalia L. Quinteros Casaverde

Dr. Quinteros Casaverde participated in one panel during the celebration of Women and Girls in STEM in Panama City on February 17th, 2025 (<https://vozeladiazpora.com/cientificas-de-la-nasa-y-jovenes-panamenas-inspiran-a-las-nuevas-generaciones/>).

Dr. Quinteros Casaverde gave a talk about the AVUELO campaign tailored to the Panamanian audience at the Gambi seminar series titled "AVUELO! AVIRIS is Coming to Panama. A Collaborative Study of Tropical Ecosystem Function/ AVUELO! AVIRIS viene a Panamá. Un Estudio Colaborativo sobre el Funcionamiento de Ecosistemas Tropicales." In Spanish with slides presented in English for the English-speaking students and researchers.

Dr. Quinteros Casaverde participated in a panel titled "I Got My Bachelor's Degree, Now What?", 2025 Ecological Society of America in Baltimore MD on August 12th, 2025. During the panel she engaged with recent graduates where she talked about her career path and gave advice about how to prepare for a future in science and academia.

Task 228 / Brian Markham

Dr. Brian Markham was interviewed by Laura Rocchio of the Landsat Science Office. The discussion was a summary of Dr. Markham's career achievements on the Landsat Program: <https://landsat.gsfc.nasa.gov/article/data-as-good-as-it-gets-a-discussion-with-brian-markham/>.

Task 229 / Kelsey Huelsman

Dr. Huelsman was Co-Chair of the Earth Science Information Partners (ESIP) Biological Data Standards Cluster.

GEODESY AND GEOPHYSICS LABORATORY CODE 61A

Task 188 / Stacey Huang

Dr. Huang mentored one graduate student in the Emmett Interdisciplinary Program in Environment and Resources (E-IPER) at Stanford University and met with the student once.

G E S T A R I I S E M I N A R S E R I E S

The GESTAR II Seminar Series presentations are held on Tuesdays or Thursdays monthly. Seminars average 50-85 attendees and include an engaged Q&A session following a 45-minute talk.

Carol Kuehn and Dominique Footes (SURA) organized and facilitated this series. Speakers came from universities, research facilities, and within GESTAR II. The chart below details the speakers who presented in the past year.

Speaker Name	Title of Seminar Talk	Affiliation	Date of Talk
Dr. Gaige Kerr	"Air Pollution Inequity in the United States: The View from Space"	George Washington Univ. Climate and Health Institute	October 10, 2024
	GESTAR II Fellows Presentations Fellows: Chhaya Kulkarni, UMBC Yu-An Chen, Colorado State University Ajan Coleman, Morgan State University Praveena Kulandhaivel, Arizona State University Alexis Cole, Pennsylvania State University Madison Shogrin, Colorado State University		October 22, 2024
Dr. Veljko Petkovic,	"Data-driven Precipitation Retrievals: Understanding Uncertainties and Information Content"	ESSIC/UMD	November 14, 2024
Dr. Gloria Manney	"Linking a Polar Vortex Centered View of Stratospheric Circulation to Upper Tropospheric Circulation and Composition"	NWRA	February 13, 2025
Mr. Sean Foley	"Retrieving 3D Cloud Structure from Multi-angle Observations with Neutral Rendering"	MSU	February 25, 2025
Dr. Lyatt Jaegle	"Blowing Snow over Arctic Sea Ice: Integrating modeling, field measurements, and satellite observations"	University of Washington	April 10, 2025

Dr. Skylar Bayer	"Alaska Regional Office Habitat Conservation Division: Essential Fish Habitat Science and Management"	NOAA Fisheries Alaska Regional Office	May 8, 2025
Double check if not in student section.	GESTAR II Visiting Fellows and Graduate Student Presentations Fellows: Joshua Mallay, Pennsylvania State University Saameeriny Kalapala, Arizona State University Kamal Aryal, University of Maryland, Baltimore County		August 26, 2025
Dr. Stephanie Shaw	Need seminar title "Air Quality Aspects of the Electric Power Industry: Emerging Research Directions in the Energy Transition."	EPRI	September 23, 2025

COMMUNICATIONS/MEDIA



GLOBAL MODELING AND ASSIMILATION OFFICE CODE 610.1

Manisha Ganeshan / Task 052

Manisha Ganeshan contributed to preparing a [NASA GMAO science snapshot](#) summarizing the published work on Tropical Cyclone Idai.

Erica McGrath-Spangler / Task 052

Erica McGrath-Spangler generated all of the figures for a [NASA GMAO Science Snapshot](#), which focused on her work with evaluating the impact of NASA's SMAP soil moisture information on numerical weather prediction.

Young-Kwon Lim / Task 061

Young-Kwon Lim continued collaboration with scientists and visualization experts to complete a video illustrating the transition from La Niña to El Niño in recent years. The animation depicted the evolving oceanic and atmospheric spatial patterns during this shift, accompanied by narration. After completion, the video was presented at the 2024 AGU meeting by project lead Dr. Atousa Sabari (code 606.4). Dr. Lim was responsible for generating and providing the atmospheric data used in the animation.

Task 112 / Tianle Yuan

Tianle Yuan was interviewed by a few major press outlets, including the [NY Times](#), Washington Post, etc.

Carl Malings / Task 129

Carl Malings contributed to an article on how Earth Intelligence can help improve air quality and respiratory health, which was published on the [Group on Earth Observations website](#) (March 17, 2025). Carl Malings was quoted in an article by a Bulgarian fact-checking organization, which refutes a claim being circulated in Bulgarian social media that “NASA found the area of Tsigov Chark and Batak Dam has the cleanest air on the planet,” (July 1, 2025): <https://factcheck.bg/ne-e-vyarno-che-nasa-e-obyavila-cigov-chark-bracigovo-ili-ravnogor-za-rajon-s-naj-chistiya-vazduh-na-planetata/>

Katherine H. Breen / Task 140

Katherine Breen presented [Hyperwall talks](#) at Supercomputing 2024.

Amin Dezfuli / Task 162

Dr. Dezfuli was interviewed by Univision DFW TV about climate impacts on bird migration in North America. October 2024 (<https://www.univision.com/local/dallas-kuvn/descubre-migracion-aves-texas-por-que-peligro-espectaculo-natural>).

Task 176 / Janak Joshi

Janak Joshi contributed to a NASA GMAO Science Snapshot: July–August 2024 Saharan Dust Transport (<https://gmao.gsfc.nasa.gov/science-snapshots/july-august-2024-saharan-dust-transport>).

**ATMOSPHERIC CHEMISTRY AND DYNAMICS
LABORATORY
CODE 614**

Michael D. Himes / Task 205

Dr. Himes contributed to an article about his NRT aerosol paper posted on myUMBC (July 24, 2025): <https://my3.my.umbc.edu/groups/gestar2/posts/151163>.

**CRYOSPHERIC SCIENCES LABORATORY
CODE 615**

Elizabeth Ultee / Task 202

Lizz Ultee was interviewed for an article in *National Geographic* about global glacier change (November 15, 2024): <https://www.nationalgeographic.com/environment/article/glacier-ice-melting-climate-change-sea-level-rise>.

**OCEAN ECOLOGY LABORATORY
CODE 616**

Violeta Sanjuan Calzado / Task 005

Violeta Sanjuan Calzado was lead narrator for PACE mission on the upcoming Earth Information Center documentary, filmed during 2024-2025. Dr. Sanjuan Calzado has contributed to numerous TV, radio and newspaper interviews during the past year, some of them listed here:

- Newspaper, Progreso hispano news. (April 22, 2024). Talking about PACE mission for Earth Day
- TV, Animal Politico. (April 22, 2024). TV interview talking about PACE mission for Earth Day. https://animalpolitico.com/tendencias/ciencia-tecnologia/mision-pace-nasa-oceanos?rtbref=rtb_tfb6i61afw3anhttkpx_1714205608501
- TV, Telemundo Houston. (April 22, 2024). Media interview talking about PACE for Earth Day
- TV, Radio Television Canaria. Interview about Ocean Optics conference in Las Palmas de Gran Canaria. <https://www.facebook.com/watch/?v=1056373379611070&rdid=e5abWhpOlvuUZlI4>
- Radio, CADENA SER. (February 6, 2024). Radio interview for PACE launch <https://cadenaser.com/nacional/2024/02/06/la-nasa-lanza-el-mayor-satelite-para-vigilar-la-contaminacion-del-aire-y-el-mar-cadena-ser/>
- TV, EFE News Miami. (February 6, 2024). Interview for news agency for PACE mission launch. Interview for Ocean Optics XXV congress in Las Palmas de Gran Canaria, Spain. <https://efe.com/canarias/2024-10-09/el-nuevo-satelite-pace-de-la-nasa-detecta-olas-de-calor-marinas-de-dos-y-tres-meses-en-el-pacifico/>

Ivona Cetinić / Task 017

Ivona Cetinić served in several media functions throughout the past year:

- Hyperwall at EGU, April 2025
- Interviewed and narrator for [Wave: From Space to Ocean](#) @ Kennedy Center, summer 2025
- Part of Wild Kratts, episode “[Mini Heroes and Mighty Mouths](#)” (aired in 2025)
- Interviewed for a piece on Climate change in NYTimes, <https://www.nytimes.com/2025/03/03/climate/plankton-ocean-warming.html#> March 2025
- TV interviews for Global temperature release, <https://www.youtube.com/watch?v=0dxXyztF2ZQ>, January 2025
- PACE-PAX video <https://www.youtube.com/watch?v=cCsuck3dJU4>, December 2024
- Interviewed for <https://www.nasa.gov/earth/nasa-earth-scientists-take-flight-set-sail-to-verify-pace-satellite-data/>, September 2024
- Contributed to NASA Earth Observatory, Image of the day: <https://earthobservatory.nasa.gov/images/154699/a-sea-aswirl-with-chlorophyll>, August 2025
<https://earthobservatory.nasa.gov/images/153782/phytoplankton-flourish-in-patagonian-waters>, January 2024

Bridget Seegers / Task 029

Bridget Seegers contributed to an article about using NASA ocean color data to monitor for North Atlantic right whale food and therefore right whale habitat.

<https://science.nasa.gov/earth/nasa-data-helps-map-tiny-plankton-that-feed-giant-right-whales/new>

HYDROLOGICAL SCIENCES LABORATORY

CODE 617

Nishan Kumar Biswas / Task 033

Nishan Kumar Biswas contributed to the research on Urban Heat in the Lower Mekong Delta was highlighted in the NASA Landsat Science homepage:

<https://landsat.gsfc.nasa.gov/article/urban-heat-in-the-lower-mekong-delta/>

Fadji Zaouna Maina / Task 057

Fadji Maina's research was featured as one of the top NASA Earth Science Discoveries of 2024. See "Multidecadal land reanalysis over High Mountain Asia showcases a pioneering multivariate land data assimilation system (WEC)" in [A Year in Review](#), 2025.

BIOSPHERIC SCIENCES LABORATORY

CODE 618

Petya Campbell / Task 122

Dr. Campbell contributed to the articles about the ABoVE project *Clarifying linkages between canopy SIF and physiological function for high latitude vegetation*. The articles were written by Dr. K. F. Huemmrich, and appeared in the Earth Observatory's Notes from the Field:

<https://earthobservatory.nasa.gov/blogs/fromthefield/2024/05/06/springtime-in-the-deciduous-forest/>.

Arif Rustem Albayrak / Task 133

Feb 5, 2025: Arif Albayrak contributed to an article published by Fraunhofer HHI, Germany titled: "Fraunhofer HHI experts underscore the value of XAI in Geosciences",

https://www.hhi.fraunhofer.de/en/press/news/fraunhofer-hhi-experts-underscore-the-value-of-xai-in-geosciences.html?utm_source=chatgpt.com.

K. Fred Huemmrich / Task 134

Fred supported the production of data visualization from NASA Goddard Science Visualization Studio, Global Views of PACE Land Vegetation Data, June 5, 2025,

<https://svs.gsfc.nasa.gov/5548/>. Fred was also interviewed for NASA Goddard Science Visualization Studio video, Leaf Year: Seeing Plants in Hyperspectral Color, June 5, 2025, <https://svs.gsfc.nasa.gov/14850>, and for a news item by Sara Hansen, UMBC, July 29, 2025, <https://umbc.edu/stories/pace-data-plant-health/> This story was picked up by Phys.org news, <https://phys.org/news/2025-07-nasa-pace-enables-method-global.html>.

GEODESY AND GEOPHYSICS LABORATORY

CODE 61A

Kyle Gwirtz / Task 204

Dr. Kyle Gwirtz gave a talk along with Travis Davis, Matthias Morzfeld, Catherine Constable, Alexandre Fournier, Gauthier Hulot; "Using machine learning to search for precursors to

excursions and reversals," 14th Institute for Rock Magnetism Conference, University of Minnesota, June 2025.

REVIEWER ACTIVITIES

EARTH SCIENCES DIVISION

CODE 610

Assaf Anyamba / Task 221

Assaf Anyamba is an Editorial Board Member with AGU *GeoHealth Journal* responsible for Vectorborne Diseases Reviews

<https://agupubs.onlinelibrary.wiley.com/hub/journal/24711403/editorial-board.html>.

GLOBAL MODELING AND ASSIMILATION OFFICE

CODE 610.1

Bryan Karpowicz / Task 006

Bryan Karpowicz served as a reviewer for *Journal of Geophysical Research – Atmospheres* from February-August 2025, and a journal article for the *Journal of Atmospheric and Oceanic Technology*, July-September 2025.

Nikki Privé / Task 007

Nikki Privé reviewed publications for *Journal of Advances in Modeling Earth Systems*, *Journal of Atmospheric and Oceanic Technology*, and *Earth and Space Science*.

Pamela Wales / Task 022

Pamela Wales was a reviewer for a NASA ROSES proposal review panel and for the *Journal of Geophysical Research – Atmospheres* and *Earth Space Sciences* journals.

Lionel Arteaga / Task 023

Lionel Arteaga served as a manuscript reviewer for *Modeling Earth Systems and Environment*, *Remote Sensing of Environment*, *Frontiers, Communications Earth and Environment*, *Nature Communications*, *Global Change Biology*, and for a NSF proposal. Dr. Arteaga served as a reviewer of three proposals for the National Academies of Sciences in August 2025, and for a proposal reviewer for a NASA ROSES panel in March 2025.

Brad Weir / Task 025

Brad Weir served as reviewer for several journals and on NASA proposal review panels.

Natalie Thomas / Task 027

Natalie Thomas served as a reviewer for *Journal of Climate* and *Journal of Geophysical Research*, and on a review panel for NASA FINESST.

Young-Kwon Lim / Task 061

Young-Kwon Lim has reviewed manuscripts for several scientific journals, including *Journal of Climate*, *Climate Dynamics*, *Journal of Geophysical Research – Atmospheres*, and *Nature*

Communications. In addition, he has been serving as the executive editorial coordinator for the *Asia-Pacific Journal of Atmospheric Sciences*.

Allison Collow / Task 051

Allison Collow reviewed publications for the *Journal of Geophysical Research and Atmospheric Environment*.

Dhruva Kathuria / Task 093

Dhruva Kathuria served as a reviewer for *Water Resources Research*, *Journal of Geophysical Research -Machine Learning* and *Remote Sensing of Environment*, and as a Proposal Review panel for a NASA proposal.

Andrew Fox / Task 094

Andrew Fox served as a reviewer for AGU *Journal of Advances in Modeling Earth Systems* and EGU journals. He also served as a panel reviewer for NASA on “The Science of PACE.”

Yujin Zeng / Task 124

Yujin Zeng served as a reviewer for *Geophysical Research Letters* this past year.

Carl Malings / Task 129

Carl Malings reviewed manuscripts for *Climate and Atmospheric Science* (Springer Nature), October 2024, *EGUsphere* (Copernicus), December 2024, *Geohealth* (AGU), March 2025, and *Climate and Atmospheric Science* (Springer Nature), June 2025.

Eun-Gyeong Yang / Task 163

Eun-Gyeong Yang served as a reviewer for *Journal of Geophysical Research: Atmospheres* (two papers).

Retha M. Mecikalski / Task 169

Retha Mecikalski served as a reviewer for a National Science Foundation proposal, and as reviewer for a journal paper in *Weather and Forecasting*.

Janak Joshi / Task 176

Janak Joshi served as a peer reviewer and completed two reviews for the journal *Aeolian Research* (Elsevier).

Meng Zhou / Task 185

Meng Zhou served as a reviewer for three articles in *Remote Sensing of Environment*, one in the *Journal of Geophysical Research* and another in the *Geoscientific Model Development*.

Fei Liu / Task 186

Fei Liu reviewed one publication for *Atmospheric Chemistry and Physics*, and four for *Journal of Geophysical Research*. Dr. Liu also participated in the NASA ROSES ACMAP review panel and provided scientific evaluation for a proposal of the Swiss National Science Foundation.

Ahreum Lee / Task 209

Ahreum Lee reviewed a journal article for *Journal of Geophysical Research – Atmosphere* in April 2025, and a journal article for *Geoscientific Model Development* (GMD) in May 2025.

Viral Shah / Task 212

Dr. Shah served as a reviewer for about twelve peer-reviewed manuscripts, and a proposal reviewer for the New Zealand Royal Society.

MESOSCALE ATMOSPHERIC PROCESSES LABORATORY CODE 612

Liang Liao / Task 053

Liang Liao served as reviewer for three journal articles submitted to *Journal of Geophysical Research* and *Journal of Atmospheric and Oceanic Technology* (JTECH).

Mircea Grecu / Task 055

Mircea Grecu served as a member of the NASA Future Investigators in NASA Earth and Space Science and Technology (FINESST) review panel.

Jasper Lewis / Task 101

Jasper Lewis served as a peer reviewer for multiple journal articles, including *Atmospheric Research*, *Journal of Geophysical Research - Atmospheres*, and *Remote Sensing of the Environment*.

Ali Tokay / Task 123

Ali Tokay reviewed two articles each for the *Journal of Hydrometeorology* and for the *Journal of Atmospheric and Oceanic Technology*.

Yuli Liu / Task 149

Yuli Liu served as a reviewer for *Journal of Quantitative Spectroscopy and Radiative Transfer* and *Advances in Atmospheric Sciences*.

Sean Foley / Task 181

Sean Foley served as a reviewer for *Atmospheric Measurement Techniques*, and he performed red team reviews for ROSES A.28 Remote Sensing Theory.

CLIMATE AND RADIATION LABORATORY CODE 613

Sergey Korkin / Task 001

Sergey Korkin served as a reviewer for four papers: three for *Journal of Quantitative Spectroscopy and Radiative Transfer* (JQSRT), and one for the *Journal of Optical Society of America* (JOSA-A). Dr. Korkin also reviewed three NASA ROSES-2024 proposals seeking funding from the Remote Sensing Theory (RST) program. In December, Dr. Korkin also participated as a member of the Red Team review and commented on two proposals submitted to the ROSES Decadal Survey Incubator (DSI) program.

Manisha Ganeshan / Task 012

Manisha Ganeshan served as a Reviewer for *Geophysical Research Letters*, *Journal of Hydrometeorology*, and *Remote Sensing* journals.

Junhua Liu / Task 014

Junhua Liu served as a reviewer for *Journal of Geophysical Research: Atmospheres*.

Jackson Tan / Task 018

Jackson Tan reviewed manuscripts for *Atmospheric Research*, *Geophysical Research Letters*, *Journal of Hydrometeorology* (in capacity as Editor), *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *Earth System Science Data*, *Journal of Geophysical Research Atmosphere*, and *Dynamics of Atmospheres and Oceans*.

Cornelius Csar Jude H. Salinas / Task 035

Jude Salinas served as a reviewer for a few manuscripts under the *Journal of Geophysical Research: Space Physics*, *Advances in Space Research*, *Frontiers in Astronomy and Space Sciences* and the *Atmospheric Chemistry and Physics* journal. Dr. Salinas was also a reviewer for the UMBC Strategic Awards for Research Transitions (START) proposals.

Young-Kwon Lim / Task 036

Young-Kwon Lim has reviewed manuscripts for several scientific journals, including *Journal of Climate*, *Climate Dynamics*, *Journal of Geophysical Research – Atmospheres*, and *Nature Communications*. In addition, Dr. Lim has been serving as the executive editorial coordinator for the *Asia-Pacific Journal of Atmospheric Sciences*.

Daeho Jin / Task 040

Daeho Jin served as a reviewer three times for a peer-reviewed journal.

Guoyong Wen / Task 043

Guoyong Wen reviewed two manuscripts for *Journals of Geophysical Research*.

Tamás Várnai / Task 102

As a member of the editorial board of *Remote Sensing*, Tamás Várnai made editorial decisions for 30 manuscripts submitted to the journal. He also reviewed three manuscripts for *Remote Sensing*, two each for *Atmospheric Measurement Techniques* and for *Atmospheric Chemistry and Physics*, and one each for *Journal of Quantitative Spectroscopy and Radiative Transfer*, *Atmospheric Environment*, *Atmosphere*, and *Geophysical Research Letters*. Additionally, Dr. Várnai also reviewed two proposals submitted to NASA.

Anin Puthukkudy / Task 110

Anin Puthukkudy reviewed multiple articles in *Remote Sensing of Environment*, *Remote Sensing*, *Atmospheric Environment*, *Frontiers in Remote Sensing*, and *Optics express*.

Daniel J. Miller / Task 113

Daniel Miller participated as a reviewer for three *Journal of Geophysical Research* (JGR) manuscripts.

Yujie Wang / Task 118

Yujie Wang served as reviewer for following journals: *Frontiers in Earth Science*, *Remote Sensing*, *Atmospheric Research*, *Atmospheric Environment*, *Environmental Pollution*, and *The Science of The Total Environment*.

Myungje Choi / Task 120

Myungje Choi reviewed three papers for *IEEE Transactions on Geoscience and Remote Sensing*, *Journal of Geophysical Research – Atmosphere*, and *Journal of Quantitative Spectroscopy and Radiative Transfer*.

Yingxi Shi / Task 132

Yingxi Shi served as reviewer for five journals and reviewed fifteen papers.

Mijin Kim / Task 165

Mijin Kim served as reviewer for a manuscript submitted to *EGUsphere*, in March 2025. Dr. Kim also served as reviewer for a manuscript submitted to *IEEE Transactions on Geoscience and Remote Sensing*, in May 2025.

Jianyu Zheng / Task 193

Jianyu Zheng served as a reviewer for *JGR-Atmosphere*, *Journal of Quantitative Spectroscopy and Radiative Transfer*, *Remote Sensing of Environment*, *Remote Sensing*, *Asia-Pacific Journal of Atmospheric Sciences*.

Alexander Matus / Task 195

Dr. Matus served as a reviewer for journals such as *Geophysical Research Letters* and *Atmospheric Chemistry and Physics*.

**ATMOSPHERIC CHEMISTRY AND DYNAMICS
LABORATORY
ODE 614**

Daniel Anderson / Task 013

Daniel Anderson reviewed a proposal for NSF, as well as five papers for *Journal of Atmospheric Chemistry and Physics*, *Journal of Geophysical Research Atmospheres*, and *Geophysical Research Letters*.

Sarah Strode / Task 015

Sarah Strode served on a NASA proposal review panel and reviewed papers for *Atmospheric Chemistry and Physics* and *Atmospheric Environment*.

Feng Li / Task 064

Feng Li reviewed one manuscript for *Geophysical Research Letters*, one manuscript for *Global and Planetary Change*, one manuscript for *Communications, Earth & Environment*, and one manuscript for *Atmospheric Chemistry and Physics*.

Ghassan Taha / Task 084

Ghassan Taha reviewed a manuscript for *Atmospheric Chemistry and Physics*.

Huisheng Bian / Task 127

Huisheng Bian reviewed one article for *Journal of Geophysical Research* and one for *Atmospheric Chemistry and Physics*.

Anne Thompson / Task 138

Anne Thompson reviewed articles in *Atmospheric Chemistry and Physics*, *Journal of Geophysical Research – Atmospheres*, and *Atmospheric Measurement Technology*. Dr. Thompson also served as editor as of the Board of Reviewing Editors for *Proceedings of the Natl Academy of Sciences*.

Caterina Mogno / Task 172

Caterina Mogno served as a reviewer for GESTAR II UMBC Student Graduate Fellowship 2025-2026. She also served as a reviewer for the journal *Atmospheric Chemistry and Physics* and as a reviewer for NASA's Earth Science Data and Information Systems (ESDIS) - Measurement Unit Standards.

Apoorva Pandey / Task 177

Apoorva Pandey served as a reviewer for *Environmental Science and Technology*, *American Chemical Society Environmental Science & Technology Air* (ACD ES&T Air), and *Journal of Geophysical Research*. Dr. Pandey also served as a reviewer on NASA ACMAP review panel 2025.

Doyeon Ahn / Task 179

Doyeon Ahn reviewed a grant proposal submitted to the Swiss National Science Foundation (SNSF). Additionally, Dr. Ahn reviewed scientific manuscripts submitted to *EGUsphere*, *Environmental Research Communications*, and *Atmospheric Chemistry and Physics*.

Michael D. Himes / Task 205

Michael Himes reviewed three manuscripts: one for *Atmospheric Measurement Techniques*, one for *RAS Techniques and Instruments*, and one for *Astronomy & Astrophysics*.

**CRYOSPHERIC SCIENCES LABORATORY
CODE 615**

Paolo de Matthaeis / Task 016

Paolo de Matthaeis was an Associate Editor for the IEEE *Journal of Selected Topics in Applied Earth Observations and Remote Sensing*. Dr. de Matthaeis also reviewed two papers for IEEE *Transactions on Geoscience and Remote Sensing*, one paper for IEEE *Journal of Selected Topics in Journal of Atmospheric and Oceanic Technology*, and one paper for IEEE Access. Dr. de Matthaeis also served as reviewer for the RFI 2024 Workshop Proceedings, as well as the IGARSS 2025 and URSI AP-RASC 2025 conferences

Elizabeth Ultee / Task 202

Elizabeth Ultee reviewed manuscripts for *Science*, *Journal of Hydrology*, *Annals of Glaciology*, *Journal of Glaciology*, and *The Cryosphere*. Dr. Ultee also reviewed a grant proposal for the National Sciences and Engineering Research Council of Canada.

David Le Vine / Task 234

David Le Vine reviewed two papers for *Radio Science* and Institute of Electrical and Electronics Engineers (IEEE) Transactions on *Geoscience and Remote Sensing* (IEEE/TGRS).

OCEAN ECOLOGY LABORATORY

CODE 616

Susanne Craig / Task 004

Susanne Craig served as an NSF proposal reviewer, and as a Review Editor for *Frontiers in Remote Sensing*.

Violeta Sanjuan Calzado / Task 005

Violeta Sanjuan Calzado was a panel reviewer for the PACE science call, 'The Science of PACE' in May 2025. Dr. Sanjuan Calzado also reviewed two papers for *Frontiers in Remote Sensing*.

Ivona Cetinić / Task 017

Ivona Cetinić served on a panel review for NASA and NSF proposals. Dr. Cetinić also reviewed papers for *Journal of Geophysical Research – Oceans* and for *Optics Express*.

Bridget Seegers / Task 029

Bridget Seegers served on a NASA proposal review panel in Spring of 2025. Dr. Seegers also completed a technical review for a manuscript necessary for EPA clearance.

Andrew Sayer / Task 048

Andrew Sayer reviewed eleven articles for various journals and served on one NASA review panel. Dr. Sayer also served as an associate editor for *Atmospheric Measurement Techniques*, where he reviewed six papers. Dr. Sayer also reviewed seven proposals as part of UMBC's GESTAR II Graduate Fellowship selections and was a screener for entries for the AAAS annual Kavli Science Journalism Awards. The role of screeners is to meet as a panel to review entries for accuracy, timeliness, interest, and other criteria before making a shortlist to recommend which entries are sent to judges.

Inia M. Soto Ramos / Task 049

In June 2025, Inia Soto Ramos served as a 2018-2023 External reviewer for the Site Review Team for Texas Sea Grant. Dr. Ramos also served as a member of a hiring search committee for UCAR, and she was a GESTAR II Chair for promotions committee. Lastly, Dr. Ramos reviewed a NASA proposal and reviewed manuscripts for *Nature Communications* and *Remote Sensing of Applications*.

J. Vanderlei Martins, Xiaoguang (Richard) Xu, Anin Puthukkudy / Task 115

Richard Xu and Anin Puthukkudy reviewed multiple articles in *Remote Sensing of Environment*, *Remote Sensing*, *Atmospheric Environment*, *Frontiers in Remote Sensing*, *Optics Express*, *Remote Sensing of Environment*, and *Atmospheric Measurement Techniques*. Richard Xu is an Associate Editor of *Frontiers in Remote Sensing*.

Ian Carroll / Task 161

Ian Carroll conducted a peer-review for *Remote Sensing of the Environment*.

James Allen / Task 174

James Allen served as a reviewer for several papers in *Optics Express*, *EGUsphere*, and *Progress in Oceanography*.

HYDROLOGICAL SCIENCES LABORATORY CODE 617

Jinzheng Peng / Task 020

Jinzheng Peng reviewed two journal papers and served as a reviewer for eight abstracts submitted to the IGARSS 2025 conference.

Priscilla Mohammed-Tano / Task 020

Priscilla Mohammed reviewed three papers for the International Geoscience and Remote Sensing Symposium (IGARSS) 2025, and reviewed one journal article for the *IEEE Transactions on Geoscience and Remote Sensing*.

Robert Emberson / Task 030

Robert Emberson served as a reviewer for one NASA ROSES panel; three NASA SMDSS proposals; the USGS Small Grant Program; and for the *Journal of Geophysical Research* and *Geophysical Research Letters*.

Elijah Orland / Task 031

Eli Orland served as a Panel Reviewer for NSF proposals.

Thomas Stanley / Task 032

Thomas Stanley served as a reviewer for the *International Journal of Disaster Risk Reduction*, the *Scientific Data*, and the *Journal of Hydrology*.

Nishan Kumar Biswas / Task 033

Nishan Kumar Biswas served as a journal reviewer for *Earth's Future*, *Geophysical Research Letters*, *MDPI Remote Sensing*, and *Water Resources Research*. Dr. Biswas also served as a panel reviewer for the Le Studium Visiting Researcher award for the Loire Valley Institute for Advanced Studies in France.

Fadji Zaoua Maina / Task 057

Fadji Maina served as an Editor for *Hydrology and Earth System Sciences*, as an Associate Editor for *Scientific Report*, as a NASA ROSES panelist for grant reviews, a User Working Group Member of NSIDC, and a Member of AMS hydrology committee. Dr. Maina also served as a Reviewer for the following journals: *Journal of Hydrology*, *Geophysical Research Letters*, *Water Resource Research*, *Journal of Hydrometeorology*, *Advances in Climate Change Research*, *Nature Communications*, and *Hydrological Processes*.

Pukar Amatya / Task 063

Pukar Amatya served as a reviewer for the journal *Engineering Geology*.

Cheng-Hsuan Lyu / Task 073

Cheng-Hsuan Lyu reviewed and commented on QS data format requirements document, on QS Calibration Data Book, RE-23091_REV_A, on QS Sensor Performance Math Model (SPMM), and on Northrop Grumman's Quick Sounder (QS) Calibration Test Report (CDRL) RE-23090. Dr. Lyu

reviewed and commented on Near Earth Orbit Network (NEON) QuickSounder ATMS Post-launch Calibration and Validation plan, 471-CCD-24-0070, version D4, on JPSS-4 PRDs, A_PRD-9966 and A_PRD-9967, and on JPSS-2 RE-21487 Rev – Receiver Subsystem Performance. Dr. Lyu also reviewed and approved the D3 version of QS Pre-launch Cal/Val plan, 471-CCR-24-0069. He also reviewed and discussed with the NASA team a memo about J2 ATMS SRF dynamic ranges between 70 to 79 dB based on RE-21137 Final Antenna Test Report.

Jessica Sutton / Task 160

Jessica Sutton served on reviewer panels for the NSF CAIG proposals and for the 2024 Disasters Inclusion Plans. Dr. Sutton also served as a reviewer for *Journal of Hydrometeorology* and *Geophysical Research Letters*.

**BIOSPHERIC SCIENCES LABORATORY
CODE 618**

Celio Resende de Sousa / Task 060

Celio de Sousa was a Panelist for Commercial Satellite Data Earth Science Research and Applications (CESRA) Panel 2 – LCLUC proposal review.

Thomas Eck / Task 085

Thomas Eck performed peer reviews for publications in the following scientific journals: *Atmospheric Chemistry and Physics*, *Journal of Geophysical Research*, *Atmospheric Environment*, and *Geophysical Research Letters*. Dr. Eck also served as an Associate Editor for the journal *Atmospheric Measurement Techniques*.

Anthony Campbell / Task 109

Anthony Campbell served as an external reviewer for the Ecohydrology panel (A.63 Ecohydrology) and reviewed a data release for the Environmental Protection Agency on Sewersheds. Dr. Campbell also reviewed a proposal for the SIOS knowledge center, one for the German Research Foundation, and several papers for the journals *Nature*, *Nature communications*, *Wetlands Ecology and Management* and *Environmental Research Letters*.

Petya Campbell / Task 122

Petya Campbell contributed as a reviewer for peer reviewed publications in the AGU *Journal of Geophysical Research – Bio-geosciences*, *Canadian Journal of Remote Sensing*, *Ecological Applications*, *Journal of Applied Meteorology and Climatology* and *Remote Sensing of Environment*. Dr. Campbell also served as a reviewer on NASA's FINNEST and LCLUC proposal review panels.

K. Fred Huemrich / Task 134

Fred Huemrich served as a reviewer for papers from *Environmental Research: Ecology*.

Giuseppe Zibordi / Task 151

Giuseppe Zibordi served as a reviewer for *Optics Express*, *IEEE Transactions in Geoscience and Remote Sensing* and *Journal of Oceanic and Atmospheric Technology*.

Ameni Mkaouar / Task 166

Ameni Mkaouar served as reviewer for IEEE *Transactions on Geoscience and Remote Sensing* (TGRS), as a reviewer for IGARSS 2025 proceedings, and as a reviewer for IEEE *Remote Sensing Applications: Society and Environment*.

Junhyeon Seo / Task 173

Junhyeon Seo served as a reviewer for multiple peer-reviewed journals, including *Atmospheric Environment* and *Journal of Geophysical Research – Atmospheres* (JGR-A). Dr Seo also served as a panelist for NASA FINESST (Future Investigators in NASA Earth and Space Science and Technology), reviewing and scoring multiple proposals, participating in panel deliberations, and contributing to funding recommendations.

Natalia L. Quinteros Casaverde / Task 217

Dr. Quinteros Casaverde participated as a reviewer for the FINESST 2025 grant in May 2025.

**GEODESY AND GEOPHYSICS LABORATORY
CODE 61A**

Stacey Huang / Task 188

Dr. Huang served as an online reviewer for a NASA proposal and a peer reviewer for IEEE *Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *Communications Earth and Environment*, and *Journal of Geophysical Research: Solid Earth*.

Kyle Gwartz / Task 204

Kyle Gwartz reviewed proposals for NASA FINESST 2025, and served as a reviewer for *Journal of Geophysical Research*, *Earth, Planets and Space*, and *Advances in Space Research*.

MISCELLANEOUS

EARTH SCIENCES DIVISION

CODE 610

Amita Mehta / Task 096

Dr. Mehta facilitated a three-day ARSET-WWAO training session: [Monitoring Mountain Snowpack and Prediction of Water Availability in the Western US for Water Resources and Disaster Applications](#)

Assaf Anyamba / Task 221

Dr. Anyamba contributed to Gordon and Betty Moore Foundation Initiative on Remote Sensing of Zoonotic Diseases.

GLOBAL MODELING AND ASSIMILATION OFFICE

CODE 610.1

Erica McGrath-Spangle / Task 008

Erica McGrath-Spangler co-organized and planned several NOAA/NASA GeoXO Sounder (GXS) subgroup meetings focused on: proxy data, retrievals, nowcasting, and innovation (September 2024), advocacy (February to March 2025), and private sector benefits (May 2025). Erica McGrath-Spangler was selected by GMAO to present to Goddard 610 leadership on OSSE work in support of GXS (March 2025). Erica McGrath-Spangler planned, organized and hosted the GXS monthly discussion meetings.

Pamela Wales / Task 022

Pamela Wales is a co-chair of the GEOS-Chem stratospheric working group.

Lionel Arteaga / Task 023

Lionel Arteaga was nominated and selected to the Ocean Studies Board of the National Academies of Sciences. Arteaga participated in his first board meeting reviewing national research priorities in marine systems in April 2025.

Brad Weir / Task 025

Brad Weir served as Secretary of the Nonlinear Geophysics section of AGU and as a science adviser for AGU *Eos*.

Natalie Thomas / Task 027

Natalie Thomas - Co-chair of “Advanced Statistical Methods and Development of Indices for the Earth Sciences: Innovations in Climatology, Meteorology, and Oceanography” session at American Geophysical Union Fall Meeting, December 2024, Washington, DC.

Allison Collow / Task 051

Dr. Collow participated in the Code 600 initiative on orientation, training, and mentoring. She also attended monthly meetings of Code 610's Early-Mid Career Council and led their shadowing effort.

Andrew Fox / Task 094

Andrew Fox served as a Steering Committee member for AIMES Land Data Assimilation Working Group (<https://aimesproject.org/ldawg/>), and was an organizer for 5th annual Land Data Assimilation (DA) Community Virtual Workshop on "Developments in Land Data Assimilation" 27-28 October, 2025.

Katherine H. Breen / Task 140

Katherine Breen co-organized and led the discussion for a breakout group for the Interagency Council for Advancing Meteorological Services (ICAMS) AI/ML workshop, November 4, 2024. She contributed to a white paper following the workshop.

Michael J. Murphy, Jr / Task 168

Dr. Murphy served as part of NASA's CSDA GNSS Radio Occultation PlanetiQ vendor evaluation team throughout 2025 until present. Dr. Murphy was an active participant representing NASA GMAO in the RO Modeling Experiment (ROMEX), which includes participants from all major global NWP centers. Dr. Murphy also participated in the international RO in NWP Working Group hosted by Rick Anthes of UCAR COSMIC and including colleagues from all over Europe. Dr. Murphy participated in the Polarimetric RO Working Group hosted by JPL and including colleagues from ICE-CSIC, IEEC in Spain

Viral Shah / Task 212

Dr. Shah serves as the GMAO liaison on the GEOS-Chem Steering Committee, member of the TEMPO science team supporting retrievals, and for part of last year coordinated the GMAO science theme meetings.

**MESOSCALE ATMOSPHERIC PROCESSES
LABORATORY
CODE 612**

Jasper Lewis / Task 101

Jasper Lewis is a committee member of the AeroCenter-Cloud Precipitation Center, an interdisciplinary union of researchers and students from NASA GSFC, GISS, and local universities, and helps host and organize a seminar series. Jasper Lewis is now affiliated with the Physics Department at UMBC and mentors graduate and undergraduate students in the Demoz Lidar Group, conducting training on calibration and maintenance of the Micro Pulse Lidar on campus.

Ali Tokay / Task 123

Ali Tokay was a speaker at the tribute to Professor V. N. Bringi gathering during the 41st AMS Radar Meteorology conference in Toronto, Canada (August 2025). Ali Tokay is the team lead for NASA's Mesoscale Processing Laboratory (Code 612.0) GESTAR II faculty (April-November 2025). Ali Tokay organized the GESTAR II presentation session as part of UMBC's Department of Geography and Environmental Systems (GES) seminar series (December 2024).

Sean Foley / Task 181

Sean Foley performed various support tasks to assist his colleagues with their own research, such as the automation of several time-consuming aspects of data acquisition

Sergey Korkin / Task 182

Dr. Korkin developed open-source software. Dr. Korkin's lead author paper in JQSRT explains, step by step and from the ground up, the development of this open-source code for numerical simulation of gas absorption spectroscopy in a gas cell and in the Earth's atmosphere (codes GCELL and ASPECT, respectively). The codes are available from the journal website as a supplement to the paper (i.e., they cannot be removed) and from Dr. Korkin's GitHub repository: https://github.com/korkins/aspect_gcell (i.e., they can be updated as necessary).

CLIMATE AND RADIATION LABORATORY CODE 613

Sergey Korkin / Task 001

March 27 - April 2: Dr. Korkin communicated with Dr. Erkin Sidik, an engineer in ReflectOrbital, a startup from CA, to explain the calculation of fluxes using Dr. Korkin's open-source, tutorial RT code GSIT (<https://github.com/korkins/gsit>). In April, Dr. Korkin modified the interface for his open-source RT code SORD (https://github.com/korkins/SORD_JQSRT_2017), so now it conveniently simulates the reflectance spectra for a given aerosol model, and shared this code with Dr. Alexander Kokhanovsky, Marburg University (Germany).

In May, a 610 Strategic Science project team conducted the Goddard ESD Modeling Inventory, aiming to produce a catalog of modeling capabilities - particularly in areas where there are opportunities to improve interoperability for collaborative and mission development. They sought to capture technical information, model output variables, readiness levels, applications, development plans, status documentation links, and examples of interoperability. Although input was primarily required from civil servants and collected from Code 613 by Dr. Y. Yang, Dr. Korkin was one of the few non-Civil Servants invited to contribute - and he did.

Manisha Ganeshan / Task 012

Manisha Ganeshan served as an Assessment Lead for NASA HQ's *Satellite Needs Working Group* (SNWG) where she conducted interviews to evaluate satellite needs submitted by agencies such as NOAA, USGS, and DOE, and provided solutions for the same. Manisha Ganeshan submitted a science highlight for Earth Action/HQ management describing the use of NASA purchased commercial satellite data for Arctic weather monitoring. Manisha Ganeshan is the seminar coordinator for her lab (Code 613) at Goddard where she facilitates biweekly seminars.

Daniel J. Miller / Task 113

Daniel Miller participated in the PACE Hackweek 2025 to gain greater familiarity with working with PACE data in the AWS cloud.

Jae N. Lee / Task 114

Jae Lee is serving as an organizing committee member of the Sun-Climate Symposium 2025, which will be held in Fairbanks, Alaska during September 15- 19, 2025.

Jackson Tan / Task 018

Jackson Tan served as Editor, of *Journal of Hydrometeorology*, from February 1, 2024 to the present. Jackson is also a member of the AGU Precipitation Technical Committee, and Chair of the AGU Precipitation Technical Committee Awards Subcommittee.

Alexander Matus / Task 195

Alexander Matus participated in CERES and HAQAST science team meetings, contributing to research on Earth's global energy budget and air quality. Alexander is also an active member of the American Geophysical Union (AGU) and the American Meteorological Society (AMS).

ATMOSPHERIC CHEMISTRY AND DYNAMICS LABORATORY CODE 614

Huisheng Bian / Task 127

Huisheng Bian served as a member of AeroCom Steering Committee.

Anne Thompson / Task 138

Anne Thompson was named to the NDACC Steering Committee in November 2024. Anne is a member of AGU Fellows Legacy Committee and participated in the Webinar Roundtable on “Restoring Trust in Science” with the American Academy for Arts and Sciences in March 2025 and serves as Extraordinary member of the Natural Sciences faculty at Northwest University in Potchefstroom, South Africa.

Caterina Mogno / Task 172

Caterina Mogno volunteered as Co-Organizer for the NASA GEOS-CCM Journal Club at NASA Goddard Space Flight Center.

Doyeon Ahn / Task 179

Doyeon Ahn participated as a panelist and led a session at the Urban Greenhouse Gas Conference and Stakeholder Summit 2025, World Meteorological Organization, Geneva Switzerland, in-person, Apr 07-09, 2025 (invited):

<https://community.wmo.int/en/meetings/urban-greenhouse-gas-conference-and-stakeholder-summit-2025>.



Photo: (Left) Dr. Ahn speaking as a panelist at the Urban GHG Conference and Stakeholder Summit 2025, World Meteorological Organization, Geneva, Switzerland. (Right) Group photo at the WMO headquarters. Credit: D. Ahn.

Michael D. Himes / Task 205

Dr. Himes has continued as a co-lead organizer for the 610 ML Applications group, which has grown to 47 members across code 610; as co-lead, he organized monthly seminars on ML applications in Earth science and adjacent fields. Dr. Himes is now also the lead organizer for the weekly 614 Lab Seminar series, which focuses on remote sensing and modeling efforts related to atmospheric chemistry and dynamics.

CRYOSPHERIC SCIENCES LABORATORY CODE 615

Paolo de Matthaeis / Task 016

Paolo de Matthaeis is the Chairperson of IEEE OES Ocean Remote Sensing Technology Committee.

Elizabeth Ultee / Task 202

Elizabeth Ultee served on the Greenland Ice-Ocean working group for the Ice Sheet Model Intercomparison Project (ISMIP7). Elizabeth also contributed to planning for the Glacier Model Intercomparison Project (GlacierMIP) and served as a chapter author for a new broad-audience textbook, *Handbook of Glacial Environments*.

OCEAN ECOLOGY LABORATORY CODE 616

Susanne Craig / Task 004

Susanne was an External PhD Examiner for Nikolaos Papagiannopoulos, King Abdullah University of Science and Technology. “*Integrative approaches to understanding and monitoring ecosystem functioning in the Northern Red Sea*,” on 23 April 2025, and for Kamal Aryal, UMBC, “*Advancing aerosol and ocean color remote sensing over coastal waters using multiangle polarimetry and machine learning*,” on 16 July 2025. Dr. Craig developed, proposed, and ran a session at the AGU 2025 Conference to highlight the first year of NASA’s PACE mission, “The Earth Through the

PACE Lens: Atmospheres, Oceans, Land, and Lakes—The Multidisciplinary Science of the PACE Mission,” at AGU24 on 10 December 2024

(<https://agu.confex.com/agu/agu24/meetingapp.cgi/Session/228770>). Dr. Craig developed, proposed, and had a session accepted for the Ocean Sciences Meeting (OSM) 2026, entitled, “Invisible Giants: Exploring Phytoplankton Ecology at Oceanic Scales.” OSM will convene in Glasgow, Scotland, on 22-27 February 2026. Dr. Craig was a member of the Ocean Carbon & Biogeochemistry (OCB) Program’s Scientific Steering Committee. The role included organizing the annual summer workshop (~200 participants), reviewing requests for various funding opportunities, interacting with other national/international research organizations, and participating in monthly meetings. Her service spanned 2022-2025. Dr. Craig is Chair of The Oceanography Society's (TOS) Justice, Equity, Diversity, and Inclusivity (JEDI) Committee. Her role includes guiding committee activities, attending committee meetings, interfacing with the parent TOS Council, authoring JEDI content in society's publication, and organizing community events such as Town Halls. June 2020-present. Dr. Craig served on the Promotion Committee for GESTAR II faculty. Dr. Craig reviewed a promotion package submitted by a GESTAR II faculty member. She participated in meetings with other committee members to discuss the suitability of the applicant for promotion from July 2024 to March 2025.

Andrew Sayer / Task 048

As vice-chair of the AeroSat organization, Andrew Sayer co-organized the annual AeroCom/AeroSat workshop, held in Lille, France in October 2024, which brings together experts from the aerosol remote sensing and modeling communities. As deputy PACE Science and Applications Team Lead, Andrew Sayer co-organized the PACE Science Teams (SAT, PVST, PACE-PAX) workshop at NASA GISS in February 2025. He co-led sessions, led a discussion breakout group, and gave two presentations. As PACE Project Science Lead for OCI Atmospheres, Andrew Sayer participated in and led a breakout discussion at the 2024 PACE Applications Workshop in Washington DC in December 2024. This was held in advance of the AGU Annual Meeting, where he also participated in the GESTAR II and NASA booths, talking about PACE and atmospheric science. Andrew Sayer participated in a workshop at EUMETSAT (Darmstadt, Germany) in January 2025. A small number of international experts, including Dr. Sayer, were invited to provide recommendations on EUMETSAT’s next generation of aerosol remote sensing approaches.

Ian Carroll / Task 161

Ian Carroll maintained the Océandata Notebooks tutorials repository, published with an open source license this year at <https://github.com/nasa/oceandata-notebooks>.

J. Vanderlei Martins / Task 183

R. Fitzgibbons, E. Wilk, G. Weikert: PACE Scientists Take to the Sea and Air (and Really High Air). [Video documentary](#) of the NASA Plankton Aerosol Cloud ocean Ecosystem Post-launch Airborne eXperiment (PACE-PAX) Campaign.

Priscilla Mohammed-Tano / Task 020

Priscilla Mohammed is a member of the IEEE P4006 Working Group providing support for documents related to radio frequency interference.

Bridget Seegers / Task 029

Bridget Seegers participated in NASA Headquarters Satellite Needs Working Group (SNWG) as part of the Carbon Cycle & Ecosystems team and led the assessment of a water quality need. The process included assessing the submitted need, leading interviews, and compiling a final assessment report.

Thomas Stanley / Task 032

Thomas Stanley attended the Disasters Science Team Meeting in Cambridge, June 10-12.

Thomas Stanley (617/UMBC) attended the annual NASA Science Activation/Citizen Science meeting in Leesburg, Virginia, November 13.

Nishan Kumar Biswas / Task 033

Nishan Kumar Biswas contributed to the Reservoirs Chapter of the State of Global Water Resources 2024 Report of the World Meteorological Organization (WMO) as a NASA resource person. The report provided a quantitative assessment of global water resources for the year 2024. The report will come out in the last quarter of 2025. Nishan Kumar Biswas contributed to the Reservoirs Chapter of the State of Global Water Resources 2023 Report of the World Meteorological Organization (WMO) as a NASA resource person. The report provided a quantitative assessment of global water resources for the year 2023, including reservoir operation and inflow. This report was published in October 2024: <https://wmo.int/publication-series/state-of-global-water-resources-2023>. Additionally, here is a link to the interactive ArcGIS StoryMap: <https://storymaps.arcgis.com/stories/c56d4a08c1ce4b05b900d3f5852a52af>

Fadji Zaoua Maina / Task 057

Fadji Zaoua Maina was a panelist at the French Development Agency Tech Talk titled “Artificial Intelligence and Water Resources: Opportunities and Challenges”, online
Attended the Technical Meeting of the World Meteorological Organization (WMO) Annual State of Global Water Resources Report Development Team, 2025, Geneva, Switzerland
Panelist at the International Drought Resilience Observatory side event “Advancing Drought Resilience through Collaboration and Innovation” at UNCCD COP16, 2024, Riyadh, Saudi Arabia
Panelist at the International Water Management Institute (IWMI) and the Economic Community Of West African States (ECOWAS) WaterTalk seminar “Role of AI and bid data in shaping West Africa’s water future”, 2024, online. Dr. Maina also served as a panelist at the International Drought Resilience Observatory side event “The International Drought Resilience Observatory (IDRO) Unveiled: Revolutionizing Global Drought Resilience” at UN Drought Resilience +10 Conference, 2024, Geneva, Switzerland.

Anthony Campbell / Task 109

Anthony Campbell taught a section of the ARSET workshop on Earth Observations of Blue Carbon Ecosystems.

Petya Campbell / Task 122

PUBLISHED DATASET PROVIDED BY PETYA CAMPBELL:

N Queally, FW Davis, KD Chadwick, C Ade, L Anderegg, Y Angel, B Baker, I Boving, RK Braghire, P Brodrick, P Campbell, J Cryer, KC Cushman, PD Dao, A Dibartolo, R Eckert, K Grant, B Heberlen, M Johnson, J Jourtas, K Kerr, C Kibler, M Klope, KR Kovach, A Kriesberg, P Lovegreen, AJ Maguire, CA McMahon, K Miner, C Nicles, F 122Ochoa, JP Oocon, A Oongjoko, EM Ordway, M Park, R Pavlik, AM Raiho, DA Roberts, CM Saiki, FD Schneider, K Thompson, PA Townsend, E Vvermeer, C Villanueva-Weeks, N Vinod, T Zheng, K Zumdahl, DS Schimel (2024). SHIFT: Vegetation Plot Characterization, Santa Barbara County, CA, 2022. ORNL Distributed Active Archive Center (DAAC) dataset 10.3334/ORNLDAAAC/2295

Arif Rustem Albayrak / Task 133

As UMBC and ITU Data Group Co-Chair, Arif Albayrak served as an AI/ML data process evaluator for the Zindi “Classification for Landslide Detection” competition (2025, CHF 1 000 prize), helping evaluate model performance using Earth observation datasets. Arif Albayrak taught a two-hour class at Kings College, UK, titled “Why It Matters: How Understanding ML and Tech Helps Us Tackle Disasters” (July 2025). Arif Albayrak, along with Dr. Shawn Serbin (Chief, GSFC Biospheric Sciences) and Dr. Pawan Gupta, co-founded the NASA GSFC Biospheric Science Machine Learning Focus Group (NASA-618). Within this group, they co-developed and delivered in-depth courses on machine learning algorithms tailored for physical scientists with strong mathematical backgrounds. Activities included structured courses, invited speaker lectures, and hands-on applications (April 2025 to current). As a lead Co-I for HYDROSAR-NG, Arif Albayrak participated as a consultant in Workshop/Training on Monitoring Slow-moving Landslides, and Daily Flood Inundation Mapping & Forecasting Services for the Hindu Kush Himalaya 18–20 November 2024 | ICIMOD headquarters, Kathmandu, Nepal. He gave a two-hour course on Flood Forecasting using Deep Learning and led group discussions on flood mapping.

Ameni Mkaouar / Task 166

Mkaouar participated in research visits at CESBIO, France (July 1-16, 2025), strengthening international collaborations in simulation and modeling.

Niama Boukachaba / Task 219

Dr. Niama Boukachaba serves as one of the Steering Lead for the Climate and Environmental Health Working Group within the Goddard Applied Sciences Program, where she helps foster collaboration between Goddard scientists and external partners including universities, research institutions, and public agencies to advance interdisciplinary research at the intersection of climate, environment, and public health.

Kelsey Huelsman / Task 229

Dr. Huelsman was the co-creator of the Earth Science Information Partners (ESIP) Biological Data Standards Primer Guides.

GEODESY AND GEOPHYSICS LABORATORY CODE 61A

Brian D. Beckley / Task 207

Brian Beckley contributes to the maintenance and continuous updates to the GMSL reported at climate.nasa.gov.

Kyle Gwirtz / Task 204

Dr. Gwirtz was a member of NASA Goddard Early and Mid-Career Council (EMC2).

COURSES TAUGHT

MESOSCALE ATMOSPHERIC PROCESSES LABORATORY CODE 612

Ali Tokay / Task 123

Ali Tokay led “Internship” (GES 498, Fall 2024) and he is teaching “Weather and Climate” (GES 311, Fall 2025).

CLIMATE AND RADIATION LABORATORY CODE 613

Tamás Várnai / Task 102

Tamás Várnai taught the graduate level course “Computational Physics” at UMBC (Baltimore, Maryland), in the Spring 2025 semester (January 29 to May 9, 2025).

ATMOSPHERIC CHEMISTRY AND DYNAMICS LABORATORY CODE 614

Junhua Liu / Task 014

Junhua Liu participated in the FY25 610 Group Mentoring program.

Anne Thompson / Task 138

(1) Thesis Committee Member for PhD student Joshua Richards (B. Demoz, Academic Advisor); examined successfully for candidacy, 2 May 2025

(2) October 2024 through July 2025, GSFC/Code 610, Earth Sciences Mentoring Circle #4, Co-Lead with M. Rodell (610HBG).

OCEAN ECOLOGY LABORATORY CODE 616

Dirk A. Aurin / Task 009

Dirk Aurin - Training on HyperCP: a best practice community processor for above-water radiometry. Short course. Ocean Optics XXVII Conference. October 6, 2024.

Dirk Aurin - Copernicus FRM4SOC FICE-2025 Training Event: In situ Ocean Colour Above-Water Radiometry towards Satellite Validation in Acqua Alta Oceanographic Tower and Venice. July 6-20, 2025.

Ivona Cetinić / Task 017

Ivona Cetinić taught Calibration and Validation for Ocean Color Remote Sensing, at the *University of Maine – Darling Marine Center*, in Walpole, Maine, from May 18 to June 14, 2025

J. Vanderlei Martins & Brent McBride / Task 183

Vanderlei taught Laboratory of Modern Physics at UMBC, from January to June, 2025, and from August to December, 2024. Brent McBride taught Earth Science with Satellite Data at UMBC in July 2025.

**BIOSPHERIC SCIENCES LABORATORY
CODE 618**

Natalia L. Quinteros Casaverde / Task 217

Dr. Quinteros Casaverde taught a field class on the contributions of vegetation on regulating the climate of cities at Falmouth, Jamaica as part of the Falmouth Field School of Tangible Heritage, from June 7th to June 13th, 2025, where she introduced STELLA to high school students. This class was a collaboration between Gensler Architect Kamil Quinteros and Dr. Quinteros Casaverde, where the students integrated architectural and botanical drawings with the spectral and environmental information that STELLA 1.2 provided.

APPENDICES

PUBLICATIONS

PRESENTATIONS

PROPOSALS AWARDED

PROPOSALS PENDING

PROPOSALS NOT FUNDED

PUBLICATIONS

EARTH SCIENCES DIVISION

CODE 610.1

Assaf Anyamba / Task 221

Schollaert Uz, S., **Anyamba, A.** (2025) Review of NASA Earth Observations, Recent Science, and Practical Applications, Photogrammetric Engineering & Remote Sensing, 15 August 2025. In Press, <https://www.ingentaconnect.com/content/asprs/pers/pre-prints/content-25-00010>

Rostal, M.K, Thompson, P.N., **Anyamba, A.** , Bett, B. Cêtre-Sossah, C. Chevalier, V., Guarido, M., Karesh, W.B., Kemp, A., Desiree-LaBeaud, A., Lubisi, A., Matthews, L., Msimang, V., Njenga, K., Ross, N., Tumusiime, D. Wilson, W. C., Weyer, J., Paweska, J.T., Swanepoel, R. (2025) Rift Valley fever epidemiology: shifting the paradigm and rethinking research priorities, Lancet Planetary Health, In Press.

GLOBAL MODELING AND ASSIMILATION OFFICE

CODE 610.1

Bryan Karpowicz / Task 006

McGrath-Spangler E. L., N. C. Privé, **B. M. Karpowicz**, A. Heidinger, M. Kim and S. Kalluri. 2025. "Examining the Complementarity of GEO and LEO Hyperspectral Infrared Sounders for NWP." Earth and Space Science 12 (3), <https://doi.org/10.1029/2024EA003965>.

Stegmann, P., B. Johnson, I. Moradi, **B. Karpowicz**, W. McCarty, H. Liu, S. Dutta and T. Auligné. 2025. "The CRTM Transmittance Coefficient Package." Journal of Quantitative Spectroscopy and Radiative Transfer, 109380, <http://dx.doi.org/10.1016/j.jqsrt.2025.109380>.

Privé, N. C., **B. M. Karpowicz**, E. L. McGrath-Spangler, S. Kalluri. 2024. "Impacts of an Early Morning Low Earth Orbit Observing Platform in a Future Global Observing Network Scenario." Tellus-A 76 (1): 227-249 <https://doi.org/10.16993/tellusa.4080>.

Jones, E., K. Garrett, K. Ide, **B. Karpowicz**, C. Barnet, Y. Ma and S. Boukabara. 2024. "Enabling the Assimilation of CrIS Shortwave Infrared Observations in Global NWP at NOAA. Part II: OSEs and Results." Journal of Atmospheric and Oceanic Technology, <http://dx.doi.org/10.1175/jtech-d-23-0149.1>.

Jones, E., K. Garrett, K. Ide, Y. Ma, **B. Karpowicz**, C. Barnet and S. Boukabara. 2024. "Enabling the Assimilation of CrIS Shortwave Infrared Observations in Global NWP at NOAA. Part I: Background and Methods." Journal of Atmospheric and Oceanic Technology, <http://dx.doi.org/10.1175/jtech-d-23-0148.1>

Nikki Privé / Task 007

Moradi, I., W. McCarty and **N. Privé**. 2025. "Generating Pseudo-Realistic Infrared Observations for Observing System Simulation Experiments." *IEEE Access*, 13, 123756-123763. doi:10.1109/access.2025.3588735.

McGrath-Spangler, E. L., **N. C. Privé**, B. M. Karpowicz, A.K. Heidinger, M-J. Kim, and S. Kalluri. 2025. "Examining the Complementarity of GEO and LEO Hyperspectral Infrared Sounders for NWP." *Earth and Space Science*, 12. doi:10.1029/2024EA003965.

Hu, G., S.L. Dance, A. Fowler, D. Simonin, J. Waller, T. Auligne, S. Healy, D. Hotta, U. Löhnert, T. Miyoshi, **N.C. Privé**, O. Stiller, X. Wang, M. Weissmann. 2025. "On methods for assessment of the value of observations in convection-permitting data assimilation and numerical weather forecasting". *Q. J. Roy. Meteor. Soc.*, 1–36. doi:10.1002/qj.4933.

Privé, N.C., B.M. Karpowicz, E.L. McGrath-Spangler, and S. Kalluri. 2024. "Impacts of an early morning low earth orbit observing platform in a future global observing network scenario." *Tellus-A*. 76(1), <https://doi.org/10.16993/tellusa.4080>.

Erica McGrath-Spangler / Task 008

Privé, N.C., Karpowicz, B.M., **McGrath-Spangler, E.L.** and Kalluri, S. (2024). Impacts of an Early Morning Low Earth Orbit Observing Platform in a Future Global Observing Network Scenario. *Tellus A: Dynamic Meteorology and Oceanography*, 76(1), <https://doi.org/10.16993/tellusa.4080>.

Zhu, Y., Arnold, N.P., Yang E.-G., Ganeshan, M., Salmun, H., Palm, S., Santanello, J., **McGrath-Spangler, E.L.**, Lewis, J. Molod, A., Wu, D. Lei, T., El Akkraoui, A., and Sienkiewicz, M. (2025) Utilizing PBL Height Data from Multiple Observing Systems in the GEOS System. Part I: Assimilation Framework. *Mon. Wea. Rev.*, 153, 403–423, <https://doi.org/10.1175/MWR-D-24-0141.1>.

McGrath-Spangler, E. L., Privé, N. C., Karpowicz, B. M., Heidinger, A. K., Kim, M.-J., & Kalluri, S. (2025). Examining the complementarity of GEO and LEO hyperspectral infrared sounders for NWP. *Earth and Space Science*, 12, <https://doi.org/10.1029/2024EA003965>.

Niama Boukachaba / Task 046

Boukachaba, N., Y. Zhu and S. Pawson. 2025. "Impact of Assimilating Surface Sensitive IASI and CrIS Radiance Observations Over Land in the NASA GEOS." *Journal of Atmospheric and Oceanic Technology* 42 (5): 479-492, doi:10.1175/JTECH-D-24-0090.1.

Brad Weir / Task 025

Knowland, K. E., P. A. Wales, K. Wargan, et al. 2025. "Stratospheric Water Vapor Beyond NASA's Aura MLS: Assimilating SAGE III/ISS Profiles for a Continued Climate Record." *Geophysical Research Letters*, 52 (8), <http://dx.doi.org/10.1029/2024gl112610>.

Yun J., J. Liu, B. Byrne, ... **B. Weir**, et al. 2025. "Quantification of regional net CO₂ flux errors in the Orbiting Carbon Observatory-2 (OCO-2) v10 model intercomparison project (MIP) ensemble

using airborne measurements." *Atmospheric Chemistry and Physics*, 25 (3), <http://dx.doi.org/10.5194/acp-25-1725-2025>.

Duncan B. N., D. C. Anderson, A. M. Fiore, ... **B. Weir**, et al. 2024. "Opinion: Beyond global means – novel space-based approaches to indirectly constrain the concentrations of and trends and variations in the tropospheric hydroxyl radical (OH)." *Atmospheric Chemistry and Physics*, 24 (22): <http://dx.doi.org/10.5194/acp-24-13001-2024>.

Allison Collow / Task 051

Collow, A., Das, S., Colarco, P., da Silva, A., Miller, M., and Arnold, N., 2024: Diagnosing Excessive Subsidence Across the Southeast Atlantic in the Goddard Earth Observing System (GEOS) During ORACLES-1, *J. Geophys. Res. Atmos.*, 129, <https://doi.org/10.1029/2024JD041353>.

Manisha Ganeshan / Task 052

Kolassa, J., **Ganeshan, M.**, McGrath-Spangler, E. L., Reale, O., Reichle, R. H., and Zhang, S. Q. (2025). Impact of assimilating SMAP observations over land on tropical cyclone representation: A case study of Tropical Cyclone Idai, *Quarterly Journal of the Royal Meteorological Society*, e5018.

Erica McGrath-Spangler / Task 052

Kolassa, J., Ganeshan, M., **McGrath-Spangler, E.L.**, Reale, O., Reichle, R.H. & Zhang, S.Q. (2025) Impact of assimilating SMAP observations over land on tropical cyclone representation: A case study of Tropical Cyclone Idai, *Quarterly Journal of the Royal Meteorological Society*, <https://doi.org/10.1002/qj.5018>.

Eunjee Lee / Task 059

Seo, H., **Lee, E.**, Kim, J., Choi, S., Kolassa, J., & Kim, Y., Differential effect of the CLM5-BGC resolution on soil moisture and wildfire simulations, *Journal of Hydrology*, in press.

Young-Kwon Lim / Task 061

Garcia-Franco, J. L., Lee, C., Tippett, M. K., Camargo, S., Kim, D., Molod, A., and **Lim, Y.-K.** (2025). Subseasonal prediction of tropical cyclone precipitation. *Weather and Forecasting*, 40(8), 1429-1444, <https://doi.org/10.1175/WAF-D-24-0185.1>.

Schubert, S. D., Chang, Y., DeAngelis, A. M., **Lim, Y.-K.**, Koster, R. D., Bosilovich, M. G., Molod, A. M., and Dezfuli, A. (2025). Revisiting the causes and global and historical context of the US Midwest Great Flood of 1993. *Journal of Climate*, 38(17), 4407-4425, <https://doi.org/10.1175/JCLI-D-24-0430.1>.

Sim, J., Kim, B., Lee, J., **Lim, Y.-K.**, Kim, J.-H., and Kim, J. H. (2025). Sea ice initialization and its impact on winter seasonal prediction skill over the Northern Hemisphere in coupled forecast system, *Journal of Climate*, 38(16), 3989-4001, <https://doi.org/10.1175/JCLI-D-24-0524.1>.

Garcia-Franco, J. L., Lee, C., Camargo, S., Tippett, M. K., Emlaw, N., Kim, D., **Lim, Y.-K.**, and Molod, A. M. (2024). Tropical cyclones in the GEOS-S2S-2 subseasonal forecasts. *Weather and Forecasting*, 39(9), 1297-1318, <https://doi.org/10.1175/WAF-D-23-0208.1>.

Andrew Fox / Task 094

Fox, A.M., Reichle, R.H., Liu, Q. (2025). Assimilation of ASCAT Soil Moisture and SMAP Brightness Temperature Observations in the NASA GEOS Land Data Assimilation System. *Journal of Hydrometeorology*, doi:10.1175/JHM-D-24-0139.1.

Huo, X., **Fox, A.M.**, Dashti, H., Devine, C., Gallery, W., Raczka, B., Anderson, J.L., Rogers, A., Moore, D.J.P. (2024). Integrating State Data Assimilation and Innovative Model Parameterization Reduces Simulated Carbon Uptake in the Arctic and Boreal Region. *Journal of Geophysical Research: Biogeosciences*, doi:10.1029/2024jg008004.

William S. Olson / Task 125

Grecu, M., Heymsfield, G. M., Nicholls, S., Lang, S., and **Olson, W. S.** (2025), A Machine Learning Approach to Mitigate Ground Clutter Effects in the GPM Combined Radar-Radiometer Algorithm (CORRA) Precipitation Estimates, *J. Atmos. and Oceanic Tech.*, Vol. 42, 17-31.

Carl Malings / Task 129

Malings, Carl, K. Emma Knowland, Nathan Pavlovic, Justin G. Coughlin, Daniel King, Christoph Keller, Stephen Cohn, Randall V. Martin (2024), Air Quality Estimation and Forecasting via Data Fusion With Uncertainty Quantification: Theoretical Framework and Preliminary Results, *Journal of Geophysical Research: Machine Learning and Computation*, 1(4), <https://doi.org/10.1029/2024JH000183>.

Hodoli, Collins Gameli, Iq Mead, Frederic Coulon, Cesunica E. Ivey, Victoria Owusu Tawiah, Garima Raheja, James Nimo, Allison Hughes, Achim Haug, Anika Krause, Selina Amoah, Maxwell Sunu, John K. Nyante, Esi Nerquaye Tetteh, Véronique Riffault, and **Carl Malings** (2024), Urban Air Quality Management at Low Cost Using Micro Air Sensors: A Case Study from Accra, Ghana, *ACS ES&T Air* 2025 2 (2), <https://doi.org/10.1021/acsestair.4c00172>.

Diez, Sebastian, Thomas J Bannan, Miriam Chacón-Mateos, Pete M Edwards, Valerio Ferracci, Doğuşhan Kılıç, Alastair C Lewis, **Carl Malings**, Nicholas A Martin, Olalekan Popoola, Colleen Rosales, Sean Schmitz, Phillipp Schneider, Erika Von Schneidmesser (2025), “A framework for advancing independent air quality sensor measurements via transparent data generating process classification, *NPJ Climate and Atmospheric Science*, 8, 285. DOI:[10.1038/s41612-025-01161-2](https://doi.org/10.1038/s41612-025-01161-2).

Rosales, Colleen Marciel, Jennifer R. Bratburd, Sebastian Diez, Sara Duncan, **Carl Malings**, Pallavi Pant (2025), Open Air Quality Data Platforms for Environmental Health Research and Action, *Current Environmental Health Reports*, 12, 27. DOI:[10.1007/s40572-025-00487-6](https://doi.org/10.1007/s40572-025-00487-6).

Katherine H. Breen / Task 140

Barahona, D, **Breen K**, Block K, Darmenov A (2025), Deep learning representation of the aerosol size distribution, *EGUsphere*, 1-29.

Yuan, T, Song H, Oreopoulos L, Wood R, Bian H, **Breen K**, Chin M, Yu H, Barahona D, Meyer K, Platnick S. (2024), Abrupt reduction in shipping emission as an inadvertent geoengineering

termination shock produces substantial radiative warming, *Communications Earth & Environment*, 5(1):281.

Sleeman, J., Keller, C., Ribauto, C., Leon, V.J., Chen, R., Tang, C., Kofroth, C., Chen, A., Castellanos, P., **Breen, K.H.** and Knowland, K.E. (2025), Deep Learning Ensemble Emulation for NASA's Goddard Earth Observing System (GEOS) Composition Forecast, *Artificial Intelligence for the Earth Systems*, 1.

Manisha Ganeshan / Task 152

Zhu, Y., Arnold, N. P., Yang, E. G., **Ganeshan, M.**, Salmun, H., Palm, S., et al. (2025), Utilizing PBL Height Data from Multiple Observing Systems in the GEOS System. Part I: Assimilation Framework, *Monthly Weather Review*, 153(3), 403-423.

Amin Dezfuli / Task 162

Schubert, S.D., Chang, Y., DeAngelis, A.M., Lim, Y.K., Koster, R.D., Bosilovich, M.G., Molod, A.M. and **Dezfuli, A.**, 2025. Revisiting the Causes and Global and Historical Context of the US Midwest Great Flood of 1993, *Journal of Climate*, <https://doi.org/10.1175/JCLI-D-24-0430.1>

Dezfuli, A. and Zaitchik, B.F., 2024, Transboundary sky waters in the Middle East: Definition, challenges, and opportunities, *PLOS Water*, 3(12), <https://doi.org/10.1371/journal.pwat.0000318>.

Dezfuli, A., Ichoku, C.M. and Bosilovich, M.G., 2024. Large-scale climate features control fire emissions and transport in Africa, *Geophysical Research Letters*, 51(18), <https://doi.org/10.1029/2024GL110179>.

Eun-Gyeong Yang / Task 163

Zhu, Y., N. P. Arnold, **E.-G. Yang**, M. Ganeshan, H. Salmun, S. Palm, J. Santanello, E. L. McGrath-Spangler, J. Lewis, A. Molod, D. Wu, T. Lei, A. El Akkraoui, and M. Sienkiewicz, 2025: Utilizing PBL Height Data from Multiple Observing Systems in the GEOS System. Part I: Assimilation Framework. *Monthly Weather Review*, 153(3), 403-423.

Michael J. Murphy, Jr / Task 168

Murphy, M. J., Jr., P. Hordyniec, J. S. Haase, L. Delle Monache (2025). The Utility of a Two-dimensional Forward Model for Bending Angle Observations in regions with Strong Horizontal Gradients. *Monthly Weather Review*, 153(8), doi:[10.1175/MWR-D-23-0268.1](https://doi.org/10.1175/MWR-D-23-0268.1).

Cao, B., J.S. Haase, **M.J. Murphy Jr**, A.M. Wilson (2025). Observing atmospheric rivers using multi-GNSS airborne radio occultation: system description and data evaluation, *Atmospheric Measurement Techniques*, 18(14), doi:[10.5194/amt-18-3361-2025](https://doi.org/10.5194/amt-18-3361-2025).

Hordyniec, P., J. S. Haase, M. J. **Murphy Jr**, B. Cao, A. M. Wilson, I. H. Banos (2025). Forward Modeling of Bending Angles with a Two-Dimensional Operator for GNSS Airborne Radio Occultations in Atmospheric Rivers. *Journal of Advances in Modeling Earth Systems*, 17, no. 4, doi:[10.1029/2024MS004324](https://doi.org/10.1029/2024MS004324).

Meng Zhou / Task 185

Chen, Xi, Jun Wang, **Meng Zhou**, Zhendong Lu, Lyatt Jaegle, Luke D. Oman, and Ghassan Taha (2025), Impact of water vapor on stratospheric temperature after the 2022 Hunga Tonga eruption: direct radiative cooling versus indirect warming by facilitating large particle formation, NPJ Climate and Atmospheric Science, 8, no. 1, 192.

Wang, Yi, Zibo You, Lunche Wang, Jun Wang, **Meng Zhou**, Minghui Tao, and Jhoon Kim (2025), First high temporal resolution retrievals of AOD over shallow and turbid coastal waters for Himawari-8, ISPRS Journal of Photogrammetry and Remote Sensing, 228, 603-612.

Kim, Hyerim, Xi Chen, Jun Wang, Zhendong Lu, **Meng Zhou**, Gregory Carmichael, Sang Seo Park, and Jhoon Kim (2024), Aerosol layer height (ALH) retrievals from oxygen absorption bands: Intercomparison and validation among different satellite platforms, GEMS, EPIC, and TROPOMI, EGU sphere, 1-32.

Deng, Weizhi, **Meng Zhou**, Jun Wang, Zhixin Xue, Zhendong Lu, Xi Chen, Huanxin Zhang, David A. Peterson, Edward J. Hyer, and Arlindo M. Da Silva (2024), Advancing FRP Retrieval: Bridging Theory and Application, IEEE Transactions on Geoscience and Remote Sensing.

Fei Liu / Task 186

Watson, Z., Li, C., **Liu, F.**, Freeman, S. W., Zhang, H., Wang, J., and Lee, S.-H. (2025), Estimating surface sulfur dioxide concentrations from satellite data: Using chemical transport models vs. machine learning, EGU sphere [preprint], <https://doi.org/10.5194/egusphere-2025-1735>.

M E S O S C A L E A T M O S P H E R I C P R O C E S S E S **L A B O R A T O R Y** **C O D E 6 1 2**

Mircea Grecu / Task 055

Grecu, M., G. M. Heymsfield, S. Nicholls, S. Lang, and W. S. Olson, 2024: A Machine Learning Approach to Mitigate Ground Clutter Effects in the GPM Combined Radar–Radiometer Algorithm (CORRA) Precipitation Estimates. *J. Atmos. Oceanic Technol.*, 42, <https://doi.org/10.1175/JTECH-D-24-0048.1>.

Jasper Lewis / Task 101

Dolinar, E. K., Campbell, J. R., Marquis, J. W., **Lewis, J. R.**, Lolli, S., Yang, P., Welton, E. J., 2025, Estimation of the Uncertainty in Daytime Cirrus Cloud Radiative Forcing and Heating Rates Due to Ice Crystal Optics, *Journal of Applied Meteorology and Climatology*, <https://doi.org/10.1175/JAMC-D-24-0065.1>.

Zhu, Y., Arnold, N. P., Yang, E.-G., Ganeshan, M., Salmun, H., Palm, S., Santanello, J., McGrath-Spangler, E. L., **Lewis, J.**, Molod, A., Wu, D., Lei, T., El Akkraoui, A., Sienkiewicz, M., 2025. Utilizing PBL Height Data from Multiple Observing Systems in the GEOS System. Part I: Assimilation Framework. *Mon. Wea. Rev.*, 153, 403–423, <https://doi.org/10.1175/MWR-D-24-0141.1>.

Ali Tokay / Task 123

Chang, W.Y., Yang Y. C., Hung C. Y., Kim K., Lee, G., and **Tokay, A.**, (2024) Estimation of Snow Density using collocated Parsivel and Micro-Rain Radar measurements: A preliminary study from ICE-POP. *Atmospheric Chemistry and Physics*, 24 (2), 11955-11979.

Filipiak, B., Wolff D. B., Spaulding, A., **Tokay, A.**, et al. (2025) Winter Precipitation Measurements in New England: Results from the Global Precipitation Measurement Ground Validation Campaign in Connecticut. *Earth System Science Data*, 1-45.

Yuli Liu / Task 149

Liu, Y. and Adams, I. S. (2025), Tomographic reconstruction algorithms for retrieving two-dimensional ice cloud microphysical parameters using along-track (sub)millimeter-wave radiometer observations, *Atmos. Meas. Tech.*, 18, 1659–1674, <https://doi.org/10.5194/amt-18-1659-2025>.

Sean Foley / Task 181

Foley, S., Knobelspiesse, K., **Sayer, A.**, Hays, J., Hoffman, J. (2024). 3-D Cloud Masking Across a Broad Swath using Multi-angle Polarimetry and Deep Learning. *Atmospheric Measurement Techniques*, <https://doi.org/10.5194/amt-17-7027-2024>.

Sergey Korkin / Task 182

Korkin S., Sayer A. M., Ibrahim A., and Lyapustin A. (2025), A practical guide to coding line-by-line trace gas absorption in Earth’s atmosphere, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 337: 109345, <https://doi.org/10.1016/j.jqsrt.2025.109345>.

CLIMATE AND RADIATION LABORATORY CODE 613

Manisha Ganeshan / Task 012

Ganeshan, M., Wu, D. L., Santanello, J. A., Gong, J., Ao, C., Vergados, P., & Nelson, K. J. (2025). Exploring commercial Global Navigation Satellite System (GNSS) radio occultation (RO) products for planetary boundary layer studies in the Arctic. *Atmospheric Measurement Techniques*, 18(6), 1389-1403.

Jackson Tan / Task 018

Tan, J., G. J. Huffman, and Y. Song, 2024: Automated Quality Control Scheme for GPM Satellite Precipitation Products. *Geophys. Res. Lett.*, 51, <https://doi.org/10.1029/2024GL108963>.

Cho, N., L. Oreopoulos, D. Lee, **J. Tan**, and D. Jin, 2025: Describing Seasonal Mixtures of Cloud Regimes via “Regimes of Regimes”. *J. Clim.*, 38, <https://doi.org/10.1175/JCLI-D-24-0275.1>.

Peng, K., D. B. Wright, Y. Derin, S. H. Hartke, Z. Li, and **J. Tan**, 2025: STREAM-Sat: A Novel Near-Realtime Quasi-Global Satellite-Only Ensemble Precipitation Dataset. *Water Resources Res.*, 61, <https://doi.org/10.1029/2023WR036756>.

Cornelius Csar Jude H. Salinas / Task 035

Salinas, C. C. J. H., Wu, D. L., & Qian, L. (2025). Quantifying geomagnetic activity's contribution to the Global E-region Electron density's day-to-day variability using Spire Radio Occultation observations. *Geophysical Research Letters*, 52, <https://doi.org/10.1029/2024GL112874>.
Salinas, C. C. J. H., Wu, D. L., Swarnalingam, N., Emmons, D., & Qian, L. (2024). Development of the ionospheric E-region prompt radio occultation based electron density (E-PROBED) model. *Space Weather*, 22, <https://doi.org/10.1029/2024SW004037>.

Young-Kwon Lim / Task 036

Sim, J., Kim, B., Lee, J., **Lim, Y.-K.**, Kim, J.-H., and Kim, J. H. (2025). Sea ice initialization and its impact on winter seasonal prediction skill over the Northern Hemisphere in coupled forecast system. *Journal of Climate*, 38(16), <https://doi.org/10.1175/JCLI-D-24-0524.1>.

Lipi Mukherjee / Task 037

Lipi Mukherjee, Dong L Wu, Nader Abuhassan, Thomas F Hanisco, Ukkyo Jeong, Yoshitaka Jin, Thierry Leblanc, Bernhard Mayer, Forrest M Mims III, Isamu Morino, Tomohiro Nagai, Stephen Nicholls, Richard Querel, Tetsu Sakai, Ellsworth J Welton, Stephen Windle, Peter Pantina, Osamu Uchino (2025), Twilight Near-Infrared Radiometry for Stratospheric Aerosol Layer Height, Remote Sensing.

Dongmin Lee / Task 038

Lee, D., Oreopoulos, L., & Cho, N. (2025). Regimes of cloud vertical structure from active observations. *Journal of Geophysical Research: Atmospheres*, 130, e2024JD041716.

Cho, N., Oreopoulos, L., **Lee, D.**, Tan, J., & Jin, D. (2025). Describing Seasonal Mixtures of Cloud Regimes via “Regimes of Regimes.” *Journal of Climate*, 38(4), 1175–1188.

Lee, D., Oreopoulos, L. (2025). Multiple cloud feedbacks in a global model from a single perturbation experiment. *Geophysical Research Letters*, DOI:10.1029/2025GL116120 (in press).

Nayeong Cho / Task 039

N. Cho, L. Oreopoulos, D. Lee, et al. 2025. Describing seasonal mixtures of cloud regimes via “regimes of regimes”. *Journal of Climate*, doi:10.1175/jcli-d-24-0275.1.

Lee D., L. Oreopoulos and **N. Cho.** 2024. Regimes of Cloud Vertical Structure From Active Observations, *Journal of Geophysical Research: Atmospheres* 130 (1), doi:10.1029/2024jd041716.

Daeho Jin / Task 040

Cho, N., L. Oreopoulos, D. Lee, J. Tan, and **D. Jin,** 2025: Describing seasonal mixtures of cloud regimes via “regimes of regimes”. *J. Clim.*, doi:10.1175/JCLI-D-24-0275.1.

Yoo, C., **D. Jin,** S. Lee, D. Kim, 2025: A comparison of the meridional meandering of extratropical precipitation during boreal winter: eddy momentum flux versus Eulerian storm tracks, *Nat. Clim. Atmos. Sci.*, 8, 104, doi:10.1038/s41612-025-00992-3.

Guoyong Wen / Task 043

Wen, G., A. Marshak, R. Levy, and G. Schuster, 2024. Accounting for 3D radiative effects in MODIS aerosol retrievals near clouds using CALIPSO observations, *Frontiers in Remote Sens.*,

4, doi:10.3389/frsen.2023.1333814.

Alfonso Delgado-Bonal / Task 044

Yang, Y, Bhatta, S and **Delgado-Bonal, A** (2025) Decadal observations of global daytime cloud properties from DSCOVR–EPIC, *Front. Remote Sens.*, 6:1632157, doi:10.3389/frsen.2025.1632157.

Surendra Bhatta / Task 098

Bhatta, S., and Y. Yang, 2025: Selection and Optimization of a Machine Learning Algorithm for Antarctic Blowing Snow Diagnosis Using MERRA-2 Reanalysis. *Artif. Intell. Earth Syst.*, 4, e240019, <https://doi.org/10.1175/AIES-D-24-0019.1>.

Bhatta, S., & Yang, Y. (2025). Machine Learning Model Optimization for Antarctic Blowing Snow Height and Optical Depth Diagnosis. *Atmosphere*, 16(7), 760. <https://doi.org/10.3390/atmos16070760>.

Yang, Y, **Bhatta S** and Delgado-Bonal A (2025) Decadal observations of global daytime cloud properties from DSCOVR–EPIC. *Front. Remote Sens.*, 6:1632157. doi:10.3389/frsen.2025.1632157.

Tamás Várnai / Task 102

Várnai, T., and A. Marshak, 2024: Considering the effects of horizontal heterogeneities in satellite-based large-scale statistics of cloud optical properties. *Remote Sens.*, 16, 3388, doi:10.3390/rs16183388.

Tianle Yuan / Task 112

Yuan, Tianle, Song, Hua, Oreopoulos, Lazaros, Wood, Robert, Bian, Huisheng, Breen, Katherine, Chin, Mian, Yu, Hongbin, Barahona, Donifan, Meyer, Kerry, Platnick, Steven (2024), Abrupt reduction in shipping emission as an inadvertent geoengineering termination shock produces substantial radiative warming, in Collection of Top 25 Papers of 2024 (2025), *Communications Earth & Environment*, <https://www.nature.com/collections/giegbggjad>.

Gettelman, A., Christensen, M. W., Diamond, M. S., Gryspeerdt, E., Manshausen, P., Stier, P., Watson-Parris, D., Yang, M., Yoshioka, M., **Yuan, T.** (2024). Has Reducing Ship Emissions Brought Forward Global Warming?. *Geophysical Research Letters*, <https://doi.org/10.1029%2F2024GL109077>.

Geiss, Andrew, Christensen, Matthew W., Varble, Adam C., **Yuan, Tianle**, Song, Hua (2024). Self-Supervised Cloud Classification, Artificial Intelligence for the Earth Systems. <https://doi.org/10.1175%2FAIES-D-23-0036.1>.

Liu, Jihu, Zhu, Yannian, Wang, Minghuai, Rosenfeld, Daniel, Cao, Yang, **Yuan, Tianle** (2024). Cloud Susceptibility to Aerosols: Comparing Cloud-Appearance Versus Cloud-Controlling Factors Regimes, *Journal of Geophysical Research: Atmospheres*, <https://doi.org/10.1029%2F2024JD041216>.

Daniel J. Miller / Task 113

Allwayin, N., **Miller, D.J.**, Chandrakar K.K, Larsen, M.L., Shaw, R.A. (2025), Investigating characteristic droplet size distributions in Large Eddy Simulations of stratocumulus clouds, GRL, in press.

Jae N. Lee / Task 114

Lee J. N. and D. L. Wu. (2025). Dynamic Impact of the Southern Annular Mode on the Antarctic Ozone Hole Area, Remote Sensing 17 (5): 835 doi:[10.3390/rs17050835](https://doi.org/10.3390/rs17050835).

Wu, D., Salinas, J., **Lee, J. N.** (2025). GNSS-RO residual ionospheric error (RIE): a new method and assessment, Atmospheric Measurement Techniques, 18, 843–886.

Wu, D. L., J. L. Carr, **Lee, J. N.** et al (2024). A GEO-GEO Stereo Observation of Diurnal Cloud Variations over the Eastern Pacific, Remote Sensing 16 (7): 1133 doi[10.3390/rs16071133](https://doi.org/10.3390/rs16071133).

Lee, J. N., D. L. Wu, B. Thurairajah, et al. (2024). The Sensitivity of Polar Mesospheric Clouds to Mesospheric Temperature and Water Vapor, Remote Sensing, 16 (9): 1563 doi:[10.3390/rs16091563](https://doi.org/10.3390/rs16091563).

Salinas, C., **Lee, J. N.** (2024). Energetic particle precipitation reflected in the global secondary ozone distribution, Nature Communications Earth and Environment, <https://www.nature.com/articles/s43247-024-01419-2>.

Jia, J., L. E. Murberg, T. Løvset, **Lee, J. N.** et al. (2024), Energetic particle precipitation influences global secondary ozone distribution, Communications Earth & Environment, 5 (1): 270, doi:[10.1038/s43247-024-01419-2](https://doi.org/10.1038/s43247-024-01419-2).

Yujie Wang / Task 118

Xi, X., Wang, J., Lu, Z., Sayer, A. M., Lee, J., Levy, R. C., **Wang, Y.**, Lyapustin, A., Liu, H., Laszlo, I., Ahn, C., Torres, O., Abdullaev, S., Limbacher, J., and Kahn, R. A. (2025), Analysis of a saline dust storm from the Aralkum Desert – Part 1: Consistency between multisensor satellite aerosol products, Atmos. Chem. Phys., 25, 7403–7429, <https://doi.org/10.5194/acp-25-7403-2025>.

Lyapustin, A., **Wang, Y.**, Korkin, S., Schaaf, C., Wang, W., & Wang, Z. (2025). Scaled RTLS BRDF model extended to high zenith angles, Frontiers in Remote Sensing, 6, <https://doi.org/10.3389/frsen.2025.1533803>.

Choi, M., Lyapustin, A., Schuster, G. L., Go, S., **Wang, Y.**, Korkin, S., Kahn, R., Reid, J. S., Hyer, E. J., Eck, T. F., Chin, M., Diner, D. J., Kalashnikova, O., Dubovik, O., Kim, J., & Moosmüller, H. (2024). Light-absorbing black carbon and brown carbon components of smoke aerosol from DSCOVR EPIC measurements over North America and central Africa, Atmospheric Chemistry and Physics, 24, <https://doi.org/10.5194/acp-24-10543-2024>.

Myungje Choi / Task 120

Choi, M., Lyapustin, A., Schuster, G. L., Go, S., Wang, Y., Korkin, S., Kahn, R., Reid, J. S., Hyer, E. J., Eck, T. F., Chin, M., Diner, D. J., Kalashnikova, O., Dubovik, O., Kim, J., & Moosmüller, H. (2024), Light-absorbing black carbon and brown carbon components of smoke aerosol from DSCOVR EPIC measurements over North America and central Africa. Atmospheric Chemistry and Physics, 24(18), <https://doi.org/10.5194/acp-24-10543-2024>.

Yingxi Shi / Task 132

Shi, Y.R., Levy, R.C., Remer, L.A., Mattoo, S. and Arnold, G.T., 2024. Investigating the Spatial and Temporal Limitations for Remote Sensing of Wildfire Smoke Using Satellite and Airborne Imagers During FIREX-AQ. *Journal of Geophysical Research: Atmospheres*, 129(2).

Mijin Kim / Task 165

Sawyer, V., R. C. Levy, S. Mattoo, Y. R. Shi, **M. Kim**, L. A. Remer and G. Cureton (2025), An updated VIIRS dark target aerosol product for continuity with MODIS: assessing regional aerosol trends, *Frontiers in Environmental Science*, 13, doi:10.3389/fenvs.2025.1602145.

Adeleke Ademakinwa / Task 184

Ademakinwa, A. S., Zhang, Z., Miller, D., Meyer, K. G., Platnick, S., Tushar, Z. H., Purushotham, S., and Wang, J. (2025), Impacts of the Three-dimensional Radiative Effects on Cloud Droplet Number Concentration Retrieval and Aerosol Cloud Interaction Analysis, *EGUsphere* [preprint], <https://doi.org/10.5194/egusphere-2025-4169>.

Jianyu Zheng / Task 193

Chang, I., Gao, L., Adebisi, A., Doherty, S., Painemal, D., Smith, W., Lenhardt, E., Fakoya, A., Flynn, C., **Zheng, J.**, Yang, Z., Castellanos, P., Silva, A. D., Zhang, Z., Wood, R., Zuidema, P., Christopher, S., and Redemann, J. (2025), Low cloud diurnal cycle drives regional aerosol radiative warming. *Nature Geoscience*, 18, <https://doi.org/10.1038/s41561-025-01740-1>.

Alexander Matus / Task 195

Matus, A. V., Nowottnick, E. P., Yorks, J. E., & da Silva, A. M. (2025). Enhancing surface PM_{2.5} air quality estimates in GEOS using CATS lidar data. *Earth and Space Science*, 12, <https://doi.org/10.1029/2024EA004078>.

**ATMOSPHERIC CHEMISTRY AND DYNAMICS
LABORATORY****CODE 614****Daniel Anderson / Task 013**

Duncan, B.N., **Anderson, D.C.**, Fiore, A., Joiner, J., Krotkov, N., Li, C., Millet, D., Nicely, J., Oman, L., St. Clair, J., Shutter, J., Souri, A., Strode, S., Weir, B., Wolfe, G., Worden, H., Zhu, Q. (2024) Opinion: Beyond Global Means: Novel Space-Based Approaches to Indirectly Constrain the Concentrations, Trends, and Variations of Tropospheric Hydroxyl Radical (OH), *Atmos. Chem. Phys.*, doi:[10.5194/acp-24-13001-2024](https://doi.org/10.5194/acp-24-13001-2024).

Ahn, D.Y., Goldberg, D.L., Liu, F., **Anderson, D.C.**, Coombes, T., Loughner, C.P., Kiel, M., Chatterjee, A. (2025), Satellite-Based Analysis of CO₂ Emissions from Global Cities: Regional, Economic, and Demographic Attributes, *AGU Advances*, doi:[10.1029/2025AV001747](https://doi.org/10.1029/2025AV001747).

Sarah Strode / Task 015

Samuel Benito-Barca, Marta Abalos, Natalia Calvo, Hella Garny, Thomas Birner, Nathan Luke Abraham, Hideharu Akiyoshi, Fraser Dennison, Patrick Jöckel, Bèatrice Josse, James Keeble, Doug Kinnison, Marion Marchand, Olaf Morgenstern, David Plummer, Eugene Rozanov, **Sarah Strode**, Timofei Sukhodolov, Shingo Watanabe, Yousuke Yamashita (2025). Recent lower stratospheric ozone trends in CCMI-2022 models: Role of natural variability and transport, *Journal of Geophysical Research: Atmospheres*, 130, <https://doi.org/10.1029/2024JD042412>.

Bryan N. Duncan, Daniel C. Anderson, Arlene M. Fiore, Joanna Joiner, Nickolay A. Krotkov, Can Li, Dylan B. Millet, Julie M. Nicely, Luke D. Oman, Jason M. St. Clair, Joshua D. Shutter, Amir H. Souri, **Sarah A. Strode**, Brad Weir, Glenn M. Wolfe, Helen M. Worden, and Qindan Zhu (2024). Opinion: Beyond global means—novel space-based approaches to indirectly constrain the concentrations of and trends and variations in the tropospheric hydroxyl radical (OH), *Atmospheric Chemistry and Physics*, 24(22), 13001-13023.

Elshorbany, Y., Ziemke, J. R., **Strode, S.**, Petetin, H., Miyazaki, K., De Smedt, I., Pickering, K., Seguel, R. J., Worden, H., Emmerichs, T., Taraborrelli, D., Cazorla, M., Fadnavis, S., Buchholz, R. R., Gaubert, B., Rojas, N. Y., Nogueira, T., Salameh, T., and Huang, M. (2024), Tropospheric ozone precursors: global and regional distributions, trends, and variability, *Atmos. Chem. Phys.*, 24, <https://doi.org/10.5194/acp-24-12225-2024>.

Nürnberg, P., **Strode, S. A.**, & Sussmann, R. (2024). Solar FTIR measurements of NO_x vertical distributions—Part 2: Experiment-based scaling factors describing the daytime variation in stratospheric NO_x, *Atmospheric Chemistry and Physics*, 24(17), 10001-10012.

Fei Liu / Task 019

Fasnacht, Z., Joiner, J., Bucsela, E., Bandel, M., **Liu, F.**, Lamsal, L., and Krotkov, N. (2025), Utilizing machine learning for high resolution NO₂ total columns from PACE OCI, *Environ. Res. Lett.*, 20, <https://doi.org/10.1088/1748-9326/addfef>.

Hiren Jethva / Task 047

Vasilkov A., N. Krotkov, M. Bandel, **H. Jethva**, et al. (2025), Absorbing Aerosol Effects on Hyperspectral Surface and Underwater UV Irradiances from OMI Measurements and Radiative Transfer Computations, *Remote Sensing*, 17 (3): 562, doi:10.3390/rs17030562.

Khatri, P., Hayasaka, T., Patra, P.K. **H. Jethva**, et al. (2025), Unveiling the effects of post-monsoon agricultural biomass burning on aerosols, clouds, and radiation in Northwest India. *Prog Earth Planet Sci*, 12, 11, <https://doi.org/10.1186/s40645-025-00685-8>.

Feng Li / Task 064

Li, F., Newman, P. A., & Waugh, D. W. (2025), Transient and seasonal response of Southern Ocean sea surface temperature and Antarctic sea ice to stratospheric ozone recovery, *Journal of Climate*, 38, 1731-1746, <https://doi.org/10.1175/JCLI-D-24-016>.

Jin Liao / Task 070

Liao, J., Wolfe, Kotsakis, G. M., Nicely A. E., St. Clair, J. M., Hanisco, T. F., Gonzalez Abad, G., Nowlan, C. R., Ayazpour, Z., De Smedt, I., Apel, E. C., and Hornbrook, R. S. (2025), Validation of

formaldehyde products from three satellite retrievals (OMI SAO, OMPS-NPP SAO, and OMI BIRA) in the marine atmosphere with four seasons of ATom aircraft observations, *Atmospheric Measurement Techniques*, 18, 1-16, <https://amt.copernicus.org/articles/18/1/2025/amt-18-1-2025>.

Norman, O. G., Heald, C. L., Campuzano-Jost, P., Coe, H., Fiddler, M. N., Green, J. R., Jimenez, J. L., Kaiser, K., **Liao, J.**, Middlebrook, A. M., Nault, B. A., Nowak, J. B., Schneider, J., and Welti, A. (2025), Exploring the processes controlling secondary inorganic aerosol: Evaluating the global GEOS-Chem simulation using a suite of aircraft campaigns, *Atmospheric Chemistry and Physics*, <https://acp.copernicus.org/articles/25/771/2025/>.

Jerry Ziemke / Task 074

Gaudel A., I. Bourgeois, M. Li, K.-L. Chang, **J. R. Ziemke**, B. Sauvage, R. M. Stauffer, A. M. Thompson, D. E. Kollonige, N. Smith, D. Hubert, A. Keppens, J. Cuesta, K.-P. Heue, P. Veefkind, K. Aikin, J. Peischl, C. R. Thompson, T. B. Ryerson, G. J. Frost, B. C. McDonald, and O. R. Cooper (2024), Tropical tropospheric ozone distribution and trends from in situ and satellite data, *Atmos. Chem. Phys.*, 24, 9975-10000, doi:10.5194/acp-24-9975-2024.

Kramarova, N. A., P. Xu, J. B. Mok, P. K. Bhartia, G. Jaross, L. Moy, Z. Chen, S. Frith, M. DeLand, D. Kahn, G. Labow, J. Li, E. Nyaku, C. Weaver, **J. R. Ziemke**, S. Davis, and Y. Jia (2024), Decade-long Ozone Profile Record from Suomi NPP OMPS Limb 2 Profiler: Assessment of Version 2.6 Data, *Earth and Space Sci.*, 11, doi:10.1029/2024EA003707.

Elshorbany Y., **J. R. Ziemke**, S. Strode, H. Petetin, K. Miyazaki, I. De Smedt, K. Pickering, R. Seguel, H. Worden, T. Emmerichs, D. Taraborrelli, M. Cazorla, S. Fadnavis, R. Buchholz, B. Gaubert, N. Rojas, T. Nogueira, T. Salameh, and M. Huang (2024), Tropospheric Ozone Precursors: Global and Regional Distributions, Trends and Variability, *Atmos. Chem. Phys.*, 24, <https://doi.org/10.5194/acp-24-12225-2024>.

Froidevaux, L., D. E. Kinnison, B. Gaubert, M. J. Schwartz, N. J. Livesey, W. G. Read, C. G. Bardeen, **J. R. Ziemke**, and R. A. Fuller (2025), Tropical upper-tropospheric trends in ozone and carbon monoxide (2005–2020): observational and model results, *Atmos. Chem. Phys.*, 25, 597–624, <https://doi.org/10.5194/acp-25-597-2025>.

Cooper, O. R., **J. R. Ziemke**, and K.-L. Chang (2025), Tropospheric ozone, in *State of the Climate in 2024*, *Bull. Amer. Meteorol. Soc.*, 106, S94-S96.

Arosio, C., Sofieva, V., Orfanos-Cheuquelaf, A., Rozanov, A., Heue, K.-P., Loyola, D., Malina, E. Stauffer, R. M., Tarasick, D., Van Malderen, R., **Ziemke**, J. R., Weber, M. (2025), Intercomparison of tropospheric ozone column datasets from combined nadir and limb satellite observations, *Atmos. Meas. Tech.*, 18, 3247-3265, doi:10.5194/amt-18-3247-2025.

Ziemke, J. R., N. A. Kramarova, S. M. Frith, K.-L. Huang, K. Baek, J. R. Herman, K. Wargan, S. Pawson (2025), Ten Years of Tropospheric Ozone from DSCOVR EPIC: Science and Applications, *Front. Rem. Sens.*, in press.

Ghassan Taha 084

Wang, Y., M. Schoeberl and **G. Taha** (2025), Using OMPS-LP color ratio to extract stratospheric aerosol particle radius and estimate its uncertainty, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 109560, doi:10.1016/j.jqsrt.2025.109560.

Himes, M. D., **G. Taha**, D. Kahn, et al. (2025), Using neural networks for near-real-time aerosol retrievals from OMPS Limb Profiler measurements, *Atmospheric Measurement Techniques*, 18 (11), doi:10.5194/amt-18-2523-2025.

Chen, X., J. Wang, M. Zhou, **Taha**, G., et al. (2025), Impact of water vapor on stratospheric temperature after the 2022 Hunga Tonga eruption: direct radiative cooling versus indirect warming by facilitating large particle formation, *Climate and Atmospheric Science* 8 (1), doi:10.1038/s41612-025-01056-2.

Zhang, S., Solomon, S., Boone, C. D., and **Taha, G.** (2024), Investigating the vertical extent of the 2023 summer Canadian wildfire impacts with satellite observations, *Atmos. Chem. Phys.*, 24, 11727–11736, <https://doi.org/10.5194/acp-24-11727-2024>.

Khaykin, S., **G. Taha**, T. Leblanc, T. Sakai, I. Morino, B. Liley, and S. Godin-Beekmann (2024), Stratospheric aerosols [in “State of the Climate in 2023”]. *Bull. Amer. Meteor. Soc.*, 105 (8), S96–S98, <https://doi.org/10.1175/BAMS-D-24-0116.1>.

Huisheng Bian / Task 127

Wu, M., Wang, H., Lu, Z., Liu, X., **Bian, H.**, Cohen, D., Feng, Y., Chin, M., Hauglustaine, D. A., Karydis, V. A., Lund, M. T., Myhre, G., Pozzer, A., Schulz, M., Skeie, R. B., Tsimpidi, A. P., Tsyro, S. G., and Xie, S. (2025), Observationally Constrained Analysis on the Distribution of Fine and Coarse Mode Nitrate in Global Climate Models, *EGUsphere*, <https://doi.org/10.5194/egusphere-2025-235>, in press.

Petrenko, M., Kahn, R., Chin, M., Bauer, S. E., Bergman, T., **Bian, H.**, Curci, G., Johnson, B., Kaiser, J. W., Kipling, Z., Kokkola, H., Liu, X., Mezuman, K., Mielonen, T., Myhre, G., Pan, X., Protonotariou, A., Remy, S., Skeie, R. B., Stier, P., Takemura, T., Tsigaridis, K., Wang, H., Watson-Parris, D., and Zhang, K. (2025), Biomass burning emission analysis based on MODIS aerosol optical depth and AeroCom multi-model simulations: implications for model constraints and emission inventories, *Atmos. Chem. Phys.*, 25, <https://doi.org/10.5194/acp-25-1545-2025>.

Larrabee Strow / Task 136

DeSouza-Machado, S., **Strow, L. L.**, and Kramer, R. J. (2025). Geophysical trends inferred from 20 years of AIRS infrared global observations, *Journal of Geophysical Research: Atmospheres*, 130, <https://doi.org/10.1029/2025JD043501>.

Anne Thompson / Task 138

Keppens, A., Di Pede, S., Hubert, D., Lambert, J.-C., Veefkind, P., Sneep, M., De Haan, J., ter Linden, M., Leblanc, T., Compernelle, S., Verhoelst, T., Granville, J., Nath, O., Fjæraa, A. M., Boyd, I., Niemeijer, S., Van Malderen, R., Smit, H. G. J., Dufлот, V., Godin-Beekmann, S., Johnson, B. J., Steinbrecht, W., Tarasick, D. W., Kollonige, D. E., Stauffer, R. M., **Thompson, A. M.**, Dehn, A., and Zehner, C. (2024), 5 years of Sentinel-5P TROPOMI operational ozone profiling and geophysical validation using ozonesonde and lidar ground-based networks, *Atmos. Meas. Tech.*, 17, <https://doi.org/10.5194/amt-17-3969-2024>.

Satheesan, S. M., Eichmann, K.-U., Burrows, J. P., Weber, M., Stauffer, R., **Thompson, A. M.**, Kollonige, D. E. (2024), Improved CCD tropospheric ozone from S5P TROPOMI satellite data using local cloud fields, *Atmos. Meas. Tech.*, 17, 6459–6484, <https://doi.org/10.5194/amt-17-6459-2024>.

Huang, M., Carmichael, G. R., Crawford, J. H., Bowman, K. W., De Smedt, I., Colliander, A., Cosh, M. H., Kumar, S. V., Guenther, A. B., Janz, S. J., Stauffer, R. M., **Thompson, A. M.**, Fedkin, N. M., Swap, R. J., Bolten, J. D., Joseph, A. T. (2025), Reactive nitrogen in and around the northeastern and Mid-Atlantic US: sources, sinks, and connections with ozone, *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-25-1449-2025>.

Zang, Z., Liu, J., Tarasick, D., Moeini, O., Bian, J., Zhang, J., **Thompson, A. M.**, Van Malderen, R., Smit, H. G. J., Stauffer, R. M., Johnson, B. J., Kollonige, D. E. (2024), An improved Trajectory-mapped Ozone-sonde dataset for the Stratosphere and Troposphere (TOST): update, validation and applications, *Atmos. Chem. Phys.*, 24, <https://doi.org/10.5194/acp-24-13889-2024>.

Zou, J., Walker, K. A., Sheese, P. E., Boone, C. D., Stauffer, R. M., **Thompson, A. M.**, and Tarasick, D. W. (2024), Validation of ACE-FTS version 5.2 ozone data with ozone-sonde measurements, *Atmos. Meas. Tech.*, 17, 6983–7005, <https://doi.org/10.5194/amt-17-6983-2024>.

Van Malderen, R., **Thompson, A. M.**, Kollonige, D. E., Stauffer, R. M., Smit, H. G. J., Maillard Barras, E., Vigouroux, C., Petropavlovskikh, I., Leblanc, T., Thouret, V., Wolff, P., Effertz, P., Tarasick, D. W., Poyraz, D., Ancellet, G., De Backer, M.-R., Evan, S., Flood, V., Frey, M. M., Hannigan, J. W., Hernandez, J. L., Iarlori, M., Johnson, B. J., Jones, N., Kivi, R., Mahieu, E., McConville, G., Müller, K., Nagahama, T., Notholt, J., PETERS, A., Prats, N., Querel, R., Smale, D., Steinbrecht, W., Strong, K., and Sussmann, R. (2025a), Global ground-based tropospheric ozone measurements: reference data and individual site trends (2000–2022) from the TOAR-II/HEGIFTOM project, *Atmos. Chem. Phys.*, 25, 7187–7225, <https://doi.org/10.5194/acp-25-7187-2025>.

Van Malderen, R., Zang, Z., Chang, K.-L., Björklund, R., Cooper, O. R., Liu, J., Barras, E. M., Vigouroux, C., Petropavlovskikh, I., Leblanc, T., Thouret, V., Wolff, P., Effertz, P., Gaudel, A., Tarasick, D. W., Smit, H. G. J., **Thompson, A. M.**, Stauffer, R. M., Kollonige, D. E., Poyraz, D., Ancellet, G., De Backer, M.-R., Frey, M. M., Hannigan, J. W., Hernandez, J. L., Johnson, B. J., Jones, N., Kivi, R., Mahieu, E., Morino, I., McConville, G., Müller, G., Murata, I., Notholt, J., PETERS, A., Prignon, M., Querel, R., Rizi, V., Smale, D., Steinbrecht, W., Strong, K., and Sussmann, R. (2025b), Ground-based tropospheric ozone measurements: Regional tropospheric ozone column trends from the TOAR-II/ HEGIFTOM homogenized datasets, doi:10.5194/egusphere-2024-3745, in press.

Jason St. Clair / Task 147

Gordon, A., Homeyer, C., Smith, J., Ueyama, R., Dean-Day, J., Atlas, E., Smith, K., Pittman, J., Sayres, D., Wilmouth, D., Pandey, A., **St. Clair, J. M.**, Hanisco, T., Hare, J., Hannun, R., Wofsy, S., Daube, B., Donnelly, S. (2024). Airborne observations of upper troposphere and lower stratosphere composition change in active convection producing above-anvil cirrus plumes, *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-24-7591-2024>.

Pye, H. O. T., Xu, L., Henderson, B., Pagonis, D., Campuzano-Jost, P., Guo, H., Jimenez, J., Allen, C., Skipper, T., Halliday, H., Murphy, B., D'Ambro, E., Wennberg, P., Place, B., Wiser, F., McNeill, V., Apel, E., Blake, D., Coggon, M., Crounse, J., Gilman, J., Gkatzelis, G., Hanisco, T., Huey, L., Katich, J., Lamplugh, A., Lindaas, J., Peischl, J., **St. Clair, J. M.**, Warneke, C., Wolfe, G., Womack, C. (2024), Evolution of Reactive Organic Compounds and Their Potential Health Risk in Wildfire Smoke, *Environmental Science and Technology*, <https://doi.org/10.1021/acs.est.4c06187>.

Dingilian, K., Hebert, E., Battaglia, Michael Jr., Campbell, J. R., Cesler-Maloney, M., Simpson, W., **St. Clair, J. M.**, Dibb, J., Temime-Roussel, B., D'Anna, B., Moon, A., Alexander, B., Yang, Y., Nenes, A., Mao, J., Weber, R. J. (2024). Hydroxymethanesulfonate and Sulfur(IV) in Fairbanks Winter During the ALPACA Study, *ACS ES&T Air*, 1(7), 646-659.
<https://doi.org/10.1021/acsestair.4c00012>.

Duncan, B., Anderson, D., Fiore, A., Joiner, J., Krotkov, N., Li, C., Millet, D., Nicely, J., Oman, L., **St. Clair, J. M.**, Shutter, J., Souri, A., Strode, S., Weir, B., Wolfe, G., Worden, H., Zhu, Q. (2024). Opinion: Beyond Global Means: Novel Space-Based Approaches to Indirectly Constrain the Concentrations, Trends, and Variations of Tropospheric Hydroxyl Radical (OH). *Atmospheric Chemistry and Physics*, <https://doi.org/10.5194/acp-24-13001-2024>.

Simpson, W. R., Mao, J., Fochesatto, G. J., Law, K. S., DeCarlo, P. F., Schmale, J., Pratt, K. A., Arnold, S. R., Stutz, J., Dibb, J. E., Creamean, J. M., Weber, R. J., Williams, B. J., Alexander, B., Hu, L., Yokelson, R. J., Shiraiwa, M., Decesari, S., Anastasio, C., D'Anna, B., Gilliam, R. C., Nenes, A., **St. Clair, J. M.**, et al. (2024). Overview of the Alaskan Layered Pollution and Chemical Analysis (ALPACA) Field Experiment, *ACS ES&T Air*, 1(3), 200-222.
<https://doi.org/10.1021/acsestair.3c00076>.

Gkatzelis, G., Coggon, M., Stockwell, C., Hornbrook, R., Allen, H., Apel, E., Bela, M., Blake, D., Bourgeois, I., Brown, S., Campuzano-Jost, P., **St. Clair, J. M.**, et al. (2024), Parameterizations of US wildfire and prescribed fire emission ratios and emission factors based on FIREX-AQ aircraft measurements, *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-24-929-2024>.

Skipper, T., D'Ambro, E., Wiser, F., McNeill, V., Schwantes, R., Henderson, B., Piletic, I., Baublitz, C., Bash, J., Whitehill, A., Valin, L., Mouat, A., Kaiser, J., Wolfe, G., **St. Clair, J. M.**, Hanisco, T., Fried, A., Place, B., Pye, H. (2024), Role of chemical production and depositional losses on formaldehyde in the Community Regional Atmospheric Chemistry Multiphase Mechanism (CRACMM), *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-24-12903-2024>.

Homeyer, C., Gordon, A., Smith, J., Ueyama, R., Wilmouth, D., Sayres, D., Hare, J., Pandey, A., Hanisco, T., Dean-Day, J., Hannun, R., **St. Clair, J. M.** (2024). Stratospheric Hydration Processes in Tropopause-Overshooting Convection Revealed by Tracer-Tracer Correlations From the DCOTSS Field Campaign, *J. Geophys. Res. - Atmos.*, <https://doi.org/10.1029/2024JD041340>.

Caterina Mogno / Task 172

Mogno, C., Colarco, P. R., Collow, A. B., Das, S., Strode, S. A., Valenti, V., Manyin, M. E., Liang, Q., Oman, L., Steenrod, S. D., and Knowland, K. E. (2025), From column to surface: connecting the performance in simulating aerosol optical properties and PM_{2.5} concentrations in the NASA GEOSCCM, *EGUsphere* [preprint], <https://doi.org/10.5194/egusphere-2025-2354>.

Apoorva Pandey / Task 177

Gordon, A.E., Homeyer, C.R., Smith, J.B., Ueyama, R., Dean-Day, J.M., Atlas, E.L., Smith, K., Pittman, J.V., Sayres, D.S., Wilmouth, D.M. and **Pandey, A.**, (2024), Airborne observations of upper troposphere and lower stratosphere composition change in active convection producing above-anvil cirrus plumes. *Atmospheric Chemistry and Physics*, 24(13), pp.7591-7608.

Sayres, D.S., Smith, J.B., Wilmouth, D.M., **Pandey, A.**, Homeyer, C.R., Bowman, K.P. and Anderson, J.G. (2024), Using the NAMA as a natural integrator to quantify the convective contribution to lower stratospheric water vapor over North America, *Journal of Geophysical Research: Atmospheres*, 129(17), p.e2024JD041641.

Homeyer, C.R., Gordon, A.E., Smith, J.B., Ueyama, R., Wilmouth, D.M., Sayres, D.S., Hare, J., **Pandey, A.**, Hanisco, T.F., Dean-Day, J.M. and Hannun, R. (2024), Stratospheric hydration processes in tropopause-overshooting convection revealed by tracer-tracer correlations from the DCOTSS field campaign. *Journal of Geophysical Research: Atmospheres*, 129(16), p.e2024JD041340.

Doyeon Ahn / Task 179

Ahn, D. Y., Goldberg, D. L., Liu, F., Anderson, D. C., Coombes, T., Loughner, C. P., et al. (2025). Satellite-based analysis of CO₂ emissions from global cities: Regional, economic, and demographic attributes. *AGU Advances*, 6, <https://doi.org/10.1029/2025AV001747>.

Michael D. Himes / Task 205

Himes, M. D., Taha, G., Kahn, D., Zhu, T., and Kramarova, N. A. (2025), Using neural networks for near-real-time aerosol retrievals from OMPS Limb Profiler measurements, *Atmos. Meas. Tech.*, 18, 2523-2536, <https://doi.org/10.5194/amt-18-2523-2025>, 2025.

Latouf, N., **M. D. Himes**, A. M. Mandell, M. D. Moore, V. Kofman, G. L. Villanueva, and C. Stark (2024), BARBIE. Bayesian Analysis for Remote Biosignature Identification on exoEarths. III. Introducing the KEN, *The Astron. J.*, 169, 50, <https://doi.org/10.3847/1538-3881/ad9729>.

Kanghyun Baek / Task 216

Baek, K., et al. (2025), Seasonal variations in PM_{2.5} levels in Hong Kong induced by eastern and western tropical cyclones, *Atmospheric Environment*, 361, 121497.

Baek, K., et al. (2025), Ten years of tropospheric ozone from DSCOVR EPIC: science and applications, *Frontiers in Remote Sensing*, 6:1634922, doi:10.3389/frsen.2025.16349223.

Baek, K., et al. (2025), Geostationary Satellites Total Ozone Observations: First Results on Ground-Based Networks Validation Efforts for TEMPO and GEMS, *Geophysical Research Letters*, doi:10.1029/2025GL114768.

CRYOSPHERIC SCIENCES LABORATORY
CODE 615

Elizabeth Ultee / Task 202

Schuster, L.* , Maussion, F., Rounce, D., **Ultee, L.**, Schmitt, P.* , Lacroix, P., Frölicher, T., and Schleussner, C.-F. (2025), Irreversible glacier change and trough water for centuries after overshooting 1.5° C, Nature Climate Change. doi:10.1038/s41558-025-02318-w.

Wimberly, F.† , **Ultee, L.**, Schuster, L.* , Huss, M., Rounce, D. R., Maussion, F., Coats, S., Mackay, J., and Holmgren, E.* (2025), Inter-model differences in 21st Century glacier runoff for the world's major river basins, The Cryosphere, doi:10.5194/tc-19-1491-2025.

OCEAN ECOLOGY LABORATORY

CODE 616

Susanne Craig / Task 004

Craig, S. E., Karaköylü, E. M. (2025), PhyX - Predicting Phytoplankton Community Composition from Satellite Ocean Color, Earth and Space Science Open Archive (pre-print), <https://doi.org/10.31223/x5qq9k>.

Dirk A. Aurin / Task 009

Tilstone, G., T. Jordan, **D. Aurin**, A. Białek, A. Deru, A. Ramsay, M. Hieronymi, G. Dall'Olmo, M. Ligi, C. Kovach, I. Ansko, M. Ondrusek, V. Vabson, G. Zibordi, J. Gossn, E. Kwiatkowska, and R. Vendt (2025), Radiometric field inter-comparison of fiducial reference measurements using an open source community processor, Opt. Express 33, 15756-15781.

Smith, S.L.; Schollaert Uz, S.; Clark, J.B.; **Aurin, D.** (2025), Augmenting Satellite Remote Sensing with AERONET-OC for Plume Monitoring in the Chesapeake Bay, Remote Sens., 17, 1767, <https://doi.org/10.3390/rs17101767>.

Ivona Cetinić / Task 017

Franz, B. A., I. **Cetinić**, M. Gao, D. A. Siegel, & Westberry, T. K. (2025). Global ocean phytoplankton, in "State of the Climate in 2024", Bulletin of the American Meteorological Society, 106 (8), <https://doi.org/10.1175/BAMS-D-25-0074.1>.

Neeley, A. R., **Cetinić, I.**, & Thomas, C. (2025). Evaluation of fluorometrically-derived *chlorophyll* *a* as a satellite ocean color validation product using statistical metrics, Optics Express, 33(5), <https://doi.org/10.1364/OE.549547>.

Kramer, S. J., Maritorena, S., **Cetinić, I.**, Werdell, P. J., & Siegel, D. A. (2024). Phytoplankton communities quantified from hyperspectral ocean reflectance correspond to pigment-based communities, Optics Express, 32 (20): 34482, <https://doi.org/10.1364/OE.529906>.

Andrew Sayer / Task 048

Foley, S. R., K. D. Knobelspiesse, **A. M. Sayer**, M. Gao, J. Hays, and J. Hoffman (2024), 3D cloud masking across a broad swath using multi-angle polarimetry and deep learning, Atmos. Meas. Tech., 17, 7027–7047, <https://doi.org/10.5194/amt-17-7027-2024>.

Korkin, S., **A. M. Sayer**, A. Ibrahim, and A Lyapustin (2025), A practical guide to coding line-by-line trace gas absorption in Earth's atmosphere, Journal of Quantitative Spectroscopy & Radiative Transfer, 337, 109345, <https://doi.org/10.1016/j.jqsrt.2025.109345>.

Lee, J. S. M., S. M. Loría-Salazar, H. A. Holmes, and **A. M. Sayer** (2025), Spatiotemporal gap-filling of NASA deep blue satellite aerosol optical depth over the contiguous United States (CONUS) using the UNet 3+ architecture, *Earth and Space Science*, 12, <https://doi.org/10.1029/2025EA004338>.

Xi, X., J. Wang, Z. Lu, **A. M. Sayer**, J. Lee, R. C. Levy, Y. Wang, A. Lyapustin, H. Liu, I. Laszlo, C. Ahn, O. Torres, S. Abdullaev, J. Limbacher, and R. A. Kahn (2025), Analysis of a saline dust storm from the Aralkum Desert – Part 1: Consistency between multisensor satellite aerosol products, *Atmos. Chem. Phys.*, 25, <https://doi.org/10.5194/acp-25-7403-2025>.

J. Vanderlei Martins, Xiaoguang (Richard) Xu, Anin Puthukkudy / Task 115

Chen, X., J. Wang, **X. Xu** and M. Zhou (2025), Dust Optical Centroid Height (AOCH) over bright surface: first retrieval from TROPOMI oxygen A and B absorption bands, *IEEE Geoscience and Remote Sensing Letters*, doi:10.1109/LGRS.2025.3601046.

Sienkiewicz, N., **Martins, J. V.**, McBride, B. A., **Xu, X.**, **Puthukkudy, A.**, Smith, R., and Fernandez-Borda, R. (2025), HARP2 pre-launch calibration: dealing with polarization effects of a wide field of view, *Atmos. Meas. Tech.*, 18, 2447–2462, <https://doi.org/10.5194/amt-18-2447-2025>.

Hou, W., Liu, X., Wang, J., Chen, C., & **Xu, X.** (2025). Multispectral Land Surface Reflectance Reconstruction Based on Non-Negative Matrix Factorization: Bridging Spectral Resolution Gaps for GRASP TROPOMI BRDF Product in Visible. *Remote Sensing*, 17(6), 1053. <https://doi.org/10.3390/rs17061053>.

Singh, I., Martin, R. V., Bindle, L., Chatterjee, D., Li, C., Oxford, C., **Xu, X.**, and Wang, J. (2024), Effect of dust morphology on aerosol optics in the GEOS-chem chemical transport model, on UV-vis trace gas retrievals, and on surface area available for reactive uptake, *Journal of Advances in Modeling Earth Systems*, 16, <https://doi.org/10.1029/2023MS003746>.

Xu, X., Chen X., Wang J., and Remer L.A., (2024). Potential of NASA's Plankton, Aerosol, Cloud, and Ocean Ecosystem (PACE) Satellite Observations in the Oxygen Bands for Determining Aerosol Layer Height over Ocean. *J Remote Sens.*, 4:0167. doi:[10.34133/remotesensing.0167](https://doi.org/10.34133/remotesensing.0167).

J. Vanderlei Martins / Task 183

Sienkiewicz, N., **Martins, J. V.**, McBride, B., Xu, X., Puthukkudy, A., Smith, R., and Fernandez-Borda, R. (2025), HARP2 pre-launch calibration: dealing with polarization effects of a wide field of view, *Atmospheric Measurement Techniques*, 18(11), <https://doi.org/10.5194/amt-18-2447-2025>.

McBride, B. A., **Martins, J. V.**, Cieslak, J. D., Fernandez-Borda, R., Puthukkudy, A., Xu, X., Sienkiewicz, N., Cairns, B., and Barbosa, H. M. J. (2024), Pre-launch calibration and validation of the Airborne Hyper-Angular Rainbow Polarimeter (AirHARP) instrument, *Atmospheric Measurement Techniques*, <https://amt.copernicus.org/articles/17/5709/2024/>.

Sienkiewicz, N., **Martins, J. V.**, Xu, X., McBride, B. A., and Remer, L. A. (2024), Developing small satellite ground support software for orbit tracking and target acquisition of the HARP cubesat,

HYDROLOGICAL SCIENCES LABORATORY CODE 617

Jinzheng Peng / Task 020

Peng, J. et al. (2025), One-Point Calibration for Soil Moisture Active/Passive (SMAP) L-band Microwave Radiometer, *IEEE J. Sel. Topics Appl. Earth Obs. Remote Sens.*, vol.18, pp.655-662, doi:10.1109/JSTARS.2024.3499735.

Priscilla Mohammed-Tano / Task 020

Peng, J., J. R. Piepmeier, S. Misra, **P. Mohammed** and A. Bringer (2025), One-Point Calibration for Soil Moisture Active/Passive (SMAP) L-Band Microwave Radiometer, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 18, pp. 655-662, doi:10.1109/JSTARS.2024.3499735.

Robert Emberson / Task 030

Rolla, J., A. Khuller, K. An, **R. Emberson**, E. Fielding, L. Schultz and K. Miner (2025), Satellite-Aided Disaster Response, *AGU Advances*, 6 (1), doi:[10.1029/2024av001395](https://doi.org/10.1029/2024av001395).

Elijah Orland / Task 031

Lahmers, T. M., Kumar, S. V., Ahmad, S. K., Holmes, T., Getirana, A., **Orland, E.**, Locke, K., Biswas, N. K., Nie, W., Pflug, J., Whitney, K., Anderson, M., Yang, Y. (2025), An observation driven framework for modeling post-fire hydrologic response: Evaluation for two central California case studies, *Water Resources Research*, 61, <https://doi.org/10.1029/2023WR036582>.

Thomas Stanley / Task 032

Stanley, T., R. Soobitsky, P. Amatya, D. Kirschbaum (2024), Landslide Hazard is Projected to Increase Across High Mountain Asia, *Earth's Future*, <http://dx.doi.org/10.1029/2023EF004325>.

Nishan Kumar Biswas / Task 033

Getirana, A., **Biswas, N.K.**, Kumar, S.V., Nie, W., Ahmad, S.K., Maina, F., Sakib, N., Hossain, M.S., Biswas, R. (2025), Deltaic freshwater scarcity driven by unsustainable groundwater-fed irrigation. *Nat Sustain*, <https://doi.org/10.1038/s41893-025-01566-0>.

Lahmers, T. M., Kumar, S. V., Ahmad, S. K., Holmes, T., Getirana, A., Orland, E., Locke, K., **Biswas, N.K.**, Nie, W., Pflug, J., Whitney, K., Anderson, M., & Yang, Y. (2025). An observation-driven framework for modeling post-fire hydrologic response: Evaluation for two central California case studies. *Water Resources Research*, 61(2), <https://doi.org/10.1029/2023WR036582>.

Fadji Zaoua Maina / Task 057

Flores, J. A., Gleason, C. J., Brown, C., Vergopolan, N., Lummus, M. M., Stearns, L. A., **Maina, F.Z.**, et al. (2025). Accelerating river discharge in High Mountain Asia. *AGU Advances*, 6, <https://doi.org/10.1029/2024AV001586>.

Maina, F.Z., Kumar, S.V. (2025), Global patterns of rain-on-snow and its impacts on runoff from past to future projections. *Nat Commun* 16, 4731, <https://doi.org/10.1038/s41467-025-59855-3>.

Getirana, A., Kumar Biswas, N., Kumar S., Nie W., Ahmad S., **Maina F.Z.**, Sakib N., Hossain M.S., Kumar Biswas R. (2025), Deltaic freshwater scarcity driven by unsustainable groundwater-fed irrigation. *Nat Sustain*, <https://doi.org/10.1038/s41893-025-01566-0>.

Maina, F.Z., Rosen D., Abbaszadeh P., Yang C., Kumar S.V., Rodell M., Maxwell R. (2025), Integrating the interconnections between groundwater and land surface processes through the coupled NASA land information system and ParFlow environment, *Journal of Advances in Modeling Earth Systems*, 17, <https://doi.org/10.1029/2024MS004415>.

Dennedy-Frank, P. J., Visser, A., **Maina, F. Z.**, & Siirila-Woodburn, E. R. (2024), Investigating mountain watershed headwater-to-groundwater connections, water sources, and storage selection behavior with dynamic-flux particle tracking. *Journal of Advances in Modeling Earth Systems*, 16, <https://doi.org/10.1029/2023MS003976>.

Maina, F.Z., Xue Y., Kumar S.V., Getirana A., McLarty S., Appana R., Forman B., Zaitchik B., Loomis B., Maggioni V., Zhou Y. (2024), Development of a multidecadal land reanalysis over High Mountain Asia, *Sci Data* 11, 827, <https://doi.org/10.1038/s41597-024-03643>.

Maina, F.Z., Getirana, A., Kumar, S.V., Saharia M., Kumar B. N., McLarty S., Appana R. (2024), Irrigation-driven groundwater depletion in the Ganges-Brahmaputra basin decreases the streamflow in the Bay of Bengal, *Commun Earth Environ* 5, 169, <https://www.nature.com/articles/s43247-024-01348-0>.

Dollan, I. J., **Maina F. Z.**, Kumar S. V., Nikolopoulos E. I., Maggioni V. (2024), An assessment of gridded precipitation products over High Mountain Asia, *Journal of Hydrology: Regional Studies*, <https://doi.org/10.1016/j.ejrh.2024.101675>.

Maina, F. Z. and Kumar, S. V. (2024), Anthropogenic Influences Alter the Response and Seasonality of Evapotranspiration: A Case Study Over Two High Mountain Asia Basins, *Geophysical Research Letters*, 51, <https://doi.org/10.1029/2023GL107182>.

Pukar Amatya / Task 063

Jimenez, H. N., Istanbuluoglu, E., Gorum, T., Stanley, T. A., **Amatya, P. M.**, Tanyas, H., Demirel, M. C., Akgun, A., and Bozkurt, D. (2025), Modeling the combined effects of the 2023 Türkiye-Syria Earthquake and an Atmospheric River event on landslide hazard, *Natural Hazards and Earth System Sciences Discussions*.

Stanley, T. A., Sutton, J., Vershel, R., **Amatya, P., M.** (2025). Better Satellite Precipitation Algorithms Slightly Improved Landslide Hazard Assessment, *Journal of Applied Meteorology and Climatology*. <https://doi.org/10.1175/JAMC-D-25-0021.1>.

Stanley, T. A., Soobitsky, R., **Amatya, P.M.** Kirschbaum, D. B. (2024). Landslide Hazard Is Projected to Increase Across High Mountain Asia, *Earth's Future*. <https://doi.org/10.1029/2023EF004325>.

Cheng-Hsuan Lyu / Task 073

Yang, Hu, Edward Kim, Matthew Sammons, **Cheng-Hsuan Lyu**, Saji Abraham, Alexandra Bringer, James Fuentes, James Kam, Ninghai Sun, and XingMing Liang (2025), Validation of the Calibrated Microwave Lunar Radiative Transfer Model with the ATMS 2-D Moon Observations at Different Moon Phase Angles, *IEEE Geoscience and Remote Sensing Letters*, 22.

BIOSPHERIC SCIENCES LABORATORY CODE 618

MinJeong Jo / Task 082

Huang, S., Osmanoglu, B., **Jo, M.**, Scheuchl, B. and Ciraci, E., (2024), Commercial synthetic aperture radar data for surface deformation and change. *Authorea Preprints*.

Thomas Eck / Task 085

Zhang, X., Li, L., Che, H., Dubovik, O., Derimian, Y., Holben, B., Gupta, P., **Eck, T. F.**, Lind, E.S., Toledano, C. and Xia, X. (2024), Aerosol components derived from global AERONET measurements by GRASP: a new value-added aerosol component global dataset and its application, *Bulletin of the American Meteorological Society*, 105(10), E1822-E1848.

Choi, M., Lyapustin, A., Schuster, G. L., Go, S., Wang, Y., Korkin, S., Kahn, R., Reid, J. S., Hyer, E. J., **Eck, T. F.**, Chin, M., Diner, D. J., Kalashnikova, O., Dubovik, O., Kim, J., and Moosmüller, H.: Light-absorbing black carbon and brown carbon components of smoke aerosol from DSCOVR EPIC measurements over North America and central Africa, *Atmos. Chem. Phys.*, 24, 10543–10565, <https://doi.org/10.5194/acp-24-10543-2024>, 2024.

Zhang, J., Reid, J. S., Sorenson, B. T., Miller, S. D., Román, M. O., Wang, Z., Spurr, R. J. D., Jaker, S., **Eck, T. F.**, and Rubin, J. I. (2025), Towards gridded nighttime aerosol optical thickness retrievals using VIIRS day–night band observations over regions with artificial light sources, *Atmos. Meas. Tech.*, 18, 1787–1810, <https://doi.org/10.5194/amt-18-1787-2025>, 2025.

Zhang, Z., Li, J., Che, H., Dong, Y., Dubovik, O., **Eck, T.**, Gupta, P., Holben, B., Kim, J., Lind, E., Saud, T., Tripathi, S. N., and Ying, T. (2025), Long-term trends in aerosol properties derived from AERONET measurements, *Atmos. Chem. Phys.*, 25, <https://doi.org/10.5194/acp-25-4617-2025>.

Dayanandan, B., Krishna, N., Parottil, A., Vinoj Velu, Ahmed Al Harrasi, Binisia Sanatan, Pawan Gupta, **Tom Eck**, Alexander Smirnov, Humaid AlBadi (2025), Initial Study of Column-Integrated Aerosol Optical Properties over Birkat al Mouz, Sultanate of Oman, *Aerosol Air Qual. Res.*, 25, 13, <https://doi.org/10.1007/s44408-025-00014-0>.

Fakoya, A. A., Redemann, J., Saide, P. E., Gao, L., Mitchell, L. T., Howes, C., Dobracki, A., Chang, I., Ferrada, G. A., Pistone, K., Leblanc, S. E., Segal-Rozenhaimer, M., Sedlacek III, A. J., **Eck, T.**, Holben, B., Gupta, P., Lind, E., Zuidema, P., Carmichael, G., and Flynn, C. J. (2025), Atmospheric processing and aerosol aging responsible for observed increase in absorptivity of long-range-transported smoke over the southeast Atlantic, *Atmos. Chem. Phys.*, 25, 7879–7902, <https://doi.org/10.5194/acp-25-7879-2025>.

Anthony Campbell / Task 109

DeWater, K., Kochtitzky, W., Ellis, R., Merrill, P., Pittsley, M., Morgan, P., Burns, C., **Campbell, A.** and Adamowicz, S. (2025), Widespread expansion of salt marsh pools observed on Maine marshes since 2009, *Journal of Geophysical Research: Earth Surface*, 130(2), p.e2024JF007948.

Campbell, A., Fatoyinbo, T. (2024), Mapping Aboveground Biomass and Carbon in Salt Marshes across the Contiguous United States, *Journal of Applied Remote Sensing*.

Heck, N., Goldberg, L., Andradi-Brown, D., **A., Campbell, A.**, Narayan, S., Ahmadi, G.N. and Lagomasino, D. (2024), Global drivers of mangrove loss in protected areas, *Conservation Biology*, p.e14293.

Petya Campbell / Task 122

Williams, Paige T., Valerie A Thomas, Randolph H Wynne, Karl F Huemmrich, David J Harding, K Jon Ranson, **Petya K Campbell**, Elizabeth M Middleton (2024), Characterizing the influence of varying functional traits from remotely sensed data on forest productivity acquired from selected NEON sites, *Science of Remote Sensing*, 100262.

Garcia, Maquella N, Lucas BS Tameirão, Juliana Schietti, Izabela Aleixo, Tomas F Domingues, K Fred Huemmrich, **Petya KE Campell**, Loren P Albert (2025), Predicting drought vulnerability with leaf reflectance spectra in Amazonian trees, *Remote Sensing of Environment*, 318, 114562.

Chadwick, K Dana, Frank Davis, Kimberley R Miner, Ryan Pavlick, Mark Reynolds, Philip A Townsend, Philip G Brodrick, Christiana Ade, Jean Allen, Leander Anderegg, Yoseline Angel, Indra Boving, Kristin B Byrd, **Petya Campbell**, et. al. (2025), Unlocking ecological insights from sub-seasonal visible-to-shortwave infrared imaging spectroscopy: The SHIFT campaign, *Ecosphere* 16 (3), e70194.

Lhotáková, Zuzana, Eva Neuwirthová, Markéta Potůčková, Lucie Červená, Lena Hunt, Lucie Kupková, Petr Lukeš, **Petya Campbell**, Jana Albrechtová (2025), Mind the leaf anatomy while taking ground truth with portable chlorophyll meters, *Scientific Reports*, 15 (1), 1855.

Neuwirthová, Eva, Zuzana Lhotáková, Lucie Červená, Petr Lukeš, **Petya Campbell**, Jana Albrechtová (2024), Asymmetry of leaf internal structure affects PLSR modelling of anatomical traits using VIS-NIR leaf level spectra, *European Journal of Remote Sensing* 57 (1), 2292154.

Naethe, Paul, Andrea De Sanctis, Andreas Burkart, **Petya KE Campbell**, Roberto Colombo, Biagio Di Mauro, Alexander Damm, Tarek El-Madany, Francesco Fava, John A Gamon, Karl F Huemmrich, Mirco Migliavacca, Eugenie Paul-Limoges, Uwe Rascher, Micol Rossini, Dirk Schüttemeyer, Giulia Tagliabue, Yongguang Zhang, Tommaso Julitta (2024), Towards a standardized, ground-based network of hyperspectral measurements: Combining time series from autonomous field spectrometers with Sentinel-2, *Remote Sensing of Environment*, 303, 114013.

Arif Rustem Albayrak / Task 133

Dramsch, J. S., Kuglitsch, M. M., Fernández-Torres, M.-Á., Toret, A., **Albayrak, R. A.**, Nava, L., Ghaffarian, S., Cheng, X., Ma, J., Samek, W., Venguswamy, R., Koul, A., Muthuregunathan, R., & Hraat Essenfelder, A. (2025), Explainability can foster trust in artificial intelligence in geoscience, *Nature Geoscience*, 18(2), 112–114, <https://doi.org/10.1038/s41561-025-01639-x>.

Kuglitsch, M. M., Cox, J., Luterbacher, J., Jamoussi, B., Xoplaki, E., Thummarukudy, M., Radwan, G. S., Yasukawa, S., McClain, S. N., **Albayrak, R. A.**, Oehmen, D., & Ward, T. (2024), AI to the rescue: How to enhance disaster early warnings with tech tools, *Nature*, 634 (8032), 27–29, <https://doi.org/10.1038/d41586-024-03149-z>.

Huang, S., Osmanoğlu, B., Scheuchl, B., **Albayrak, A.**, & others (2025), A new age of SAR: How can commercial smallsat constellations contribute to NASA's surface deformation and change mission? *Earth and Space Science*, 12(1), <https://doi.org/10.1029/2024EA003832>.

Rojas, C. A., Padrão, P., Fuentes, J., Reis, G. M., **Albayrak, A.**, Osmanoğlu, B., & Bobadilla, L. (2024), Combining multi-satellite remote and in-situ sensing for unmanned underwater vehicle state estimation, *Ocean Engineering*, 310, <https://doi.org/10.1016/j.oceaneng.2024.118708>.

K. Fred Huemmrich / Task 134

Caplan, Skye, **K. Fred Huemmrich** (2025), Unveiling PACE OCI's hyperspectral terrestrial data products. *Remote Sensing Letters*, 16(4), <https://doi.org/10.1080/2150704X.2025.2470905>.

Huemmrich, K. Fred, Skye Caplan, John A. Gamon, and Petya Campbell (2025), Determining Terrestrial Ecosystem Gross Primary Productivity from PACE OCI, *IEEE Geoscience and Remote Sensing Letters*, 22, 2504605, doi:10.1109/LGRS.2025.3587584.

Naethe, P., De Sanctis, A., Burkart, A., Campbell, P.K., Colombo, R., Di Mauro, B., Damm, A., El-Madany, T., Fava, F., Gamon, J.A., and **Huemmrich, K.F.** (2024), Towards a standardized, ground-based network of hyperspectral measurements: Combining time series from autonomous field spectrometers with Sentinel-2. *Remote Sensing of Environment*, 303, <https://doi.org/10.1016/j.rse.2024.114013>.

Williams, Paige T, Valerie A Thomas, Randolph H Wynne, **Karl F Huemmrich**, David J Harding, K Jon Ranson, Petya K Campbell, Elizabeth M Middleton (2024), Characterizing the influence of varying functional traits from remotely sensed data on forest productivity acquired from selected NEON sites. *Science of Remote Sensing*, <https://doi.org/10.1016/j.srs.2025.100262>.

Garcia, Maquella N, Lucas BS Tameirão, Juliana Schietti, Izabela Aleixo, Tomas F Domingues, **K Fred Huemmrich**, Petya KE Campell, Loren P Albert (2025), Predicting drought vulnerability with leaf reflectance spectra in Amazonian trees. *Remote Sensing of Environment*, 318, 114562, <https://doi.org/10.1016/j.rse.2024.114562>.

Chadwick, K Dana, Frank Davis, Kimberley R Miner, Ryan Pavlick, Mark Reynolds, Philip A Townsend, Philip G Brodrick, Christiana Ade, Jean Allen, Leander Anderegg, Yoseline Angel, Indra Boving, Kristin B Byrd, Petya Campbell, Luke Carberry, Katherine C Cavanaugh, Kyle C Cavanaugh, Kelly Easterday, Regina Eckert, Michelle Gierach, Kaitlin Gold, Erin Hestir, **Fred Huemmrich**, et. al. (2025), Unlocking ecological insights from sub-seasonal visible-to-shortwave infrared imaging spectroscopy: The SHIFT campaign. *Ecosphere* 16 (3), <https://doi.org/10.1002/ecs2.70194>.

Miller, Charles E., Robert O. Green, David R. Thompson, Andrew J. Thorpe, Michael L. Eastwood, Ian B. McCubbin, Winston Oslen-Duvall, Michael A. Bernas, Charles M. Sarture, Luis M. Rios, M. A. Hernandez, Brian D. Bue, Sarah R. Lundeen, Ryan Pavlick, John W. Chapman, Philip G. Brodrick, Regina F. Eckert, R. Willow Coleman, Latha Baskaran, Clayton D. Elder, Philip A. Townsend, Kyle R. Kovach, Shawn P. Serbin, **Karl F. Huemmrich**, et al. (2025), Airborne imaging spectroscopy surveys of Arctic and boreal Alaska and northwestern Canada 2017–2023, *Scientific Data* 12, 692, <https://doi.org/10.1038/s41597-025-04898-w>.

Giuseppe Zibordi / Task 151

Zibordi, G. and J.-F. Berthon (2024), Coastal Atmosphere & Sea Time Series (CoASTS) and Bio-Optical mapping of Marine optical Properties (BiOMaP): the CoASTS-BiOMaP data set. *Earth System Science Data*, 16, <https://doi.org/10.5194/essd-16-5477-2024>.

Zibordi, G., B.C. Johnson, E. Kwiatkowska, K.J. Voss, D. Antoine, A. Barnard, B.B. Barnes, F. Mélin, M. Wang, A. Bialek, S. Bailey, and S. Chen (2025), System Vicarious Calibration for climate and global long-term operational ocean color applications. *Bulletin of the American Meteorological Society*, 106:E394–E407, <https://doi.org/10.1175/BAMS-D-24-0085.1>.

Tiltstone, G. H., T. M. Jordan, D. Aurin, A. Bialek, A. Deru, A. Ramsay, M. Hieronymi, G. Dall’Olmo, M. Ligi, C. Kovach, I. Ansko, M. Ondrusek, V. Vabson, **G. Zibordi**, J. I. Gossn, E. Kwiatkowska, R. Vendt (2025), Radiometric field inter-comparison of fiducial reference measurements using an open source community processor, *Optics Express*, 33, <https://dx.doi.org/10.1364/OE.551042>.

Ameni Mkaouar / Task 166

Mkaouar, A., Shean, D., Yin, T., Neigh, C.S.R., Leite, R.V., Montesano, P.M., Kallel, A., Gastellu-Etchegorry, J.-P. (2025), Refining Satellite Laser Altimetry Geolocation through Full-Waveform Radiative Transfer Modeling and Matching, *Science of Remote Sensing*, Vol. 12, <https://doi.org/10.1016/j.srs.2025.100248>.

Seohui Park / Task 173

Park, S., Sayeed, A., Seo, J., Henderson, B. H., Naeger, A. R., & Gupta, P. (2025), Hour by Hour PM2.5 Mapping Using Geostationary Satellites. *ACS ES&T Air*.

Seo, J., Sayeed, A., **Park, S.**, Kerekes, J., Christel, S. M., Tran, M. T., & Gupta, P. (2025), PM2.5 forecasting at US embassies and consulates worldwide using NASA model powered by machine learning, *Earth and Space Science*, 12(6), doi:10.1029/2025EA004210.

Kim, Y., **Park, S.**, Choi, H., & Im, J. (2025), Comprehensive 24-hour ground-level ozone monitoring: Leveraging machine learning for full-coverage estimation in East Asia. *Journal of Hazardous Materials*, 488, 137369.

Junhyeon Seo / Task 173

Seo, J., Sayeed, A., Park, S., Kerekes, J., Christel, S. M., Tran, M. T., and Gupta, P. (2025), PM2.5 Forecasting at U.S. Embassies and Consulates Worldwide Using NASA Model Powered by Machine Learning, *Earth and Space Science*, 12(6), doi:10.1029/2025EA004210.

Park, S., Sayeed, A., **Seo, J.**, Henderson, B. H., Naeger, A. R., & Gupta, P. (2025). Hour by Hour PM2.5 Mapping Using Geostationary Satellites. ACS ES&T Air, doi:10.1021/acsestair.4c00365.

GEODESY AND GEOPHYSICS LABORATORY CODE 61A

Magdalena Kuzmicz-Cieslak & Keith Evans / Task 128

Ciufolini, I.; Paris, C.; Pavlis, E.C.; Ries, J.C.; Matzner, R.; Deka, D.; Ortore, E.; **Kuzmicz-Cieslak, M.**; Gurzadyan, V.; Penrose, R. et al. (2024), On the high accuracy to test dragging of inertial frames with the LARES 2 space experiment, European Physical Journal C, doi:10.1140/epjc/s10052-024-13301-8.

Stacey Huang / Task 188

Huang, S.A., Sauber, J.M., Han, S.C., Ray, R. and Fielding, E. (2025), Spatiotemporal patterns of subsidence and sea level rise in the Samoan Islands 15 years after the 2009 Samoa-Tonga earthquake, Journal of Geophysical Research: Solid Earth, 130(4), p.e2024JB029765.

Huang, S. A., Osmanoğlu, B., Scheuchl, B., Oveisgharan, S., Sauber, J. M., Jo, M., ... & Albayrak, A. (2025), A New Age of SAR: How Can Commercial Smallsat Constellations Contribute to NASA's Surface Deformation and Change Mission?. Earth and Space Science, 12(1), e2024EA003832.

HELIOSPHERIC PHYSICS LABORATORY CODE 672

Jay Herman / Task 155

Cede, A., Rajagopalan, R., Yu, Y., **Herman, J.**, Huang, L.-K., Blank, K., Marshak, A., Smith, A., and Lorentz, S. (2025), EPIC Radiometric Stability Assessment using NISTAR and ERA5 Reanalysis Data, Front. Remote Sens., Sec. Atmospheric Remote Sensing, Volume 6, doi:10.3389/frsen.2025.1646764, in press.

Herman, J., Mao, J., Huang, L., and Cede, A. (2025), Validation of DSCOVR-EPIC Total Column O3 Retrievals Using Ground-based Pandora and Satellite Data from OMI and TEMPO, Front. Remote Sens., Sec. Atmospheric Remote Sensing, Volume 6, <https://doi.org/10.3389/frsen.2025.1623828>.

Ziemke, Jerry R., Kramarova, Natalya A., Frith, Stacey M., Huang, Kai-Liang, Baek, Kanghyun, **Herman, Jay R.** (2025), Ten Years of Tropospheric Ozone from DSCOVR EPIC, Front. Remote Sens., Sec. Atmospheric Remote Sensing, Volume 6, <https://doi.org/10.3389/frsen.2025.1634922>.

Herman, J., and J. Mao (2025), Seasonal Variation of Total Column Formaldehyde, Nitrogen Dioxide, and Ozone Over Various Pandora Spectrometer Sites with a Comparison of OMI and Diurnally Varying DSCOVR-EPIC Satellite Data, Atmospheric Measurement Techniques, <https://doi.org/10.5194/amt-18-4165-2025>.

P R E S E N T A T I O N S



Photo: Amita Mehta presenting as a part of NASA's Applied Remote Sensing Training (ARSET) at the United Nations, New York

EARTH SCIENCES DIVISION CODE 610

Assaf Anyamba / Task 221

Anyamba, A. (lead), Moderator, Session: Modeling Health Risks and Outcomes, Keystone Symposium on Climate Change & Infectious Disease Threats, Hannover, Germany, June 23-26, 2025.

Anyamba, A. (lead), El Niño–Southern Oscillation (ENSO) Teleconnections and Rift Valley fever Early Warning, Session: Early Warning Systems, Keystone Symposium on Climate Change & Infectious Disease Threats, June 23-27, 2025, Hannover, Germany.

Anyamba, A. (lead), El Niño–Southern Oscillation (ENSO) Teleconnections and Rift Valley fever Early Warning, GeoHealth Infectious Disease Working Group Seminar, June 6, 2025.

Anyamba, A. (lead), Global ENSO Teleconnections and Vectorborne Disease Outbreak Patterns, School of Marine and Atmospheric Science, Stony Brook University, New York, April 11, 2025 (invited).

Anyamba, A. (lead), Jennifer Small, Richard Damoah, Stephanie Schollaert Uz, Edwin Pak, Compton Tucker, Seth Gibson, Kenneth J. Linthicum, Wassila Thiaw, Melinda Rostal, NASA Data Supports Longterm Study of Rift Valley fever, Session: Data Connections: NASA Earth Science Applications and Innovative Technologies to Monitor Vector Habitats Symposium, American Mosquito Control Association (AMCA), 91st Annual Meeting, San Juan, Puerto Rico, March 3-7, 2025.

Anyamba, A. (lead), Lory Willard, Heidi Tubbs, Karlyn Harrod, Bhaskar Bishnoi, Stephanie Schollaert Uz,, Claudia Pittiglio, Wassila Thiaw, Kevin Taylor, and Seth Gibson, A revised model to predict Rift Valley fever virus transmission risk for livestock, Session; New Vector Control Tools: UAS and Artificial Intelligence March 6, 2025, American Mosquito Control Association (AMCA), 91st Annual Meeting, San Juan, Puerto Rico, March 3-7, 2025.

Bryan Karpowicz / Task 006

Karpowicz, B., (lead), Assimilation of Reconstructed Radiances from IASI and CrIS Principal Component Scores into the GEOS-ADAS, International TOVS Working Group, Goa, India, May 9, 2025. Virtual.

Nikki Privé / Task 007

Privé, N.C., B. M. Karpowicz, E.L. McGrath-Spangler, and S.N. Kalluri. “Observing System Simulation Experiments for a Future Early Morning Low Earth Orbit Observing Platform”, speaker, American Geophysical Union Annual Meeting, Washington D.C., 9-13 December 2024.

Erica McGrath-Spangler / Task 008

Erica McGrath-Spangler. GXS Public Sector Applications, GeoXO Sounder: GXS Overview and Private Sector Benefits, May 2025.

Erica McGrath-Spangler. Evaluation of GEO Sounder Impact for Numerical Weather Prediction, International TOVS Study Conferences, Goa, India, May 2025.

Erica McGrath-Spangler. Complementarities of GEO and LEO IR Sounders for Numerical Weather Prediction in an OSSE Framework, American Meteorological Society Annual Meeting, New Orleans, LA January 2025.

Erica McGrath-Spangler. Complementary roles of LEO and GEO IR Sounders in NWP Evaluated using an OSSE Framework, American Geophysical Union Annual Meeting, Washington, DC, December 2024.

Erica McGrath-Spangler. The Potential of GEO Sounders for Numerical Weather Prediction, EUMETSAT Meteorological Satellite Conference, Würzburg, Germany, October 2024.

Lionel Arteaga / Task 023

Arteaga L. (lead), Advancing satellite-constrained modeled air-sea CO₂ fluxes with a focus on the strength of the Southern Ocean Carbon Sink, Annual NASA Carbon Monitoring System (CMS) meeting, Washington, DC, Sep 2024.

Arteaga L. (lead), Impact of Pacific Ocean heatwaves on Phytoplankton Community Composition and Export Production. NASA’s Ocean Biology and Biogeochemistry Virtual Meeting, Dec 2024.

Arteaga, L. (lead), Modeling carbon export production in the NASA Ocean Biogeochemical Model, Global Modeling and Assimilation Office Science Theme Meeting, Feb 2025.

Natalie Thomas Task 027

Thomas, N. (lead), and M.G. Bosilovich, Variability and Trends in Date of the Last Spring Freeze and the First Fall Freeze over the United States, AGU Fall Meeting, Washington, DC, Dec 9-13, 2024.

Virginie Buchard / Task 050

Buchard, V. (lead), Aerosol Data Assimilation at NASA GMAO, CEOS AC-VC meeting in College Park, MD, October 14, 2024 (invited).

Buchard, V. (lead), Aerosol Data Assimilation at NASA GMAO, AGU Fall meeting in Washington, DC, December 9, 2024.

Allison Collow / Task 051

Collow, A., From MERRA-2 to MERRA-21C: An Aerosol Perspective, UMBC, Baltimore, MD, April 2025.

Collow, A., The Representation of Aerosols in GMAO’s Newest Reanalyses, AGU Fall Meeting, Washington, D.C., December 2024.

Collow, A., The Representation of Aerosols in GMAO’s Newest Reanalyses, 6th WCRP International Conference on Reanalysis, Tokyo, Japan, October 2024.

Eunjee Lee / Task 059

Lee, E. (primary convener and session chair), GC44G Subseasonal-to-Seasonal Earth System Forecasts of Ecosystem and Associated Hydrological Variations I eLightning, AGU Fall meeting, Washington D.C., Dec 9-13, 2024.

Lee, E. (lead), Improved Hydrological Forecasting of Subseasonal Streamflow for the Irrawaddy and Mekong Rivers in Southeast Asia, SERVIR workshop, Huntsville, AL, Aug 14, 2025.

Young-Kwon Lim / Task 061

Lim, Y.-K., and Co-authors, MJO in NASA's new S2S forecast model: MJO propagation associated with moist dynamics and coupling with stratosphere controlled by QBO, AGU Fall meeting, Washington D.C., Dec 9-13, 2024.

Dhruva Kathuria / Task 093

Kathuria, Dhruva, Yoseline Angel, Evan Lang, Dana Chadwick, Shawn Serbin, Philip G Brodrick Philip A Townsend, Ting Zheng, Alexey N Shiklomanov, A Bayesian Framework for Sensor-Agnostic Plant Trait Prediction Using Imaging Spectroscopy, Biospace25, ESA-ESRIN. 2025.

Andrew Fox / Task 094

Fox, A. M., Reichle, R. H., Liu, Q. Multi-Sensor Assimilation of ASCAT Soil Moisture and SMAP Brightness Temperature in GEOS LDAS, AGU Fall Meeting, Washington, DC, 9-13 December 2024.

Fox, A. M., Reichle, R. H., Liu, Q. Enhancing Coupled Land-Atmosphere Reanalysis Through the Assimilation of CYGNSS Soil Moisture Retrievals, CYGNSS Science Team Meeting, University of Miami, 3-5 February 2025.

Yujin Zeng / Task 124

Zeng, Y. (lead), A Catchment-Based Global Model of River Flow, Velocity, and Storage for Earth-System Models. AGU Annual Meeting, Washington, D.C., December 9, 2024.

William S. Olson / Task 125

Olson, W. (lead), "Integration and Testing of Ice/Mixed-Phase Precipitation Models for TRMM/GPM Radar-Radiometer Algorithm Applications," Precipitation Measurement Missions 2024 Science Team Meeting, San Diego, CA, September 10-12, 2024.

Olson, W. S. (lead), "PMM Combined Radar-Radiometer Algorithm (CORRA)," Precipitation Measurement Missions 2024 Science Team Meeting, San Diego, CA, September 10-12, 2024.

Carl Malings / Task 129

Malings, C. (lead), "Overview of NASA Resources for Oman". Satellites, E-noses, CEMS & Vertical Monitoring, Air Quality Modeling & Forecasting, virtual, Sep 9, 2024.

Malings, C. (lead), "Data Fusion for Sub-City Scale Air Quality Forecasting: Preliminary Results for Rio de Janeiro". Special Edition of the GEO Health Community of Practice: The Americas, virtual, Sep 16, 2024.

Malings, C. (lead), "Enabling Satellite Remote Sensing for Health and Air Quality Applications". GeoHealth Webinar Series, virtual, Sep 26, 2024.

Malings, C. (lead), "Air Quality, NASA Open Data, Google Earth Engine Data Fusion". Presentation for GEEDEVs Nairobi Community, virtual, Oct 17, 2024.

Malings, C. (lead), "Air Quality Remote Sensing Missions and Datasets". ASAQ Seminar Series: Air Quality Data Analytics and Machine Learning, virtual, Nov 27, 2024.

Malings, C. (lead), "Finding, Accessing, Visualizing, and Analyzing NASA Remote Sensing Data". ASAQ Seminar Series: Air Quality Data Analytics and Machine Learning, virtual, Nov 28, 2024.

Malings, C. (lead), "Local Air Quality Forecasts Combining Global Models, Satellite, and In-situ Data: Preliminary Results and Impacts for Rio de Janeiro". AGU Fall Meeting, Washington, DC, Dec 11, 2024.

Malings, C. (lead), "Open Science for Earth Action: Challenges and Lessons Learned from the Implementation of an Open Air Quality Forecasting Data Fusion Tool". AGU Fall Meeting, Washington, DC, Dec 13, 2024.

Malings, C. (lead), “Integrating Low-cost Sensor Systems and Networks to Enhance Air Quality Applications”. Allin-Wayra Webinar Series, virtual, Apr 3, 2025.

Malings, C. (lead), “Satellite Observations for Decision Making: The NASA Applied Remote Sensing Training (ARSET) Program”. Frontiers in Environmental Science and Health (FrESH) Morewood School of Medicine Training Workshop, virtual, Jun 3, 2025.

Malings, C. (lead), “NASA’s GEOS-CF and its applications to air quality forecasting”. AIRDC Workshop 2025, Baltimore, MD, Jun 4, 2025.

Malings, C. (lead), “Localized Air Quality Forecasting with Uncertainty Quantification through Combining a Global Air Quality Forecast with Satellite and In-situ Data”. 11th International Workshop on Air Quality Forecasting Research (IWAQFR), virtual, Jun 16-19, 2025.

Malings, C. (lead), “Global Modeling and Assimilation Office Resources for SARP-East”. SARP-East, Wallops Flight Facility, VA, Jun 17, 2025.

Malings, C. (lead), “NASA’s GEOS-CF system and its applications to air quality forecasting”. Air Quality Southeast Asia Community of Practice Webinar Series ‘Mastering Air Quality Forecasting for Southeast Asia’, virtual, Jun 22, 2025.

Katherine H. Breen / Task 140

Katherine H. Breen et. al., Machine Learning-Based Estimation of Cloud Condensation Nuclei and Cloud Droplet Number Concentration from Reanalysis Products, 6th WCRP International Conference on Reanalysis, Oct. 30, 2024.

Katherine H. Breen et. al., Machine Learning Enhancement for Global Weather and Climate Simulation, Interagency Council for Advancing Meteorological Services (ICAMS) AI/ML workshop, November 4, 2024.

Katherine H. Breen et. al., Machine Learning Enhancements to NASA Weather and Climate Modeling, Supercomputing 2024, Nov. 19, 2024.

Katherine H. Breen et. al., Constraining AI-based parameterizations for GCMs using long-term observations, American Meteorological Society Meeting 2025, January 13, 2025.

Katherine H. Breen et. al., Quantitative Evaluation of Foundation Models (QEFM) for Weather, GSFC AI Center of Excellence, June 12, 2025.

Katherine H. Breen et. al., Quantitative Evaluation of Foundation Models for Physical Systems, Presentation to GSFC Lunar Foundation Model Group, June 27, 2025.

Amin Dezfuli / Task 162

Dezfuli, A., Ichoku, C. and Bosilovich, M.G., 2024. Role of Large-Scale Climate Features in Fire Emissions and Transport in Africa. AGU24.

Dezfuli, A., Bosilovich, M.G., Ichoku, C., Horton, K.G., Zuckerberg, B., Schubert, S.D. and Barahona, D., 2024. Applications of MERRA-2 data for avian migration, biomass burning, and dusty atmospheric rivers. The 6th WCRP International Conference on Reanalysis. Tokyo, Japan.

Eun-Gyeong Yang / Task 163

Yang, E.-G. (lead), Presentation and Discussion as Early Career Scientist, Meeting with NASA Headquarters “Weather Focus Area” Program managers, NASA GSFC, Greenbelt, MD, Oct 7, 2024.

Yang, E.-G. (lead), Improving Boundary Layer Data Assimilation Using Observation Data from Multiple Observing Systems in the NASA GEOS System, AGU Annual Meeting, Washington, D.C., Dec 9-13, 2024.

Yang, E.-G. (lead), Improving Boundary Layer Data Assimilation with Multiple Observing Systems in the NASA GEOS System, NASA Decadal Survey Planetary Boundary Layer Incubation Community Meeting, Silver Spring, MD, Apr 1-3, 2025.

Retha M. Mecikalski / Task 169

Mecikalski, R.M. (Lead), On the Use of GOES GLM Data for Improving Lightning Parameterization in the NASA GEOS Model, 2024 EUMETSAT Satellite conference, Würzburg, Germany, 30 Sep – 04 Oct 2024.

Mecikalski, R.M. (Lead), On the Use of GOES GLM Data for Improving Lightning Parameterization in the NASA GEOS Model, Earth Science Division All-Hands Meeting, NASA Goddard Space Flight Center, 26 March 2025.

Mecikalski, R.M. (Lead), On the Use of GOES GLM Data for Improving Lightning Parameterization in the NASA GEOS Model, GMAO Science Theme Meeting Seminar, NASA Goddard Space Flight Center, 27 March 2025.

Michael J. Murphy, Jr / Task 168

Murphy, M.J., Chattopadhyay, M., El Akkraoui, A., Gelaro, R., Anthes, R.A., Jin, J. (2025) Assimilation of High-volume commercial GNSS Radio Occultation (RO) Obs during ROMEX in NASA's GEOS Model. Poster presented at the EGU General Assembly 2025, Vienna, Austria, 27 April - 02 May 2025.

Murphy, M.J., Chattopadhyay, M., El Akkraoui, A., Gelaro, R., Anthes, R.A., Jin, J. (2025) Impact of Assimilating the ROMEX observations in NASA's Global Earth Observing System (GEOS). Lecture presented at the 2nd ROMEX Workshop, EUMETSAT, Darmstadt, Germany, 25-27 February 2025. Virtual.

Murphy, M.J., Chattopadhyay, M., El Akkraoui, A., Gelaro, R., Anthes, R.A., Jin, J. (2025) Impacts from Assimilating Large Volumes of GNSS RO Observations during ROMEX in NASA's Global Earth Observing System, 104th American Meteorological Society Annual Meeting, New Orleans, LA, USA, 12-16 January 2025.

Murphy, M.J., Chattopadhyay, M., El Akkraoui, A., Jin, J. (2024) Recent Advances in the use of GNSS-RO Observations in NWP at NASA's GMAO, 10th IROWG Workshop, UCAR, Boulder, CO, USA, 12-18 September 2024, Virtual.

Janak Joshi / Task 176

Joshi, J. (lead), Evaluation and Intercomparison of Multiple Dust Emission Schemes within the NASA Goddard Earth Observing System Model, American Meteorological Society (AMS) Annual Meeting, New Orleans, LA, 15 January 2025.

Joshi, J. (lead), Evaluation and Intercomparison of Multiple Dust Emission Schemes within the NASA Goddard Earth Observing System Model. American Geophysical Union (AGU) Annual Meeting, Washington DC, 11 December 2024.

Joshi, J. (lead), Evaluation and Intercomparison of Multiple Dust Emission Schemes within the NASA Goddard Earth Observing System Model. SED (Code 600) New Year's Poster Party, NASA GSFC, Building 28, 28 January 2025.

Fei Liu / Task 186

Liu, F. (lead), Detecting diurnal cycle and lifetime of pyrocumulonimbus using GOES-16 infrared data with a machine learning model, AGU annual meeting, Washington DC, December 9-13, 2024.

Christopher O'Dell, Andrew Schuh, and Scott Denning / Task 196

"Training a Future Workforce to Use Current and Future Atmospheric Greenhouse Gas Observing Systems", AGU Fall Meeting, Washington, D.C, 2024.

Ahreum Lee / Task 209

Lee, A. (lead), Assimilation of clear-sky radiances from GOES-16 and 18 in the KIM data assimilation system, ITSC-25, Goa, India, May 8-14, 2025.

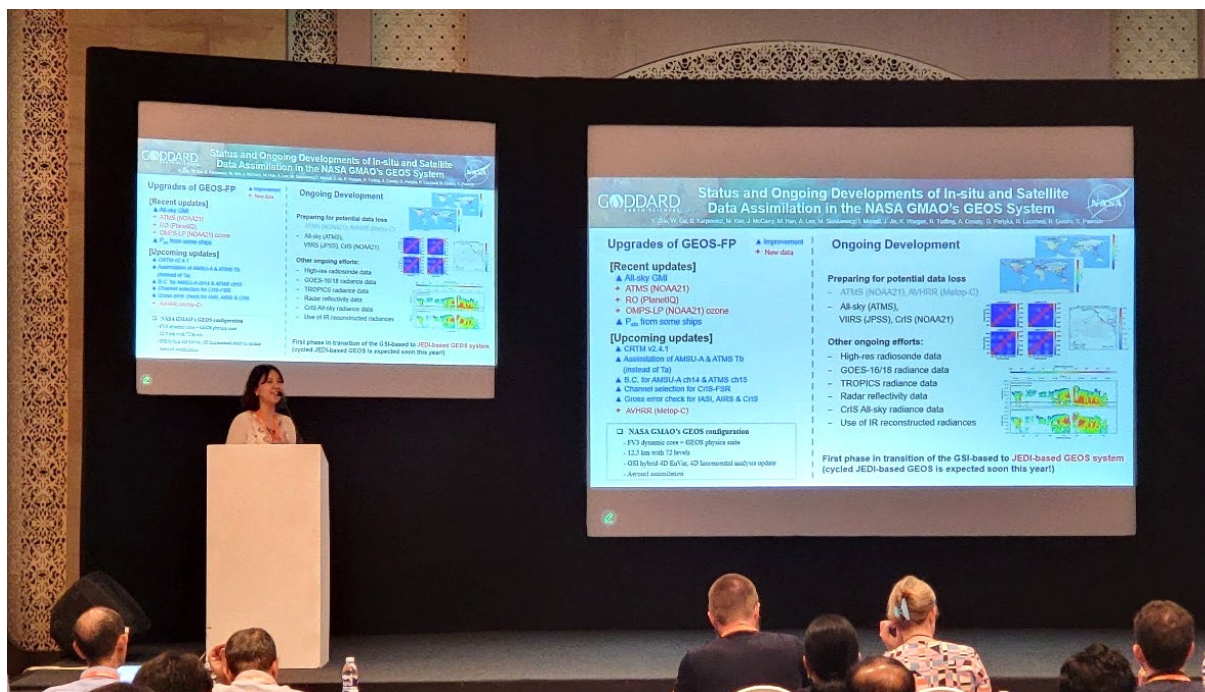


Photo: Ahreum Lee introducing poster presentation at the 25th International TOVS Study Conference, ITSC-25 in Goa, India, May 13, 2025.

Maryam Abdi-Oskouei / Task 211

Abdi-Oskouei M., “North American hourly and sectoral emissions inversion capability using the TEMPO measurements and the ED4DENVar JEDI data assimilation system”, TEMPO/GeoXO ACX Joint Science Team Workshop, Cambridge, MA, Aug 19-22, 2025.

Viral Shah / Task 212

Shah, V., New developments to the NASA GEOS Composition Forecasting, AMS Annual Meeting, New Orleans, LA, Jan 12-16, 2025.

Shah, V., New developments to the NASA GEOS Composition Forecasting, AGU Annual Meeting, Washington, DC, Dec 9-13, 2024.

MESOSCALE ATMOSPHERIC PROCESSES LABORATORY CODE 612

Liang Liao / Task 053

Liang Liao, Radar retrieval of microphysical properties within winter cyclone and arctic frontal systems during NASA IMPACTS, 41st International Conference on Radar Meteorology, 25 – 29 August 2025.

Hyokyung Kim / Task 054

Kim, H., Meneghini, R., Liao, L., Kwiatkowski, J., Recent Work on DPR Path-Attenuation Estimates, 2024 NASA PMM Science Team Meeting, September 10–12, 2024, San Diego, CA.

Kim, H., Meneghini, R., Liao, L., Kwiatkowski, J., Path Attenuation Retrieval Algorithm for the GPM Dual-Frequency Precipitation Radar Using Ocean Wind Speeds, 2024 NASA PMM Science Team Meeting.

Mircea Grecu / Task 055

Grecu, M., Ringerud, S. and Olson, W.S., 2024, December. A GMI-Based Machine Learning Algorithm for Estimating Light Precipitation Over Oceans Developed Using DPR and CloudSat Data. In *AGU Fall Meeting Abstracts* (Vol. 2024, pp. H13U-03).

Greco, M. and Yorks, J.E., 2024, December. A Sequential Uncertainty Quantification Analysis of the Benefits of Passive and Active Spaceborne Observations in the Estimation of Ice in High Clouds. In *AGU Fall Meeting Abstracts* (Vol. 2024, pp. A24B-02).

Jasper Lewis / Task 101

Lewis, J. (lead), EarthCARE Cal/Val Using the NASA Micro Pulse Lidar Network (MPLNET), 2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop, Oral Presentation, Frascati, Italy, March 17 – 20, 2025.

Lewis, J. R. (lead), Salmun, H., Molod, A., Caicedo, V., Ganeshan, M., Palm, S., Welton, E. J., Surface-based PBL height retrievals from a collocated ceilometer, lidar, and radar wind profiler in context of a global PBL observing system, AMS Annual Meeting, Poster Presentation, New Orleans, LA, USA, January 12 – 16, 2025.

Lewis, J. R. (lead), Campbell, J. R., Dolinar, E., Lolli, S., Tackett, J. L., Welton, E. J., Characterizing the spatiotemporal variability of aerosols from MPLNET and AERONET for spaceborne lidar validation, AGU Fall Meeting, Oral Presentation, Washington, D.C., USA, December 9, 2024.

Ali Tokay / Task 123

Tokay, A. (lead), (2025) PIERS+: An Independent Resource for Evaluating Precipitation Products. 41st AMS Radar Meteorology Conference, Toronto, Canada.

Yuli Liu / Task 149

Liu, Y. (lead), Tomographic cloud reconstruction algorithms for two-dimensional ice water content profiles using observations from an along-track scanning submillimeter-wave radiometer, AGU Fall Meeting, Washington, DC, Dec 9-13, 2024.

Sergey Korkin / Task 182

Korkin S., Transfer of expertise in radiative transfer, The Atmosphere Observing System (AOS)-Sky virtual science meeting, NASA GSFC, Greenbelt, MD, April 11, 2025.

Korkin S., Sayer A., Ibrahim A., and Lyapustin A., A practical guide to coding line-by-line trace gas absorption in Earth's atmosphere, The Atmosphere Observing System (AOS) Aerosol Working Group (AWG) virtual meeting, NASA GSFC, Greenbelt, MD, March 19, 2025.

Colten Peterson / Task 182

Peterson, C., Meyer, K., Platnick, S., Wind, G., Arnold, G., Amarasinghe, N., Nehrir, A. R., Crosbie, E., Collister, B. Opportunities to Improve Cloud Detection over Complex Snow and Ice Surfaces using ARCSIX AVIRIS-NG Imagery. NASA ARCSIX 2025 Science Team Meeting (Boulder, CO). May 20, 2025.

Peterson, C., Meyer, K., Platnick, S., Wind, G., Arnold, G., Amarasinghe, N., Nehrir, A. R., Crosbie, E., Collister, B. Evaluation of Passive Shortwave Imager-based Cloud Detection against Lidar over Arctic Sea Ice during the NASA ARCSIX Airborne Campaign. AGU Fall Meeting (Washington, DC). December 18, 2024.

Wei-Kuo Tao / Task 233

W.-K. Tao (lead), From Saturation Adjustment to Cloud-Precipitation-Aerosol Interaction, National Central University, Taoyuan, Taiwan, May 21, 2025.

CLIMATE AND RADIATION LABORATORY CODE 613

Sergey Korkin / Task 001

Korkin, S., My First Experience Using GPU on NCCS, 610AT Machine Learning Applications Seminar Series, NASA Goddard Space Flight Center, Greenbelt, MD, September 25, 2024.

Korkin, S., Lyapustin A., Siniuk A., Slutsker I., Lind E., and Holben B., AERONET Scientific Software After 30 Years: Time to Re-Optimize? American Geophysical Union Fall Meeting, Washington DC, USA, December 9-13, 2024.

Korkin, S., Lyapustin A., and Holben B., AERONET Project: The Next 30 Years of Software Development, AERONET Science and Application Exchange, University of Maryland College Park, MD, September 17-19, 2024.

Manisha Ganeshan / Task 012

Ganeshan, M., & Yang, Y. (2024, December). Studying properties of single-layer tropospheric clouds over Dome C, Antarctica, by integrating CALIPSO with in-situ measurements. In *AGU Fall Meeting Abstracts* (Vol. 2024, No. 2073, pp. A43G-2073).

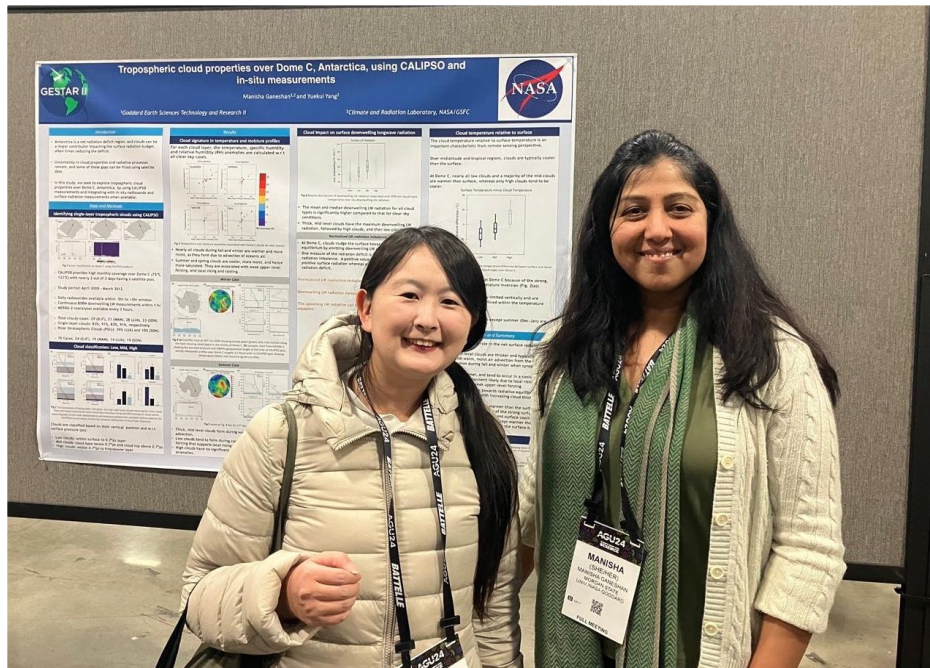


Photo: Dr. Ganeshan presenting her poster at AGU 2024 to a colleague. Credit: Natsuki Yoshida.

Jackson Tan / Task 018

Tan, J., A Prototype Precipitation Uncertainty Product for IMERG, AGU Annual Meeting, Washington, DC, 9–13 Dec 2024.

Tan, J., IMERG V08 and Beyond, AMS Annual Meeting 39th Conference on Hydrology, New Orleans, LA, 12–16 Jan 2025.

Tan, J., A Prototype Precipitation Uncertainty Product for IMERG, AMS Annual Meeting 39th Conference on Hydrology, New Orleans, LA, 12–16 Jan 2025.

Cornelius Csar Jude H. Salinas / Task 035

Salinas, C.C.J. (lead), Investigation of E-region Electron Density and Conductivity using COSMIC-1 Measurements, International Radio Occultation Working Group 10 Meeting, Boulder, Colorado, September 2024.

Salinas, C.C.J. (lead), Quantifying the Contributions of Geomagnetic Activity and Solar Rotation on E-region Electron Density's Day-to-day Variability, NASA Early Career Scientist Forum, Greenbelt, Maryland, October 2024.

Salinas, C.C.J. (lead), Development of the E-region Prompt Radio Occultation Based Electron Density (E-PROBED) Model, AGU Fall Meeting, Washington, DC, December 2024.

Salinas, C.C.J. (lead), E-region Electron Density's Response to Geomagnetic Activity as observed by Global Navigation Satellite System Radio Occultation Measurements, AGU Fall Meeting, Washington DC, December 2024.

Salinas, C.C.J. (lead), Response of Ionospheric E-region Electron Density to Geomagnetic Activity, Coupling Energetics and Dynamics of Atmospheric Regions Workshop 2025, Des Moines, Iowa, June 2025.

Salinas, C.C.J. (lead), Severe Geomagnetic Storm reduces Day-time E-region Electron Density over the Mid-latitudes, Coupling Energetics and Dynamics of Atmospheric Regions Workshop 2025, Des Moines, Iowa, June 2025.

Salinas, C.C.J. (lead), Sporadic-E Perturbations on Ionospheric Conductivity during the Perseids Meteor Shower, Coupling Energetics and Dynamics of Atmospheric Regions Workshop 2025, Des Moines, Iowa, June 2025.

Salinas, C.C.J. (lead), From decadal to hourly time-scales, Radio Occultation enables a deeper probe into the Ionospheric E-region's Response to Solar and Geomagnetic Variabilities, NCAR High Altitude Observatory Colloquium, Boulder, Colorado, August 2025.

Lipi Mukherjee / Task 037

Lipi Mukherjee, Dong Wu, Nader Abuhassan, Thomas Hanisco, Bernhard Mayer, Forrest M. Mims III, Peter Pantina, Richard Querel, Si-Chee Tsay, Stephen Windle, Twilight VIS/NIR Radiometry for Aerosol Layer Height and Optical Depth, Climate Radiation Lab, Code 613, NASA, GSFC, Oct 2024.

Dongmin Lee / Task 038

Lee, D., Oreopoulos, L., Cho, N., A new paradigm for calculating Cloud Radiative Effect and feedback by cloud type in a GCM, AGU Fall Meeting, 2024.

Nayeong Cho / Task 039

Cho, Nayeong (lead), A different perspective on the role of clouds in the symmetry of hemispheric reflected solar radiation, 42nd CERES-II Science Team Meeting, Hampton, VA, May 2025.

Daeho Jin / Task 040

Jin, D. (lead), Sensitivity of low clouds to atmospheric stability indices: Implications for low cloud feedback, AGU Fall Meeting, Washington, DC, Dec 09-13, 2024.

Guoyong Wen / Task 043

Wen, G., A. Marshak, and R. Levy, 2024. Aerosol Properties near clouds from MODIS and CALIPSO, 2024 AMS Annual Meeting, Baltimore, MD, January 28 through February 1, 2024.

Wen, G., A. Marshak, R. Levy, and G. Schuster, 2024. Aerosol Properties in Cloud Fields in the Amazon Region from MODIS and CALIPSO, International Radiation Symposium (IRS), Hangzhou, China, June 17-21, 2024.

Wen, G., A. Marshak, and W. Su, 2024. EPIC Observed Global Spectral Reflectance Variations, DSCOVR EPIC and NISTAR Science Team Meeting, October 16-18, 2024, Goddard Visitor Center, Greenbelt, MD.

Wen, G., A. Marshak, and W. Su, 2024. Rotational Variation of Spectral Reflectance from DSCOVR/EPIC Observations, December 9-13, 2024, Washington D.C.

Surendra Bhatta / Task 098

S. Bhatta, Y. Yang. Blowing Snow in Antarctica: Data available within the MERRA-2 Grid and Period, AGU Fall Meeting Abstracts 2024 (194), C41D-0194.

Tamás Várnai / Task 102

Várnai, T. (lead), Considering the impacts of horizontal heterogeneity in satellite-based large-scale statistics of cloud optical properties, 105th Annual Meeting of the American Meteorological Society, New Orleans, LA, January 12-16, 2025.

Várnai, T. (lead), Insights into the composition of ice clouds, based on spaceborne observations of sun glints from horizontally oriented ice crystals, 105th Annual Meeting of the American Meteorological Society, New Orleans, LA, January 12-16, 2025.

Várnai, T. (lead), Spaceborne observations of sun glint from clouds, AGU2024 Annual Meeting, Washington, DC, December 9-13, 2024.

Anin Puthukkudy / Task 110

Puthukkudy, A., Martins, J.V., et al., Validating aerosol products from the HARP family of polarimeters using AERONET data, AERONET Science and Application Exchange, September 17-19, 2024.

Daniel J. Miller / Task 113

Miller, D. J., Developing Advanced Cloud Retrievals for PACE: Building a Joint Spectro-Polarimetric Cloud Microphysics Retrieval, APOLO 2024, Kyoto, Japan, Nov 18-21, 2024. <https://apolo.loa.univ-lille.fr/program/>.

Miller, D. J., Advanced cloud products from the PACE mission, APOLO 2024, Kyoto, Japan, Nov 18-21, 2024.

Miller, D. J., Developing Advanced Cloud Algorithms for PACE: Preliminary work leveraging both spectral and hyperangular polarimetric cloud observations, AGU 2024 Fall Meeting, Washington DC, December 9-13, 2024. <https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1676268>.

Jae N. Lee / Task 114

Lee, J. N., Dynamic Impact of Southern Annular Mode on Antarctic Ozone Hole Area, AGU 2024 Fall Meeting, December 12, 2024.

Myungje Choi / Task 120

Choi, M. (lead), Validation and uncertainty estimation for MAIAC EPIC smoke AOD and spectral SSA using AERONET, AERONET Science and Application Exchange, College Park, MD, Sep 17-19, 2024.

Choi, M. (lead), Global smoke characterization using MAIAC from DSCOVR EPIC measurement record, DSCOVR EPIC and NISTAR STM, NASA GSFC, Oct 16-18, 2024.

Choi, M. (lead), Climatology of MAIAC EPIC smoke properties including BC and BrC light-absorbing components (2015-2023), AGU Fall meeting, Washington DC, Dec 9-13, 2024.

Choi, M. (lead), Light-absorbing black carbon and brown carbon components of smoke aerosol from DSCOVR EPIC measurements. NASA GSFC code 613 Seminar, NASA GSFC, Mar 5, 2025.

Mijin Kim / Task 165

Kim, M. (lead), Dark Target Aerosol Retrieval for VIIRS: Surface Reflectance Parameterization, AGU Fall Meeting, San Francisco, CA, Dec 9-13, 2024.

Kim, M. (lead), Geostationary Aerosol Retrievals in Comparison: Toward High-Temporal-Resolution Global Monitoring with LEO–GEO Integration, TEMPO/GeoXO ACX Joint Science Team Workshop, CfA, Cambridge, MA, Aug 19-22, 2025.

Colten Peterson / Task 170

Peterson, C. (lead), Opportunities to Improve Cloud Detection over Complex Snow and Ice Surfaces using ARCSIX AVIRIS-NG Imagery, NASA ARCSIX 2025 Science Team Meeting (Boulder, CO). May 20, 2025.

Peterson, C. (lead), Evaluation of Passive Shortwave Imager-based Cloud Detection against Lidar over Arctic Sea Ice during the NASA ARCSIX Airborne Campaign. American Geophysical Union Fall Meeting (Washington, DC). December 18, 2024.

Jianyu Zheng / Task 193

Zheng, J. (lead), An overview of aerosol remote sensing products from CALIOP and MODIS observations, University of Puerto Rico, Rio Piedras, Virtual, May 27-30, 2025.

Zheng, J. (lead), An improved retrieval of dust optical depth and effective diameter based on MODIS observations from visible to thermal infrared, Aerocenter-CPC Seminar at Goddard Space Flight Center, Greenbelt, MD, April 8, 2025.

Zheng, J. (lead), A Synergistic Retrieval of Mid-Visible and Thermal Infrared Dust Optical Depth and Coarse Mode Particle Size from MODIS Observation, AMS Annual Meeting, New Orleans, LA, January 12-16, 2025.

Zheng, J. (lead), A synergistic retrieval of mid-visible and thermal infrared dust optical depth and coarse mode particle size from MODIS observation, AGU Fall Meeting, Washington D.C., December 9-13, 2024.

Alexander Matus / Task 195

Matus, A. (lead), Disrupting Equilibrium: A Climate Data Record of Radiative Forcing and Feedbacks. Global Energy and Water Exchanges (GEWEX) Open Science Conference and Early Career Workshop. Sapporo, Japan. July 10, 2024.

Matus, A. (lead), New Approach for PM_{2.5} Retrievals using NASA CATS lidar and GEOS-5 model. International Global Atmospheric Chemistry (IGAC) Science Conference. Kuala Lumpur, Malaysia. September 10, 2024.

Matus, A. (lead), A Global Climate Data Record of Radiative Forcing and Feedbacks. CERES Science Team Meeting. Livermore, CA. October 1, 2024.

Matus, A. (lead), Tracking Earth's Energy Imbalance: Radiative Forcing and Feedbacks. American Geophysical Union (AGU) Meeting. Washington, D.C. December 10, 2024.

Matus, A. (lead), Enhancing PM_{2.5} air quality retrievals using CATS lidar and GEOS-5 model data. NASA Health and Air Quality Applied Science Team (HAQAST) Meeting. Washington, D.C. January 20, 2025.

Matus, A. (lead), An Observational Climate Data Record of Radiative Forcing and Feedbacks. Cloud Feedback Model Intercomparison Project-CloudSense Meeting. Exeter, United Kingdom. July 10, 2025.

ATMOSPHERIC CHEMISTRY AND DYNAMICS LABORATORY

CODE 614

Daniel Anderson / Task 013

Anderson, D. (lead), Recommendations for a robust observing strategy to indirectly constrain the distribution and spatiotemporal variability of the hydroxyl radical. AGU Fall Meeting, Washington, DC, Dec. 10, 2024.

Junhua Liu / Task 014

Junhua Liu (lead), Hydrogen cyanide (HCN) and methyl cyanide (CH₃CN) in GMI, CCM meeting, Greenbelt, MD, June 2025.

Sarah Strode / Task 015

Strode, S. (lead), “Theory & Analysis Group Report Part II: GMI Output for NDACC”, NDACC 2024 Steering Committee Meeting, Santiago, Chile, Nov. 11-15, 2024.

Strode, S. (lead), “Scientific Target Prioritization with the Intelligent Long Endurance Observing System (ILEOS)”, poster presented at the 2022 AGU Annual Meeting, Washington, DC, Dec. 9-13, 2024.

047/Hiren Jethva

Jethva, H. (lead), UV-VIS Aerosol Absorption Data Collection at Santa Cruz, Tenerife Island PACE-PAX, PVST joint meeting, NASA GISS, New York, February 2025.

Jethva, H. (lead), Aerosol optical centroid height retrievals using EPIC O2-B observations EPIC Science Team Meeting, NASA Goddard, October 2024.

Jethva, H. (lead), One-and-half Decade Long Global Retrieval Dataset of UV-VIS Spectral Optical Depth and Single-scattering Albedo of Absorbing Aerosols above Clouds from A-train Active-Passive Synergy, EGU General Assembly 2025, Vienna, Austria.

Jethva, H. (lead), Ground-based UV-VIS MFRSR spectral retrievals of Saharan dust absorption at Izaña Observatory, AGU Fall Meeting 2024, December 2024, Washington DC.

Jethva, H. (lead), The UV Enrichment of PACE-OCI Unified Aerosol Algorithm, AGU Fall Meeting 2024, December 2024, Washington DC.

Feng Li / Task 064

Li, F. (lead), Transient and seasonal response of Southern Ocean Sea Surface Temperature and Antarctic Ozone to Stratospheric Ozone Recovery, AGU Fall Meeting, Washington, DC, Dec 9-13, 2024.

Li, F., Impacts of stratospheric ozone recovery on Southern Ocean and Antarctic sea ice, NASA GSFC 614 Lab Seminar, Greenbelt, MD, June 26, 2025.

Jin Liao / Task 070

Liao, J. (lead), Comparison of GEMS formaldehyde (HCHO) and nitrogen dioxide (NO₂) retrievals with ASIA-AQ airborne observations and application to study ozone production, AGU Fall Meeting, Washington DC, Dec 9-13, 2024.

Ghassan Taha / Task 084

G. Taha (lead), Stratospheric Aerosol Perturbations Caused by the 2024 Ruang Eruption, American Geophysical Union (AGU) 2024 Fall Meeting, Washington DC, December 2024.

Zhining Tao / Task 087

Tao, Z. (lead), Role of anthropogenic aerosols on PBL processes and meteorology in the Indian subcontinent – 6th International Workshop on Atmospheric Composition and the Asian Monsoon, Bali, Indonesia, 9-13 June 2025.

Dongchul Kim / Task 088

Kim, D., et al., Multi satellite-multi model comparison of dust aerosol optical depth at 10 μ m wavelength, February 18, 2025, Aerocenter Seminar, NASA/GSFC, Greenbelt, MD.

Kim, D., et al., Remote sensing and modeling dust storms from the Copper River Valley, a major dust source in Alaska, 2024, AGU Fall Meeting, Washington D.C.

Huisheng Bian / Task 127

Bian, H., (lead), Investigating recent decadal trends in the Pacific westerly jet in response to various atmospheric forcings using CMIP6 model results and reanalysis data, NASA GEOSCCM seminar, January 2025.

Bian, H., (lead), Recent decadal trend of the Pacific westerly jet in response to anthropogenic aerosol emissions, AGU 2024 fall conference, December 2024.

Bian, H. (lead), Data processing for comparisons between Aerocom model results and NASA ATom measurements, AeroCom workshop, October 2024.

Anne Thompson / Task 138

Anne Thompson (lead), Trends (2000-2022) from the TOAR II/HEGIFTOM Global Ground-based Tropospheric Ozone Measurements: A Reference Dataset for Satellite Products and Models, CACGP/IGAC Quadrennial Ozone Symposium, Kuala Lumpur, September 10, 2024.

Anne Thompson (lead), Southern Hemisphere Additional Ozonesondes (SHADOZ) Network: Satellite Validation Standard & UT/LS Trends, SAGE Science Team Meeting, NASA/LaRC, October 2024.

Anne Thompson (lead), Trends (2000 to 2022) from TOAR II/HEGIFTOM Global Ground-based Tropospheric Measurements: A Reference Dataset for Satellite Products & Models, Comm. On Earth Observing Satellites, College Park, MD, October 2024.

Anne Thompson (lead), Tropical Ozone Variability & Trends in the Troposphere & Lowermost Stratosphere: Perspectives from SHADOZ Soundings (1998-2023), AGU, Washington DC, December 2024.

Anne Thompson (lead), Nitrogen Dioxide Variability over the Gulf of Mexico in June 2024: In-situ, Pandora and Satellite Views during SCOAPE II, AGU, Washington DC, December 2024.

Anne Thompson (lead), Global Ground-based UT/LS Ozone Trends from the HEGIFTOM Project (2000-2022): Regional and Seasonal Variability, AMS Annual Meeting, New Orleans, LA, January 2025.

Anne Thompson (lead), Atmospheric Chemical Composition: “Charting Across Scales” Begins with Measurements, AMS Annual Meeting, New Orleans, LA, January 2025.

Nigel Richards / Task 143

Richards, N. A. D. (lead), Validation of OMPS Limb Profiler Ozone Profile Retrievals Using Ground-Based Correlative Data, AGU Fall Meeting, Washington DC, Dec 9-13, 2024.

Richards, N.A.D. (lead), Validation of OMPS Limb Profiler Ozone Retrievals, Limb workshop, Germany, June 2-6, 2025 (virtual).

Richards, N. A. D. (lead), Validation of OMPS Limb Profiler Ozone Retrievals Using SAGE III/ISS and Other Correlative Measurements, SAGE III Science Team Meeting, NASA Langley, Hampton, VA, Aug 13-14, 2025.

Jason St. Clair / Task 147

St. Clair, J. M. (lead), A new US network for ground-based remote sensing of carbon dioxide, methane, and CO, AGU Fall Meeting, Washington, DC, Dec 9-13, 2024.

Keith Evans / Task 159

Keith Evans (lead), Simon Carn, Can Li, Nickolay Krotkov and Nicolas Theys, SO₂ Measurements Comparing NOAA20-JPSS1-OMPS to OMI, NPP-OMPS and TROPOMI, 2024 Fall Meeting, AGU, Washington, D.C., 9-13 Dec 2024.

Caterina Mogno / Task 172

Mogno, C. (lead), From Column to Surface: Connecting the Performance in Simulating Aerosol Optical Properties and PM Concentrations in the NASA GEOS-CCM Model -poster presentation, 24th Meeting of the American Geophysical Union, Washington, DC, Aug 2025.

Mogno, C. (lead), From Column to Surface: Connecting the Performance in Simulating Aerosol Optical Properties and PM Concentrations in the NASA GEOS-CCM Model -poster presentation, The Atmospheric Chemistry Gordon Research Conference, Newry, Maine, Dec 2024.

Mogno, C. (lead), Challenges in Simulating Nitrate Aerosols in Climate Models: from Computation to Observations, NASA AeroCenter-CPC Seminar Series, NASA Goddard Space Flight Center, Dec 2024.

Mogno, C. (lead), “Towards the Harmonization of Nitrate Aerosols Simulation within the NASA GEOS Modeling System,” 23th AeroCom / 12th AeroSAT meeting, Lille, FR, Oct 2024.

Apoorva Pandey / Task 177

Pandey, A. (lead), Examining column and vertically resolved MAX-DOAS formaldehyde retrievals from the PGN, AGU Fall Meeting, Washington, DC, Dec 2024.

Pandey, A. (lead), Validating column and profile MAX-DOAS formaldehyde retrievals from the PGN, AGU Fall Meeting, Washington, DC, Dec 2024.

Doyeon Ahn / Task 179

Doyeon Ahn (lead), Regional and Socioeconomic Characteristics in Global C40 Cities' CO₂ Emissions Revealed from Space, the Urban Greenhouse Gas Conference and Stakeholder Summit 2025, World Meteorological Organization, Geneva, Switzerland, Apr 07-09, 2025.

Doyeon Ahn (lead), Regional and Socioeconomic Characteristics in C40 Cities' CO₂ Emissions Revealed from Space, Session A24F: Remote Sensing of CH₄ and CO₂ from Space: The Expanding Observing System III, American Geophysical Union annual meeting, Washington DC, Dec 10, 2024.

Doyeon Ahn (lead), Regional and Socioeconomic Characteristics in C40 Cities' CO₂ Emissions Revealed from Space, OCO-2/3 Science Team Meeting, May 20, 2025 (invited).

Doyeon Ahn (lead), Regional and Socioeconomic Characteristics in C40 Cities' CO₂ Emissions Revealed from Space, 21st International Workshop on Greenhouse Gas Measurements from Space (IWGGMS-21), 9-12 June 2025, Takamatsu, Japan.

Michael D. Himes / Task 205

Himes, M. D. (lead), Retrieval Atmospheric Parameters via Neural Networks, Exoplanets in Our Backyard 3 workshop, Louisville, KY, Nov 13-15, 2024.

Himes, M. D. (lead), N. A. Kramarova, G. Jaross, S. Davis, and K. Wargan, Retrieving water vapor from OMPS LP measurements via neural networks, AGU Annual Meeting, Washington, D.C., Dec 9-13, 2024.

Himes, M. D. (lead), G. Taha, T. Zhu, D. Kahn, and N. A. Kramarova, Near-real-time aerosol retrievals from OMPS Limb Profiler measurements, AGU Annual Meeting, Washington, D.C., Dec 9-13, 2024.

Himes, M. D. (lead), N. A. Kramarova, G. Jaross, K. Wargan, and S. M. Davis, A machine learning approach to retrieving stratospheric water vapor from OMPS LP measurements, 13th International Atmospheric Limb Workshop, Karlsruhe, Germany, June 2-6, 2025.

Oleg Dubovik / Task 213

Oleg Dubovik (lead), Aerosol components/types: How do remote-sensing products and models agree and if they can be harmonized?, AeroCenter seminar, NASA/GSFC, March 11, 2025.

Oleg Dubovik (lead), Harmonization of aerosol assumptions in remote sensing and climate models: Results and Perspectives, PACE-PAX, PVST, and SAT3 Science Team Meeting, February 18 - 21, 2025, NASA/GISS, NY.

Kanghyun Baek / Task 216

Baek, K. (lead), Development of Soft Calibration for OMPS/N₂O and Its Implications for GEMS and TEMPO Applications, GEMS Science Meeting, Seoul, South Korea, Sept 2-4, 2025.

CRYOSPHERIC SCIENCES LABORATORY CODE 615

Paolo de Matthaeis / Task 016

Paolo de Matthaeis (lead), Priscilla Mohammed, Alexandra Bringer, and David Le Vine, RFI and SMAP: Results and Trends in Almost 10 years of L-band RFI Observations, RFI 2025 Workshop, Bariloche, Argentina, 14-18 October 2025.

Paolo de Matthaeis (lead), Beau Backus, Raúl Díez-García and Mingliang Tao, Passive Remote Sensing of Sea Surface Temperature: Opportunities and Threats, World Radiocommunication Conference 2027, RFI 2025 Workshop, Bariloche, Argentina, 14-18 October 2025.

Paolo de Matthaeis (lead), Standard for Remote Sensing Frequency Band RFI Impact Assessment, Space Frequency Coordination Group – CSSMA Workshop, Cologne, Germany, 9-10 December 2024.

Paolo de Matthaeis (lead), Raúl Díez García, and Ming-Liang Tao. Electro-Magnetic Spectrum Environment Changes to Passive Remote Sensing, 105th American Meteorological Society Annual Meeting, New Orleans, Louisiana, 12-16 January 2025.

Paolo de Matthaeis (lead), Update on the Activities of the Frequency Allocations in Remote Sensing Technical Committee (FARS TC), Spring Meeting of the Committee on Radio Frequencies, Washington, DC, May 8-9, 2025.

Paolo de Matthaeis (lead), RFI in Passive Microwave Remote Sensing: Lessons Learned from SMAP and Future Scenarios in EO, ESA Living Planet Symposium 2025, Vienna, Austria, June 23-27, 2025.

Paolo de Matthaeis (lead), Dong Wu, Priscilla N. Mohammed and Clara Chew, L-Band Radio Frequency Interference in Conflict Zones: Impact on GNSS-R and SMAP Measurements, International Geoscience and Remote Sensing Symposium (IGARSS) 2025, Brisbane, Australia, August 3-8, 2025.

Paolo de Matthaeis (lead), Beau Backus and Renee Leduc, Remote Sensing and 5G at mm-Wave Frequencies: What Will We Learn from the 24 GHz Experience?, URSI Asia Pacific Radio Science Conference (URSI AP-RASC) 2025, Sydney, Australia, August 17-22, 2025.

Paolo de Matthaeis (lead), Working Party 3J Fundamentals of radio-wave propagation in non-ionized media, lecture at ITU Workshop, URSI Asia Pacific Radio Science Conference (URSI AP-RASC) 2025, Sydney, Australia, August 17-22, 2025.

Elizabeth Ultee / Task 202

Ultee, L. (lead), Global glacier models agree on 21st century runoff and drought metrics at river basin scale, AGU Fall Meeting, Washington, DC, Dec 9-13, 2024.

Ultee, L. (lead), The Cryosphere is for All, AGU Fall Meeting, Washington, DC, Dec 9-13, 2024.

Ultee, L. Glacier effects on future water resources at local to global scale. University of Arizona Geosciences seminar, Tucson, AZ, March 1, 2025.

Ultee, L. (lead), Glacier model spread in runoff projections is large, but climate model spread is larger. Global Glacier Modeling Workshop, Oslo, Norway, Feb 10-14, 2025.

OCEAN ECOLOGY LABORATORY

CODE 616

Susanne Craig / Task 004

Invited Plenary Speaker: Craig, S.E., 'The NASA PACE Mission: A Hyperspectral View of the Ocean,' 3rd

Craig, S.E. (lead), Decadal Survey 101: Earth Science & Applications from Space, Marine Technology Society eDNA Webinar. December 17, 2024.

Craig, S.E. (lead), The NASA PACE Mission: A Hyperspectral View of the Ocean Ecosystem, Ocean Biodiversity Techsurge, Baltimore, MD, October 1, 2024.

Craig, S.E. (lead), The NASA PACE Mission: A Hyperspectral View of the Ocean Ecosystem, The National HAB Observing Network (NHABON) Webinar Series, September 18, 2024.

Violeta Sanjuan Calzado / Task 005

Sanjuan Calzado, V. (lead), Radiometric requirements and standards for validation, PACE Validation Science Team Meeting, February 2025.

Dirk A. Aurin / Task 009

Aurin, D. (lead), A Community Processor for Validation-Quality In Situ Above Water Radiometry (AWR), Ocean Optics Conference XXVI, Las Palmas de Gran Canaria, Spain, October 6-11, 2024.

Aurin, D. (lead), A Collaborative Community Processor for Field Validation of Hyperspectral Ocean Color Spectrometry with End-to-End Uncertainty Estimation, American Geophysical Union 2024 Conference, Washington, D.C., December 9-13.

Aurin, D. (lead), HSI Capabilities for Tracking Floating Algae, GLIMR Sargassum Workshop, Isla Magueyes, Puerto Rico, February 4-7, 2025.

Ivona Cetinić / Task 017

Cetinić, I. (lead), Ibrahim, A., NASA's PACE Mission Status Updates: Advancing Science and Data Products, 2025 European Geosciences meeting, EGU, April 2025.

Cetinić, I. (lead), Knobelspiesse, K., Cairns, B., Werdell, J., PACE Mission validation with the PACE-PAX field campaign, 2025 European Geosciences meeting, EGU, April 2025.

Bridget Seegers / Task 029

Seegers, B. (lead), PACE for Inland Water Quality Monitoring aka PACE gets Fresh, Ocean Optics Conference, Las Palmas, Spain, October 6-11, 2025.

Seegers, B. (lead), PACE Satellite Products for HAB and Water Quality Monitoring, 12th U.S. Symposium on Harmful Algae, Portland, ME, Oct. 27-Nov. 1, 2024.

Seegers, B. (lead), RV Blissfully: Sailing for Science, PAC³ Meeting, NASA's Goddard Institute for Space Studies (GISS) New York City, NY, February 18–21, 2025.

Seegers, B. (lead), Real-Time Decision Making and Use of Remote/Continuous Monitors for HAB Management, National Monitoring Conference (NMC), Green Bay, WI, March 11 – 13, 2025.

Seegers, B. (lead), Observing Cyanos from Space with CyAN (Cyanobacteria Assessment Network), State of the Science: HABs in the Winnebago-Green Bay Waterways Workshop, June 10, 2025.

Andrew Sayer / Task 048

Sayer, A. M. (lead), Anomalous trends in global ocean carbon concentrations following the 2022 eruptions of Hunga Tonga-Hunga Ha'apai, NASA AeroCenter seminar series, NASA GSFC, Oct 29 2024.

Sayer, A. M. (lead), MODIS-Based Neural Network Cloud Masking Algorithm for PACE OCI, AGU Annual Meeting, Washington, DC, Dec 9-13, 2024.

Sayer, A. M. (lead), Status and early evaluation of PACE OCI cloud data products, AGU Annual Meeting, Washington, DC, Dec 9-13, 2024.

Sayer, A. M. (lead), NASA's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) meeting: an overview of the science, EUMETSAT, Darmstadt, Germany, Jan 15 2025.

Inia M. Soto Ramos / Task 049

Soto Ramos, I. (lead), PACE validation and data flows, AGU Fall Meeting 2024, Washington, D.C., 9-13 December 2024.

Soto Ramos, I. (lead), PACE Observatory validation plan, data sources, and results, EGU25-14414, Vienna, Austria, 27 April–2 May 2025.

J. Vanderlei Martins, Xiaoguang (Richard) Xu, Anin Puthukkudy / Task 115

Puthukkudy, A., Martins, J. V., Xu, X., Sienkiewicz, N., McBride, On-Orbit Performance Assessment of the HARP2 Multi-Angle Polarimeter on the NASA PACE Mission: Intercomparison with OCI and SPEXOne Instruments, CalCon 2025, June 2025.

Puthukkudy, A., Martins, J. V., Xu, X., Litvinov, P., Fuertes, D., García Gómez, A., Lopatin, A., Matar, C., Antuña-Sánchez, J. C., Sienkiewicz, N., Dubovik, O., Retrieving Aerosol and Surface Products Using Multi-Pixel approach from PACE Polarimeter HARP2 Observations with GRASP, AGU Fall Meeting 2024, Washington, DC, Dec 2024.

Puthukkudy, A., Martins, J. V., Xu, X., Sienkiewicz, N., McBride, B., Litvinov, P., Fuertes, D., Dubovik, O., Aerosol and Surface Products from PACE Polarimeter HARP2 Observations using GRASP, APOLO 2024, Nov 2024.

Ian Carroll / Task 161

Carroll, I.T. (lead), A. Windle, K. Bisson, S. Foley, P.C. Gray, E. E Holmes, C. Poulin, T. Snow, G. Wang, P. J. Werdell and P. Zhai, PACE Hackweek: An open community keeping up with PACE, AGU Annual Meeting, Washington, DC, Dec 2024.

James Allen / Task 174

Allen, J. G. (lead), MOCMAC: Ocean Color Atmospheric Correction with Bayesian Inference, Ocean Optics Conference XXVI, Gran Canaria, Spain, Oct 6-11, 2024.

Allen, J. G. (lead), MOCMAC: Ocean Color Atmospheric Correction with Bayesian Inference, AGU 2024, Washington D.C., Dec 9-13.

J. Vanderlei Martins and Team / Task 178

Puthukkudy, A. (lead), On-Orbit Performance Assessment of the HARP2 Multi-Angle Polarimeter on the NASA PACE Mission: Intercomparison with OCI and SPEXOne Instruments, CalCon 2025, June 2025.

Puthukkudy, A. (lead), Retrieving Aerosol and Surface Products Using Multi-Pixel approach from PACE Polarimeter HARP2 Observations with GRASP, AGU Fall Meeting 2024, December 2024.

Puthukkudy, A. (lead), Aerosol and Surface Products from PACE Polarimeter HARP2 Observations using GRASP, APOLO 2024, November 2024.

Smith, R. (lead), Preliminary Liquid Water Cloud Retrievals from HARP2 and AirHARP2 Measurements from the PACE-PAX Validation Campaign, AGU Fall Meeting 2024, Washington, D.C., 9-13 December 2024.

Smith, R. (lead), Liquid Water Cloud Retrievals from HARP2 and AirHARP2 Measurements from the PACE-PAX Validation Campaign", EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025.

McBride, B. (lead), Observations of Hurricane Beryl, the Earliest Category 5 Atlantic Hurricane on Record, with OCI and HARP2 on PACE, AGU Fall Meeting 2024, Washington, D.C., 9-13 Dec 2024.

J. Vanderlei Martins & Team / Task 183

McBride, B., Martins, J.V., Xu, X., Puthukkudy, A., and Smith, R., AirHARP2/ER-2 status, PAC3 Science Team Meeting. NASA Goddard Institute for Space Studies, New York, NY, Feb 18 -21, 2025.

Smith, R., McBride, B., Xu, X., and Martins, J. V., Preliminary Liquid Water Cloud Retrievals from HARP2 and AirHARP2 Measurements from the PACE-PAX Validation Campaign, AGU Fall Meeting 2024, Washington, D.C., 9-13 December 2024.

Smith, R., Xu, X., McBride, B., and Martins, J. V., Liquid Water Cloud Retrievals from HARP2 and AirHARP2 Measurements from the PACE-PAX Validation Campaign, EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025.

McBride, B., Puthukkudy, A., Xu, X., Smith, R., Remer, L. A., and Martins, J. V., Observations of Hurricane Beryl, the Earliest Category 5 Atlantic Hurricane on Record, with OCI and HARP2 on PACE, AGU Fall Meeting 2024, Washington, D.C., 9-13 December 2024.

Tesfa Worku Meshesha / Task 192

Tesfa W. Meshesha, Cecile S. Rousseaux, Louise Chini, Blake Clark, Stephen Crooks, George Hurtt, Michael Mehari, and Stephanie Schollaert, Integrating Lateral Carbon Fluxes into Global Ocean Carbon Estimates, AGU24 Fall Meeting, Washington, D.C., Dec 13-18, 2024.

Tesfa W. Meshesha, Dulcinea Avouris Amanda Mulcan Lopez, Christine M. Lee, Ibrahim Mohammed, Erin Hestir, Thomas Harmon, Woolsey Fire Impacts on Coastal Water Quality in Southern California, AGU24 fall Meeting, Washington DC, Dec 13-18, 2024.

HYDROLOGICAL SCIENCES LABORATORY CODE 617

Jinzheng Peng / Task 020

J. Peng (Co-lead), Radiometer Status, Performance and EM Assessment, SMAP Engineering Review 2025 by SMAP mission Project, February 25-26, 2025.

J. Peng (lead), SMAP Radiometer Calibration, 18th SMAP Science Team meeting, SMAP mission Project, April 22-24, 2025.

J. Peng (lead), Calibration Error Budget for the PolSIR Radiometer, IGARSS 2025, Brisbane, Australia, August 03-08, 2025.

J. Peng (lead), One-Point Calibration of the Third and Fourth Stokes Parameters for SMAP L-band Microwave Radiometer and its Impact on the TEC Measurement, IGARSS 2025, Brisbane, Australia, August 03-08, 2025.

Priscilla Mohammed-Tano / Task 020

Priscilla Mohammed, “Anything is devastating: How do we enable spectrum sharing with less anxiety and more trust?,” NRDZ 2024, Sept 9-10, 2024, <https://www.cs.albany.edu/nrdz-ra/meetings/gbo2024/>.

Priscilla Mohammed, Jinzheng Peng, Jeffrey Piepmeier, RFI Environment, SMAP Science Team Meeting #18, April 22-24, 2025.

Priscilla Mohammed, Jinzheng Peng, Jeffrey Piepmeier, Radiometric Status, Performance and EM Assessment, SMAP Mission Engineering Review, Feb 2025.

Robert Emberson / Task 030

Emberson. R., McClain, S., Schultz, S., Barnes, J., NASA data to support Disaster decision making: past lessons, and future directions, AGU Fall Meeting 2024, Washington, DC, Dec 2024.

Emberson, R., Talla, P., Connecting agricultural soil erosion with pollution impacts on hydrological systems, AGU Fall Meeting 2024, Washington, DC, Dec 2024.

Emberson, R., Remote Sensing for Landslide Hazard Exposure and Risk Assessment, Allegheny Landslide Community, Oct 2024.

Emberson, R., NASA’s Disasters Program. EOTEC Devnet webinar, June 17, 2025.

Elijah Orland / Task 031

Orland, E., Lewis, S., Robichaud, P., Loboda, T. V., Ebel, B. A., Follette-Cook, M. B., Morton, D. C., Coffield, S., McCabe, T., Loehman, The Influence of Fire Behavior on Burn Severity and Post-Fire Recovery, American Geophysical Union Fall Meeting, Washington, DC, Dec 2024 (invited).

Thomas Stanley / Task 032

Thomas Stanley, George Huffman, Jackson Tan, Andrea Portier, Owen Kelley, Jason West, and Andrey Savtchenko, “Landslide hazard assessment, satellite precipitation, and satellite soil moisture”, United States Geological Survey, Golden, CO, June 16-17, 2025.

Thomas Stanley (lead), Developing a landslide forecasting system for the Karnali River basin in Nepal: integrating satellite and numerical weather predictions, AGU Fall Meeting, Washington DC, Dec 9-13, 2024.

Thomas Stanley (lead), Do better satellite precipitation algorithms improve landslide hazard assessment?, AGU Fall Meeting, Washington, DC, Dec 9-13, 2024.

Nishan Kumar Biswas / Task 033

Biswas, N.K. (lead), Global quantification of the response of reservoir storage changes to droughts, NASA Early Career Scientist Forum 2024, NASA Goddard Space Flight Center, Greenbelt, MD, Oct 23, 2024.

Biswas, N. K. (lead), Stanley, T. A., Kirschbaum, D.B., Laverde, M., and Towashiraporn, P., Unravelling the role of global and downscaled rainfall forecasts in landslide hazard prediction over the Lower Mekong Region, AGU Fall Meeting, Washington DC, Dec 9-13, 2024.

Biswas, N.K. (lead), Rothee, S.R., Analysis of Land Surface Temperature and Vegetation Trends in Lower Mekong Delta Cities, AGU Fall Meeting, Washington DC, Dec 9-13, 2024.

Biswas, N. K. (lead), Kumar, S. V., A global quantification of the response of reservoir storage changes to droughts, AGU Fall Meeting, Washington DC, Dec 9-13, 2024.

Fadji Zaouna Maina / Task 057

Maina, F.Z. (lead), Unlocking Sahel's Hydrological Changes: Science and Data for Climate Resilience, Keynote Speaker, Climate Resilience Symposium, Abuja, Nigeria, 2025 (invited).

Maina, F.Z. (lead), Hydrological Shifts Under Climate and Human Influences: Insights From Modeling and Satellite Observations, Stanford University, Stanford, CA, USA, 2025 (invited).

Maina, F.Z. (lead), Advancing IDRO's Mission with NASA's Water Insight," International Drought Resilience Alliance at the UNCCD COP16, Riyadh, Saudi Arabia, 2024.

Maina, F.Z. (lead), Restoring land in West Africa's transboundary basins: tackling climate and hydrological challenges, G20 Land Initiative at UNCCD COP16, Riyadh, Saudi Arabia, 2024.

Maina, F.Z. (lead), Reviving the Sahel: transformative approaches to land restoration and climate resilience, Science Day at UNCCD COP16, Riyadh, Saudi Arabia, 2024.

Maina, F.Z. (lead), Innovative applications of satellite data in water resource management, [ComoLake Conferences](#), Cernobbio, Italy, 2024.

Maina, F.Z. (lead), Deciphering the impacts of climate-human interactions on hydrology through satellite observations, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia, 2024.

Maina, F.Z. (lead), Deciphering the impacts of climate-human interactions on hydrology through satellite observations, JMISC, Strasbourg, France, 2024.

Maina, F.Z. (lead), Creating a water atlas: a scientist's odyssey across borders and disciplines, ENGEES, Strasbourg, France, 2024.

Maina, F.Z. (lead), The impacts of climate change and human management on the hydrology of High Mountain Asia, George Mason University, Fairfax, VA, 2024.

Maina, F.Z. (lead), NASA WaterInSight Team, Enhancing Precision Agriculture Through Innovative Fine-Scale Surface Meteorology, Third U.S.-Africa Frontiers of Science, Engineering, and Medicine Symposium, Kigali, Rwanda, 2025.

Maina, F.Z. (lead), Rosen D., Abbaszadeh P., Yang C., Kumar S.V., Rodell M., Maxwell R., Linking Groundwater and Land Surface Processes with the Coupled NASA Land Information System and ParFlow Framework, AMS Annual Meeting, New Orleans, LA, 2025.

Maina, F.Z. (lead), Kumar S.V., Rain-on-snow and its consequences on the hydrology from the historical period to the end of the century, AGU Fall Meeting, Washington, DC, 2024.

Maina, F.Z. (lead), Kumar S.V., Mocko D., Whitney K., Locke K., Development of a fine-scale North American precipitation analysis for retrospective and operational applications, AWRA, UCOWR, NIWR 60th Anniversary Joint Water Resources Conference, Saint Louis, MO, 2024.

Maina, F.Z. (lead), Kumar S.V., Mocko D., Kemp E., Collins C., Beck J., NLDAS-3, a fine scale surface meteorology dataset for North and Central America, AGU Water Science Conference, Saint Paul, MN, 2024.

Maina, F.Z. (lead), Kumar S.V., Mocko D., Kemp E., Collins C., Beck J., Development of a fine-scale North American precipitation analysis for retrospective and operational applications, AMS Annual Meeting, Baltimore, MD, 2024.

Pukar Amatya / Task 063

Pukar Amatya. Landslide Monitoring and Risk Assessment Using NASA Earth System Data, ARSET training, Virtual, 2025.

Amatya, P., Monitoring Slow-moving Landslides, and Daily Flood Inundation Mapping & Forecasting Services for the Hindu Kush Himalaya, ICIMOD, Nepal, 2024.

Amatya, P., Handwerger, A., Carroll, M., "Rapid response landslide detection using ICEYE, AGU24, Washington DC, 2024.

Amatya, P., Stanley, T., Maharjan, S. B., "Towards a national-scale automated landslide mapping system for Nepal, AGU24, Washington DC, 2024.

Amatya, P. "Landslide mapping and forecasting using machine learning", Virtual, Stimson Center Webinar, 2025.

Cheng-Hsuan Lyu / Task 073

Cheng-Hsuan Lyu (lead), Sounder for Microwave-Based Applications (SMBA): the Next-Generation US Spaceborne Operational Microwave Sounder, Baltimore, MD, 2024.

Cheng-Hsuan Lyu (lead), GSFC Science Enables NOAA Next-Gen Operational Microwave Sensor Series through 2050, NASA GSFC Sciences & Exploration Directorate Annual New Year's Poster Party 2025, Jan 2025.

Jessica Sutton / Task 160

Sutton, J. R. P. (lead) and T. Stanley, Hurricane Helene Case Study, Goddard Disasters Meeting, May 2025.

Sutton, J. R. P. (lead), T. Stanley, R. Soobitsky, and P. M. Amatya, Do better satellite precipitation algorithms improve landslide hazard assessment?, Goddard 617 Lab Meeting, July 2025.

Sutton, J. R. P. (lead) and M. Kumah, Evaluating the Performance of GPM IMERG Products for Extreme Precipitation Estimation in Volta River Basin of Ghana, 2024 AGU Fall Meeting, Washington, D. C., December 2024.

Sutton, J. R. P. (lead), T. Stanley, R. Soobitsky, E. Orland, and D. Kirschbaum, Characterizing Extreme Storms to Better Inform Hydrometeorological Hazard Assessment, 2024 Precipitation Measurement Mission Science Team Meeting, San Diego, CA, September 2024.

BIOSPHERIC SCIENCES LABORATORY CODE 618

Celio Resende de Sousa / Task 060

De Sousa, C. (lead), Earth Observation-based Mapping of Protected areas of West Africa: Results for Guinea Bissau, ForestSAT, Rotorua, New Zealand, September 2024.

Thomas Eck / Task 085

Thomas Eck (lead), Dust optical/physical Properties, AGU Annual Meeting, Washington, DC, Dec 9-13, 2024.

Anthony Campbell / Task 109

Campbell, A. (lead), Enabling Coastal wetland monitoring across scales with lidar, imaging spectroscopy, and very high-resolution satellite imagery, FWBON Africa monthly meetings, Feb 7, 2025.

Campbell, A. (lead), Enabling Coastal wetland monitoring across scales with lidar, imaging spectroscopy, and very high-resolution satellite imagery, 2024 American Geophysical Union meeting, Dec 9, 2024.

Campbell, A. (lead), Enabling Coastal wetland monitoring across scales with lidar, imaging spectroscopy, and very high-resolution satellite imagery, Goddard Space Flight Center: Early Career Scientists Forum, Oct 23, 2024.

Campbell, A. (lead), Earth Observation for Estuarine Biodiversity Monitoring in the Western Cape Province of South Africa, Biennial Conference of the Society for South African Geographers, Sept 15, 2024

Arif Rustem Albayrak / Task 133

Albayrak, A. (lead), From classifiers to crisis response: A machine learning journey through space-based disaster monitoring, Φ-lab Explore Office Team & Φ-lab Invest Office Team, European Space Agency (ESA), Frascati, Italy, June 3, 2025.

Albayrak, A. (lead), Leveraging AI and best practices to bridge standardization gaps in natural disaster management, WMO Study Group on Future Data Infrastructure (SG-FIT) Workshop, Session 6 on Standards, Sept 23, 2024.

Albayrak, A. (lead), Transforming Flood Analysis: Hydro-SAR Next Generations, SERVIR Geo-AI, Jan 22, 2025.

K. Fred Huemmerich / Task 134

Huemmerich, K.F. (lead), PACE Terrestrial Products, a New View of Ecosystem Distributions, Phenology, and Function, PACE Applications Workshop, Washington DC, Dec. 8, 2024.

Huemmrich, K.F. (lead), PACE Provides a New Look at Terrestrial Ecosystems, UMBC Geography and Environmental Studies, Baltimore, MD, Dec. 4, 2024.

Huemmrich, K.F. (lead), PACE Terrestrial Products, a New View of Ecosystem Distributions, Phenology, and Function, 2024 AGU Fall Meeting, Washington, DC, Dec. 10, 2024.

Huemmrich, K.F. (lead), PACE Terrestrial Products, a New View of Ecosystem Distributions, Phenology, and Function, Biospheric Sciences Brownbag, NASA Goddard Space Flight Center, Greenbelt, MD, January 28, 2025.

Huemmrich, K.F. (lead), PACE Terrestrial Products, a New View of Ecosystem Traits, Phenology, and Function, PACE Science Showcase, Feb. 27, 2025.

Huemmrich, K.F. (lead), PACE Terrestrial Products, a New View of Ecosystem Traits, Productivity, and Biodiversity, SBG Algorithms Working Group, March 31, 2025.

Huemmrich, K.F. (lead), PACE Terrestrial Products, a New View of Ecosystem Traits, Land Cover, and Productivity, PACE Land Users Group, April 15, 2025.

Huemmrich, K.F. (lead), PACE Terrestrial Products, a New View of Ecosystem Distributions, Phenology, and Function, PACE Hackathon, UMBC, Baltimore, MD, August 7, 2025.

Ameni Mkaouar / Task 221

Ameni Mkaouar (lead), Advancing Digital Surface Model Derivation in Forested Environments Through the Simulation and Fusion of Satellite Stereophotogrammetry and LiDAR Data, JACIE 2025, USGS Headquarters, Reston, VA, April 7-11, 2025.

Ameni Mkaouar (lead), Improved Digital Surface Model Derivation in Vegetation Landscapes through Simulation and Fusion of Satellite Stereophotogrammetry and Laser Altimetry, AGU 2024, Washington, D.C., Dec 2024.

Ameni Mkaouar (lead), Advances in Spaceborne LiDAR and Stereo Photogrammetry Modeling for Improved Digital Surface Model Generation, IGARSS 2025, Brisbane, Australia, 3-8 August 2025.

Ameni Mkaouar (lead), Keynote Speaker, Advancing Digital Surface Model Derivation in Forested Environments Through the Simulation and Fusion of Satellite Stereophotogrammetry and LiDAR Data, the 2nd National Conference on Applications of Artificial Intelligence (A2I'25), Computer Science Department, University of Boumerdes, Algeria, April 16–17, 2025.

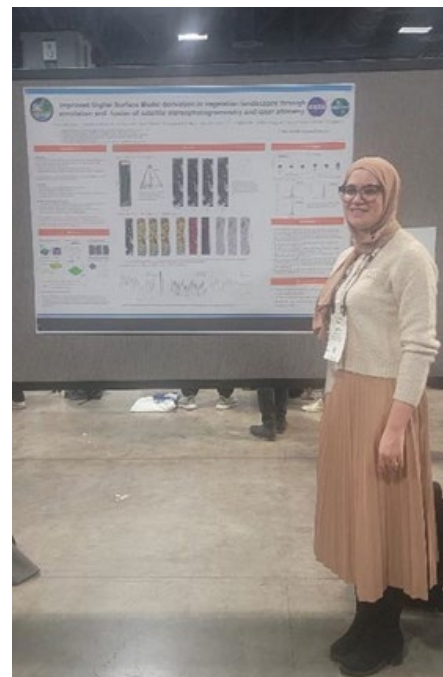


Photo: Dr. Mkaouar's poster presentation at AGU 2024, Washington, D.C., December 2024. Credit: Maggie Wooten.

Seohui Park / Task 173

Park, S. (lead), Improving Aerosol Optical Depth Retrieval from GOES-R: Deep Learning-Based Bias Correction with AERONET Data, AERONET Workshop, Maryland, September 17-18, 2024.

Park, S. (lead), Hour by Hour PM2.5 Mapping using Synergy of TEMPO and GOES Satellites, Washington DC, December 09-13, 2024.

Park, S. (lead), Hour by Hour PM2.5 Mapping using Synergy of TEMPO and GOES Satellites, Boston, MA, August 19-22, 2025.

Natalia L. Quinteros Casaverde / Task 217

Quinteros Casaverde, N. (lead), Serbin, S., Daly, D., Spectroscopic reconstruction of fresh-leaf moisture content in dried leaves, Ecological Society of America Annual Meeting, Baltimore, MD, Aug 11-14, 2025.

Kelsey Huelsman / Task 229

Kelsey Huelsman (lead), Behind the scenes: collaborative creation of the Biological Data Standards Primer Guides, Earth Science Information Partners (ESIP) July Meeting, Seattle, WA, July 23, 2025.

GEODESY AND GEOPHYSICS LABORATORY CODE 61A

Magdalena Kuzmicz-Cieslak & Keith Evans / Task 221

Magdalena Kuzmicz-Cieslak, Keith D. Evans (leads), Update on the activities of the NASA GSFC/JCET ILRS Analysis Center, EGU General Assembly, Vienna, Austria, Mar 18, 2025.

Magdalena Kuzmicz-Cieslak, Keith D. Evans (leads), Overview of the NASA GSFC/UMBC JCET ILRS Analysis Center Activities in Support of the ITRF, AGU Fall Meeting, San Francisco, CA, Dec 2024.

Stacey Huang / Task 188

Huang, S., Osmanoglu, B., Scheuchl, B., Oveisgharan, S., Sauber, J., Jo, M., Khazendar, A., Tymofyeyeva, K., Wusk, B., Albayrak, A., Small Satellites, Big Science? Evaluating the Role of Commercial Smallsat Constellations in NASA's Surface Deformation and Change Mission, 2024 American Geophysical Union Annual Meeting, Washington, D.C., December 2024.

Kyle Gwirtz / Task 204

Kyle Gwirtz, Terence Sabaka, Weijia Kuang, Variance component estimation for scaling observation uncertainties: experiments in geomagnetic data assimilation, 2024 AGU annual meeting, Washington D.C., Dec 2024.

PROPOSALS AWARDED

Proposal Title	Funding Agency	PI (GESTAR II)	CO-I(s)/ Collaborators (GESTAR II)	Period of Performance
Cooperation and Agreements enhancing Global interoperability for Aerosol, Cloud and Trace gas research infrastructures (CARGO-ACT)	European Commission		Jasper Lewis (UMBC)	Awarded
Forecasting and mapping landslides in eastern North America	NASA		Pukar Amatya (UMBC), Thomas Stanley (UMBC), Jessica Sutton (UMBC)	2025 - 2027
Ocean Optics Training Workshop: theory and measurements in support of calibration and validation of space-based ocean color observations	NASA		Ivona Cetinić (MSU)	July 1, 2025 – June 30, 2028
Towards 3-D structure of Wildfire Smoke Plumes: Integrating Physics-Informed Machine Learning with High Spatial, Temporal, and Spectral Observations	NASA – AIST Step One	Yingxi Shi (UMBC)		Awarded
Developing hyperspectral, polarimetric libraries for remote sensing applications: From marine debris detection to national security	NASA GSFC		Sean Foley (MSU)	Nov 2024 – ongoing
Continuing the MLS stratospheric water vapor record with OMPS LP	NASA GSFC ESD	Michael Himes (MSU)		Jan 2025 – Sept 2025
An Open Science, Community-Driven Approach to Assemble Benchmark Datasets for Machine Learning Algorithms to Predict Ocean Ecology	NASA GSFC ESD	Susanne Craig (UMBC)	Ian Carroll (UMBC)	Oct 1, 2024 – Sept 30, 2025
AUTOCRACY - Aerial Autonomous Ocean Color and Atmospheric Chemistry System: Follow on Funding	NASA GSFC ESD	Susanne Craig (UMBC)		Nov 1, 2023 – Oct 31, 2024

The Role of Oceans in the Earth System: Preparing the Oceans Community for the 2027 Decadal Survey	NASA GSFC ESD	Susanne Craig (UMBC)		Oct 1, 2024 – Sept 30, 2025
3D Cloud Reconstruction in Multi-Angle Polarimetry with a Foundation Model	NASA GSFC IRAD		Sean Foley (MSU)	Oct 2024 – Sept 2025
Determining near real time surface ozone concentrations from TEMPO and machine learning: a feasibility study	NASA HAQAST	Daniel Anderson (UMBC)		2025 – 2029
ISFM work package for GPM ground validation research and analysis at NASA Wallops Flight Facility	NASA HQ		Ali Tokay (UMBC)	2025 – 2026
PACE and EarthCARE Synergy with MAAP	NASA MAAP		Sean Foley (MSU)	Sept 2025 – Feb 2026
Growth of the Earth and Space Institute at UMBC	NASA RFP	J. Vanderlei Martins (UMBC)	Roberto Borda (UMBC), Lorraine Remer (UMBC)	Awarded
A globally applicable change detection-based deep learning framework for mapping disaster induced landslides using Planet data	NASA ROSES	Pukar Amatya (UMBC)	Thomas Stanley (UMBC)	2025 – 2027
AK FirE-SAFE: Alaska Fire Event Situational Awareness From Earth Observations	NASA ROSES		Arif Albayrak (UMBC)	Awarded
Building global PBL height analysis and monitoring capability and improving the representation of PBL thermodynamic structure in a global modeling framework	NASA ROSES		Eun-Gyeong Yang (UMBC), Manisha Ganeshan (MSU), Erica McGrath-Spangler (MSU), Jasper Lewis (UMBC), Virginie Buchard (UMBC)	Awarded
Cloud Credits Supplement to Enable Open Sciences for MEASURES and EMIT projects	NASA ROSES	Jianyu Zheng (UMBC)	Zhibo Zhang (UMBC), Jianwu Wang (UMBC)	Oct 1, 2024 – Sept 30, 2025
Combining Solar Induced Fluorescence (SIF) and Reflectance (R) Metrics for Improved Assessment of Photosynthesis at Local, Regional and Global Levels - USPI on the ESA FLuorescence EXplorer (FLEX) Mission	NASA ROSES	Petya Campbell (UMBC)		Awarded

Development of a multidecadal land reanalysis over South America	NASA ROSES	Fadji Maina (UMBC)		Oct 1, 2024 – Sept 30, 2026
Earth Surface Model Investigation of Cascading Earthquake Hazards augmented by field and remote sensing observations	NASA ROSES		Pukar Amatya (UMBC) Thomas Stanley (UMBC)	2025 – 2028
Geomagnetic Data Assimilation with Kalman Smoothing: Fitting Core Dynamics to Geomagnetic Secular Variation	NASA ROSES	Kyle Gwirtz (UMBC)		2025 – 2027
Global Km-Scale Reanalysis for Assessing Uncertainties in Downscaled Climate Projections with Applications to End-Users	NASA ROSES	Carl Malings (MSU)	Science PI: Katherine Breen (MSU); Caterina Mogno (UMBC)	Oct 2025 – Sept 2028
Improving Prediction of High Impact Land Falling Hurricanes in GEOS using surface sensitive microwave observations from GPM	NASA ROSES	Bryan Karpowicz (UMBC)		Awarded
Integrating NASA satellite data, model outputs and research into U.S. State Department's Environmental Diplomacy Efforts in Africa	NASA ROSES		Junhyeon Seo (MSU)	2025 – 2028
Lightning-NOx production as viewed by TEMPO	NASA ROSES		Pamela Wales (MSU)	Awarded
Scaling Data Fusion Tools to Support Local Air Quality Managers in Latin America	NASA ROSES	Carl Malings (MSU)		July 2025 – June 2029
Support Air Quality and Public Health Management in Wildfires: Satellite and Machine Learning Based Air Quality Forecast	NASA ROSES		Meng Zhou (UMBC)	Jan 2026 – Jan 2029
Tracking Sea Level Rise in American Samoa with Ultra-High-Resolution SAR Imagery: An Umbra Feasibility Study	NASA ROSES	Stacey Huang (UMBC)	MinJeong Jo (UMBC)	Aug 2024 – July 2025
Advancing Aerosol Property Retrievals with High Resolution Commercial Satellite Data: Leveraging Spatial and Temporal	NASA ROSES - CESRA		Anin Puthukkudy (UMBC)	Awarded

Correlations in Surface and Aerosol State				
Effective use of regional and chemistry-climate modeling, and remote sensing to support INSPYRE flight planning, execution, and data analysis	NASA ROSES - INSPYRE		Meng Zhou (UMBC), Fei Liu (MSU)	Oct 1, 2025 – Sept 30, 2030
Deployment of AirHARP2 suite of instruments on the NASA ER2 aircraft for the measurements of pyroCb-injected smoke plumes and their effect on earth's radiative budget	NASA ROSES – INSPYRE	J. Vanderlei Martins (UMBC)	Brent McBride (UMBC), Richard Xu (UMBC), Anin Puthukkudy (UMBC)	Oct 1, 2025 – Sept 30, 2030
Retrospective analysis and forecasting of the impact of marine heatwaves on oceanic export production	NASA ROSES - OBB	Lionel Arteaga (UMBC)	Ivona Cetinic (MSU)	Jan 1, 2025 – Dec 31 – 2028
Advanced air quality forecasting through coupled data assimilation of hyperspectral PACE aerosol retrievals and all-sky radiances from multiple satellite-based sensors	NASA ROSES - PACE		Jérôme Barré (MSU)	2024 – 2027
Refinement of the Unified Algorithm for aerosol retrieval from PACE OCI measurements	NASA ROSES - PACE	Lorraine Remer (UMBC)	Yingxi Shi, Christina Hsu (UMBC), Hiren Jethva (MSU)	Awarded
Advancement of the PACE Polarimetric and Spectral Cloud Retrieval Algorithms OF HARP2 and OCI	NASA ROSES – PACE	Daniel Miller (UMBC)		2025 – 2028
Phase Transition in High-Latitude Clouds: Disentangling Effects of Aerosols and Meteorology Using NASA PACE Satellite and In-Situ Observations	NASA ROSES – PACE	Richard Xu (UMBC)		Awarded
Uncovering coccolithophore and diatom biogeochemical and ecological patterns with combined radiometry and multiangle polarimetry	NASA ROSES – PACE		Brent McBride (UMBC), L. Remer (UMBC), Anin Puthukkudy (UMBC), Richard Xu (UMBC)	July 1, 2026 – June 30, 2028
UV-VIS-NIR Spectral Aerosol Absorption in Cloud-free and Above-cloud Atmospheres using PACE-AERONET-EarthCARE Synergies	NASA ROSES – PACE	Hiren Jethva (MSU)		Awarded

A systematic investigation of the potential of SMAP soil moisture assimilation for improving the simulation and prediction of tropical cyclones	NASA ROSES – SMAP		Erica McGrath-Spangler (MSU)	Awarded
Beyond HCHO/NO ₂ : A Comprehensive Investigation of Hourly-Varying Ozone Production Rates and Their Sensitivities to Weather, Chemistry, and Emissions	NASA ROSES - TEMPO	Amir Sourì (MSU)	Junhua Liu (MSU), Sarah Strode (MSU)	May 1, 2025 – Apr 30, 2028
Harnessing Machine Learning Techniques to Develop Novel Ocean Color Products from TEMPO	NASA ROSES – TEMPO		James Allen (MSU)	Apr 18, 2025 – Apr 17, 2028
Impact of Measured Formaldehyde Profiles from Pandora Instruments on TEMPO Retrievals	NASA ROSES – TEMPO	Apoorva Pandey (UMBC)	Jin Liao (UMBC)	July 29, 2025 – July 29, 2028
Spatiotemporal Fusion of TEMPO-Inferred and Bottom-Up Estimates for High-resolution Nitrogen Oxide Emissions	NASA ROSES - TEMPO	Fei Liu (MSU)		May 1, 2025 – Apr 30, 2028
Funding for students & early-career researchers to attend 4th Advancement of POLarimetric Observations (APOLO-2024) Conference	NASA ROSES-2024: TWSC24	Richard Xu (UMBC)		Awarded
Improve the Quantification of the Efficacy of Marine Cloud Brightening with Observations and Modeling by Studying Recent Analogs	NOAA	Tianle Yuan (UMBC)		Awarded
Advancing JEDI-Based Emission Inversions to Improve the NOAA Aerosols medium and long-range predictions using Neural Networks	NOAA – OAR – WPO	Jérôme Barré (MSU)		2025 – 2028
Assessing and Accelerating Living Shoreline in the US Gulf Coast for Climate Resilience and Habitat Restoration	NSF		Nishan Biswas (UMBC)	Sept 1, 2025 – Aug 31, 2027
REU Site: Experiments in Earth and Atmospheric Science: Learning Opportunities and Research Experience (EXPLORE)	NSF	Adriana Rocha Lima (UMBC)	Ivona Cetinić (MSU)	Sept 1, 2025 - Aug 31, 2028

CAIG: Towards 3-D Structure of Wildfire Smoke Plumes: Integrating Physics-Informed Machine Learning with Multi-Sensor Data	NSF - CAIG		Yingxi Shi (UMBC), Jianwu Wang (UMBC)	Awarded
Improving Aerosol Height and Optical Properties for NAAPS Aerosol Forecast	Office of Naval Research	Myungje Choi (UMBC)	Yujie Wang (UMBC)	Aug 2025 – July 2028
FETCH ₄ : Fate, Emissions, and Transport of CH ₄ in past and modern atmospheres	Schmidt Sciences	Daniel Anderson (UMBC)		2024 – 2027
Future sea-level rise and freshwater export from Antarctic Peripheral Glaciers and Ice Caps in a warming climate	UK Natural Environment Research Council		Liz Ultee (MSU)	Aug 1, 2024 – July 31, 2029
Identification of Virga Precipitation Events	UMBC	Jessica Sutton (UMBC)	Thomas Stanley (UMBC)	Awarded
Polarimetric characterization of the lunar surface from UMBC's HARP2 instrument on the NASA PACE mission	UMBC – START	Brent McBride (UMBC)	J. Vanderlei Martins (UMBC), Nirandi Jayasinghe (UMBC)	July 1, 2025 – June 30, 2026

PROPOSAL PENDING

Proposal Title	Funding Agency	PI (GESTAR II)	CO-I(s) & Collaborator(s) (GESTAR II)	Status
Leveraging Digital Twin Technology for Climate Resilience in the UAE	Abu Dhabi Investment Authority		Niama Boukachaba (MSU)	Pending
AI Applications: Fine-scale air pollutants mapping using multi-scale learning	Center for Emerging Artificial Intelligence Systems, IBM-U		Jérôme Barré (MSU)	Pending
International Livestock Research Institute (ILRI-Kenya) Piloting Rift Valley fever Modeling Results at Local Scale	Gates Foundation	Assaf Anyamba (UMBC)		Pending
Leveraging Space Technology and AI for Sustainable Water Resource Management and Carbon Sequestration in the Face of Climate Change	Mohammed VI Polytechnic University (UM6P)		Niama Boukachaba (MSU)	Pending
GPM Algorithm Work Package Report: DPR Path-Attenuation Estimates	NASA	Liang Liao (MSU)	Hyokyung Kim (MSU)	Pending
Linkages among atmospheric thermodynamics, the structure of convection, and rain rate intensity	NASA		Tianle Yuan (UMBC)	Pending
Nitrogen Dioxide measurements for FarmFlux: Flux and concentration measurements of NO ₂ over animal feeding operations and agricultural croplands	NASA EVS-4 ROSES		Jason St. Clair (UMBC)	Pending
From Space to Grains of Dirt: Leveraging Remote Sensing and Artificial Intelligence to Track No-See-Ums and Oropouche Virus in the Americas	NASA GLOBE		Assaf Anyamba (UMBC)	Pending
Development of a framework to accelerate numerical model processes using AI/ML	NASA GSFC IRAD		Zhining Tao (MSU), Michael Himes (MSU)	Pending
Efficient Fine-Tuning for Atmospheric Tomography,	NASA GSFC IRAD		Sean Foley (MSU)	Pending
Aboveground Biomass Prediction and Change Retrieval in Forests through	NASA ROSES		Ameni Mkaouar (UMBC)	Pending

Spatially Consistent Data Fusion Using Spaceborne LiDAR, Sub-Meter Stereo Imagery, and Deep Learning				
Advanced Information Systems for STV Fusion, Stereo Processing, and Precise Pointing	NASA ROSES		Ameni Mkaouar (UMBC)	Pending
Building global PBL height analysis and monitoring capability and improving the representation of PBL thermodynamic structure in a global modeling framework	NASA ROSES		Eun-Gyeong Yang (UMBC), Manisa Ganeshan (MSU)	Selectable
Collaborative Research: Improving fire evolution in mesoscale air quality modeling via observation constrained and physics informed machine learning	NASA ROSES	Yingxi Shi (UMBC)	Meng Zhou (UMBC)	Pending
Dust remote sensing in the thermal infrared: a missed opportunity	NASA ROSES	Andrew Sayer (UMBC)	Ian Carroll (UMBC)	Pending
Enhancing the use of satellite precipitation data for SERVIR-West Africa	NASA ROSES	Jessica Sutton (UMBC)	Thomas Stanley (UMBC)	Pending
GEOS composition modeling to support FarmFlux flight planning and to improve air quality predictions in US agricultural areas	NASA ROSES	Viral Shah (MSU)	Pamela Wales (MSU), Huisheng Bian (UMBC), Caterina Mogno (UMBC)	Pending
Identification of Virga for Enhancing Satellite Derived Surface Precipitation Estimation from GPM IMERG	NASA ROSES	Jessica Sutton (UMBC)	Thomas Stanley (UMBC), Jackson Tan (UMBC)	Pending
Investigating the Diurnal Cycles of Precipitation and Ice Water Path	NASA ROSES		Jackson Tan (UMBC)	Pending
Looking Beyond Lookup Tables: An Open-source Deep Learning Framework for Fast, Multidimensional, Hyperspectral Radiative Transfer Modeling	NASA ROSES	Michael Himes (MSU)	Sergey Korkin (UMBC)	Pending
Machine learning prediction of ecological and biogeochemical information from aquatic remote sensing in the optically complex and rapidly changing North Slope of Alaska	NASA ROSES	Susanne Craig (UMBC)		Pending
Quantifying vegetation response to rainfall and	NASA ROSES		Dhruva Kathuria (MSU)	Pending

heatwave pulses for improved flash drought prediction				
Spatiotemporal Dimension Reduction of Multisensor Data to Enhance Adoption and Accessibility	NASA ROSES		Dhruva Kathuria (MSU)	Pending
T-AIR Transforming Air Quality Insights into Research and Action for Texas Communities	NASA ROSES		Adriana Rocha Lima (UMBC), Anin Puthukkudy (UMBC), Carl Malings (MSU)	Pending
Uncertainty characterization of IMERG Across Time and Space Averages for Enhanced Hydrologic Predictions	NASA ROSES		Jackson Tan (UMBC)	Pending
Using Machine Learning to Enhance Precipitation Retrieval Performance of SmallSats	NASA ROSES		Jackson Tan (UMBC)	Pending
Virtual Observatory for Advanced Aerosol Characterization	NASA ROSES		Sergey Korkin (UMBC), Myungje Choi (UMBC), Yujie Wang (UMBC), Michael Himes (MSU)	Pending
Investigating the Impacts of Tropospheric ozone Precursor and Ozone Depleting Substance Emissions on Ocean Heat Uptake in the Past and Future,	NASA ROSES – ACMAP	Feng Li (UMBC)	Junhua Liu (MSU), Huisheng Bian (UMBC)	Pending
Modeling the Aerosol Lifecycle Across Scales in the Goddard Earth Observing System	NASA ROSES – ACMAP	Allison Collow (UMBC)		Pending
Wide-band RFI -resilient Microwave Radiometer Front-End for Remote Sensing of Earth's Sea, Ice and Land Surfaces	NASA ROSES - ACT		Priscilla Mohammed (MSU), Jizheng Peng (MSU)	Pending
Dynamics in photosynthetic function for drylands -- upscaling from leaf to canopy and regional levels	NASA ROSES – CARBON		Petya Campbell (UMBC)	Pending
Linking Phytoplankton Community Composition to Downwind Aerosol and Cloud Properties with PACE	NASA ROSES – FINESST		Susanne Craig (UMBC)	Pending
Assimilation of PACE hyperspectral data into the NASA Ocean Biogeochemical Model	NASA ROSES - MAP	Lionel Arteaga (UMBC)		Selectable
STARS: Chlorine activation on wildfire aerosols and its impact on the ozone layer	NASA ROSES - MAP		Ghassan Taha (MSU)	Selectable

A statistical cloud condensation scheme driven by deep learning	NASA ROSES – MAP		Katherine Breen (MSU)	Pending
Advancing the use of Polarimetric Radio Occultation in NASA's GEOS Model	NASA ROSES – MAP	Michael Murphy (UMBC)		Selectable
Characterizing the Variability of Dust Mineralogy, Dust-borne Nutrients and Direct Radiative Effect Over the Last Two Decades	NASA ROSES – MAP		Dongchul Kim (UMBC)	Selectable
Closure studies of biomass burning aerosol optical properties from aircraft to improve NASA GOCART-2G optical property estimates	NASA ROSES – MAP		Dongchul Kim (UMBC)	Selectable
Dusty Atmospheric Rivers: Processes, Impacts, and Predictions in GEOS Model	NASA ROSES – MAP	Amin Dezfuli (UMBC)	Allison Collow (UMBC)	Pending
Improving Climate Projections and Subseasonal-to-Seasonal Predictions in GEOS by Understanding the Biases of Southern Hemisphere Large-Scale Circulation	NASA ROSES – MAP	Feng Li (UMBC)		Pending
Leveraging the power of high-resolution satellite data and a machine learning parameterization to represent non-linear ozone chemistry in chemistry-climate model simulations	NASA ROSES – MAP	Sarah Strode (MSU)	Daniel Anderson (UMBC), Junhua Liu (MSU), Amir Sourì (MSU)	Selectable
Transport and wet scavenging of aerosols in the NASA GEOS model as constrained by radionuclide tracers and aircraft observations: characterization, representation, uncertainties, and trends	NASA ROSES – MAP		Huisheng Bian (UMBC)	Selectable
Developing ML-based subcolumn generator for simulating subgrid variability of hydrometeors in Global Climate Models	NASA ROSES – PMM	Daeho Jin (UMBC)	Dongmin Lee (MSU), Nayeong Cho (UMBC)	Pending
Generative ML to support the development of estimation algorithms using observations from new satellite sensors	NASA ROSES - RST	Mircea Grecu (MSU)		Pending
Integrating Lidar and GEO Retrievals for Enhanced Aerosol Characterization	NASA ROSES - RST		Anin Puthukkudy (UMBC)	Pending

Atmospheric Neural Radiance Fields	NASA ROSES – RST	Sean Foley (MSU)		Pending
Cloud property retrievals for horizontally nonhomogeneous clouds	NASA ROSES – RST	Tamás Várnai (UMBC)		Pending
Enhanced Parallax Correction in Multi-Angle Polarimeter Retrievals: Addressing Horizontal Inhomogeneity in Clouds and Aerosols	NASA ROSES – RST	Anin Puthukkudy (UMBC)		Pending
Steering improvements in aerosol retrieval assumptions with suborbital datasets in preparation for the next generation of space-based multiangle polarimeters and lidars	NASA ROSES – RST		Anin Puthukkudy (UMBC)	Pending
Exploring the relationship of urban CO ₂ and NO ₂ with applications to TEMPO emission estimates	NASA ROSES – TEMPO		Jin Liao (UMBC)	Selectable
Towards an integrated observing system of the hydroxyl radical: Assessing the feasibility of constraining spatiotemporally-resolved abundance, trends, and variability of OH with satellite proxy data	NASA ROSES - ACPMAP	Daniel Anderson (UMBC)	Junhua Liu (MSU)	Selectable
Investigation of tropical cyclogenesis in NASA GEOS-S2S system and near-real-time TC forecast products	NASA ROSES - MAP		Young-Kwon Lim (UMBC)	Pending
Assessing tropical forest carbon-climate feedback in twenty-first century by integrating satellite products, in situ measurements, and CMIP6 model results	NASA ROSES, CARBON	Huisheng Bian (UMBC)		Pending
Using machine-learning derived aerosol-cloud constraints to improve cloud responses to aerosol perturbation in global models for marine cloud brightening (MLCloudsCali)	NOAA		Tianle Yuan (UMBC)	Pending
FIRE-MODEL: Advancing Fire and Smoke Representations in a Next-Generation Earth System Model: Model Improvement, Cross-scale	Northeastern University	Yujie Wang (UMBC)		Pending

Application, and Community Engagement				
CAIG: Accelerating Radiative Transfer for Aerosol Satellite Remote Sensing Test Beds using Physics-Informed Neural Network	NSF	Anin Puthukkudy (UMBC)	Richard Xu (UMBC)	Pending
Collaborative Research: Impacts of Sulfur Emission Reductions on Wintertime PM2.5 in Fairbanks, Alaska	NSF	Jason St. Clair (UMBC)		Pending
Collaborative Research: Constraining Greenland Glacier Dynamics using 1940s Historical Aerial Photography	NSF Arctic Natural Sciences		Liz Ultee (MSU)	Pending
Understand the environmental controls of cirrus cloud formation and dissipation: a Lagrangian analysis of multiple observations and implication for CCT deployment	SIMON Foundation		Tianle Yuan (UMBC)	Pending

PROPOSALS NOT AWARDED

Proposal Title	Funding Agency	PI (GESTAR II)	CO-I(s) & Collaborator (GESTAR II)
Impact of atmospheric conditions on the transition zone between cloudy and clear air	DoE	Tamas Varnai (UMBC)	
Improving understanding of aerosol-cloud interactions using shortwave spectrometer data from ARM's EPCAPE Campaign	DoE	Guoyong Wen (MSU)	
A systematic survey of precipitation-induced landslides	NASA	Thomas Stanley (UMBC)	Pukar Amatya (UMBC), Robert Emberson (UMBC)
Commercial Observing and Analysis System for monitoring Tidal wetland Species and change	NASA	Anthony Campbell (UMBC)	
Hour-by-Hour Air Quality Mapping: Integration TEMPO and GOES-R into Machine Learning Algorithms	NASA	Mijin Kim (MSU)	Seohui Park (MSU), Kanghyun Baek (UMBC)
Identification of Virga for Enhancing Satellite Derived Surface Precipitation Estimation from GPM IMERG	NASA	Jessica Sutton (UMBC)	Thomas Stanley (UMBC), Jackson Tan (UMBC)
Climate Impact of Upper Troposphere and Lower Stratosphere Extratropical Aerosols Associated with Fires and PyroCBs	NASA ACMAP		Ghassan Taha (MSU)
Understanding the Diversity of Impacts from Volcanic Eruptions on Stratospheric Aerosols, Chemistry, and Radiation	NASA ACMAP		Ghassan Taha (MSU)
Enabling fast chemistry processing in NU-WRF: A machine learning approach	NASA GSFC SSP	Zhining Tao (MSU)	Michael Himes (MSU)
STARS: Stratospheric Trace gas and Aerosol Remote Sensor	NASA IIP		Ghassan Taha (MSU)

A Machine-Learning Framework to Enhance, Adapt, and Extend the GPM Combined Radar-Radiometer Algorithm (CORRA)	NASA PMM	Mircea Grecu (MSU)	
Enhancing Global Blind Zone Precipitation Estimates from Space Using Observations, Modeling, and Machine Learning	NASA PMM		Mircea Grecu (MSU)
4DPrecip Spatiotemporal Fusion of Multi-Sensor Observations for Next-Generation Precipitation and Cloud Products	NASA ROSES		Jackson Tan (UMBC)
A Comprehensive Evaluation of Tomorrow.io's Radar Products Using Explainable AI and GPM Data	NASA ROSES	Mircea Grecu (MSU)	
A Multi-Mission Comparison of Mars Atmospheric Scales of Motion	NASA ROSES		Manisha Ganeshan (MSU)
Addressing Parallax Challenges in Aerosol Retrieval from Multi-Angle Polarimeter Observations: Cloud Screening and Horizontal Inhomogeneity	NASA ROSES	Anin Puthukkudy (UMBC)	
Advanced Characterization of Aerosol and Land Surface Properties from TEMPO	NASA ROSES		Myungje Choi (UMBC), Yujie Wang (UMBC), Sujung Go (UMBC), Sergey Korkin (UMBC)
Advancing atmospheric composition analyses and forecasts through improved TEMPO NO ₂ retrievals and their assimilation in GEOS	NASA ROSES	Viral Shah (MSU)	Jerome Barre (MSU), Pamela Wales (MSU)
Advancing Global Snowfall Observations in Satellite Precipitation Products	NASA ROSES	Jackson Tan (UMBC)	
Advancing polar cloud and planetary boundary layer property retrievals using commercial GNSS RO measurements and studying the impact on polar thermodynamic processes	NASA ROSES	Manisha Ganeshan (MSU)	Eun-Gyeong Yang (UMBC)
Assessing differences among PBL height estimates from disparate	NASA ROSES		Jasper Lewis (UMBC),

POR sources to inform a better utilization of future spaceborne sources			Manisha Ganeshan (MSU)
Assessing TEMPO and DSCOVR Cloud Product coherence and unveiling traffic-related pollutant dynamics in the atmosphere	NASA ROSES	Alfonso Delgado-Bonal (UMBC)	
Building AI-Powered NU-WRF for Compound Extreme Events: Linking Together Winter Precipitation, Spring Flash Droughts, Summer Heatwaves, and Fall Wildfires at the Wildland-Urban Interface	NASA ROSES		Zhining Tao (MSU), Jainn J. Shi (MSU)
Carbon dynamics in the heart of North America: Comprehensive assessment of carbon cycling, ecosystem functioning and surface-atmosphere feedback mechanisms in the Northern Great Plains	NASA ROSES		K. Fred Huemmrich (UMBC)
Carbon dynamics in the Northern Great Plains	NASA ROSES	Petya Campbell (UMBC)	K. Fred Huemmrich (UMBC)
Characterizing the interplay of seismic and landslide activity in Central and Eastern Taiwan with novel InSAR processing and observation methods	NASA ROSES	Stacey Huang (UMBC)	MinJeong Jo (UMBC)
Conflict and Catastrophe: Navigating Landslide and Flashflood Risks in Cox's Bazar, Bangladesh	NASA ROSES		Nishan Biswas (UMBC)
DSCOVR and TEMPO characterization of Ozone diurnal cycles and comparison with atmospheric reanalyses	NASA ROSES	Alfonso Delgado-Bonal (UMBC)	
Earth Observations, Machine Learning, and Smartphone-based Dissemination for Nationwide High-Resolution Cholera Surveillance and Forecasting in Bangladesh (High-Burden Countries)	NASA ROSES		Nishan Biswas (UMBC)
Enabling observation driven hourly smoke emission, plume	NASA ROSES	Dongchul Kim (UMBC)	Zhining Tao (MSU)

injection height parameterization, and strong dust simulation for NU-WRF aerosol capability over North America			
Enhancing global landslide research with citizen science	NASA ROSES	Thomas Stanley (UMBC)	Pukar Amatya (UMBC), Robert Emberson (UMBC)
Enhancing Rainfall-Induced Landslide Forecasting by Integrating NASA's LHASA 2.0 Model with Physics-based Machine Learning and Commercial Satellite Data	NASA ROSES		Thomas Stanley (UMBC)
Exploring the Dominant Biomes and Broadband Colors of Earth Twins as a Function of Spin-Orbit Configuration	NASA ROSES		Michael Himes (MSU)
Eyes on ecosystem demography and post-disturbance forest recovery using OCO (XCO ₂ , SIF) with support from ISS sensors	NASA ROSES		Zhining Tao (MSU)
Great frigatebirds as a novel inclusion to planetary boundary layer assimilation efforts	NASA ROSES		Eun-Gyeong Yang (UMBC)
High Spatial and Temporal Resolution Biomass Burning Emission Estimates: Integrating LEO and GEO Observations into QFED	NASA ROSES	Meng Zhou (UMBC)	
High-Resolution Monitoring and Modeling of Coastal Wetland Dynamics for Restoration and Resilience Using Planet and WorldView Satellites	NASA ROSES		Anthony Campbell (UMBC)
High-Resolution Thermodynamic Structure from Multi-Angle Hyperspectral Microwave Observations	NASA ROSES		Mircea Grecu (MSU), Yuli Liu (UMBC)
Impact of Boundary Layer Observations on Subseasonal Prediction of PBL Height	NASA ROSES		Manisha Ganeshan (MSU)
Improving SMAP Radio Frequency Interference Detection and Geolocation and Consolidating SMAP Calibration	NASA ROSES		Priscilla Mohammed (MSU), Jinzheng Peng (MSU)

Integrating GEOS-CF, NU-WRF, TEMPO, and HAMAQ via Deep Learning for Superior Atmospheric Composition Data and Forecasting	NASA ROSES		Zhining Tao (MSU)
Integrating NASA Data and Model Capabilities to Enhance Agriculture Decision Support	NASA ROSES		Zhining Tao (MSU)
Integrating satellite and field data to characterize biodiversity changes across forest biomes	NASA ROSES	K. Fred Huemmrich (UMBC)	
Investigating diurnal variability of clouds and reflectances over ice regions measured by DSCOVR/EPIC	NASA ROSES	Alfonso Delgado-Bonal (UMBC)	
Investigation of Diurnal-to-Interannual Variations of PBL Height from Long-Term Multi-Constellation GNSS-RO	NASA ROSES		Manisha Ganeshan (MSU)
Investigation of Global Ionospheric E-region Electron Density Variabilities driven by Geomagnetic Activity	NASA ROSES	C.C. Jude H. Salinas (UMBC)	
Landslide impacts on lifelines to Cali, Colombia	NASA ROSES	Thomas Stanley (UMBC)	Pukar Amatya (UMBC)
Machine Learning-Ready Global F-Region Electron Density From GNSS-POD Limb Sounding	NASA ROSES		C.C. Jude H. Salinas (UMBC)
Marine stratocumulus clouds: a new polarized interband calibration target for upcoming multi-angle polarimeter missions	NASA ROSES	Brent McBride (UMBC)	
PACE data to characterize Process-based connections between landslides, soil erosion, siltation, and algal blooms	NASA ROSES	Robert Emberson (UMBC)	Pukar Amatya (UMBC)
Quantifying hyperlocal variations in traffic-related pollution: A citizen science approach from New York to Nairobi	NASA ROSES	Carl Malings (MSU)	Andrew Sayer (UMBC), Caterina Mogno (UMBC)
Quantifying Methane Sources by Developing an Inverse Capability of NU-WRF to Embrace Growing Satellite Observations	NASA ROSES	Zhining Tao (MSU)	Huisheng Bian (UMBC)

Quantifying the memory of snowfall and snowmelt pulse events in montane forests realized through terrestrial carbon, energy, and water cycle impacts at subseasonal to seasonal scales	NASA ROSES		K. Fred Huemmrich (UMBC)
Retrieving up-to-date DEM and monitoring surface deformation for volcanic unrest and eruptions using Umbra imagery	NASA ROSES	MinJeong Jo (UMBC)	Stacey Huang (UMBC)
ToxIDS: An Integrated Toxicological Infectious Disease Prediction System for Avian Influenza Risk	NASA ROSES		Amin Dezfuli (UMBC)
TRaining AI for a Disaster ResilIENT Caribbean (TRIDENT)	NASA ROSES	Arif Albayrak (UMBC)	Pukar Amatya (UMBC), Jackson Tan (UMBC)
Understanding the change of dust particle size during the long-range transport through integrating CALIPSO lidar and MODIS thermal infrared observations	NASA ROSES		Jianyu Zheng (UMBC), Huisheng Bian (UMBC)
Unveiling Solar Dynamics through Complexity Analysis of the Solar Dynamics Observatory Data	NASA ROSES	Alfonso Delgado-Bonal (UMBC)	
Using Blowing Snow as a Natural Tracer to Estimate Planetary Boundary Layer Height Over Polar Ice Caps: A Machine Learning Approach	NASA ROSES		Surendra Bhatta (MSU), Manisha Ganeshan (MSU)
Using Collocated Spaceborne and Airborne Radars, Lidars and Radiometers to Enable Weather-Scale Cloud-Convection-Precipitation (CCP) Study	NASA ROSES		Yuli Liu (UMBC)
Using satellite remote sensing data and atmospheric composition models to assess and enhance the utility of low-cost air quality sensors to national, state, local, and tribal air quality managers	NASA ROSES	Carl Malings (MSU)	Caterina Mogno (UMBC), Andrew Sayer (UMBC)
Utilizing Deep Learning to Enhance the Representation of	NASA ROSES		Mircea Grecu (MSU)

Atmospheric Processes and Uncertainty Quantification in Downscaling CMIP6 Projections			
Virtual Observatory for Advanced Aerosol Characterization	NASA ROSES		Yujie Wang (UMBC), Myungje Choi (UMBC), Sergey Korkin (UMBC), Michael Himes (MSU)
Assessment of the emission, distribution, and spatiotemporal variation of the Alaskan dust, a major high latitude dust source	NASA ROSES – ACPMAP	Dongchul Kim (MSU)	Seohui Park (MSU)
A New Observing Strategy for Extreme Air Pollution	NASA ROSES - AIST		Sean Foley (MSU)
AI-Driven Subsampling Techniques: Optimizing Thinning Strategies in Numerical Weather Prediction Models	NASA ROSES - AIST	Manisha Ganeshan (MSU)	Erica McGrath-Spangler (MSU), Nياما Boukachaba (MSU)
Building Machine Learning-based Cloud Retrieval Algorithm and Radiance Observation Operator in the GEOS and GEOS OSSE	NASA ROSES – AIST		Katherine Breen (MSU), Nikki Prive (MSU), Min-Jeong Kim (MSU)
INSPYRE Forecasting and Flight Planning and an Investigation of the Climate Impact of PyroCb Aerosols in the Upper Troposphere and Lower Stratosphere	NASA ROSES – INSPYRE		Ghassan Taha (MSU)
"Cloud Simulator" vs. "Cloud Translator" for MODIS-Compatible Cloud Representation	NASA ROSES – MAP	Daeho Jin (UMBC)	Dongmin Lee (MSU)
Antarctic Snowfall and Diamond Dust in MERRA-2: Enhancement with Machine Learning Models	NASA ROSES – MAP		Manisha Ganeshan (MSU), Surendra Bhatta (MSU)
Detection of marine debris using hyperangular polarimetry	NASA ROSES - OBB		Anin Puthukkudy (UMBC)
An improved treatment of parallax in PACE polarimeter retrievals: accounting for horizontal inhomogeneity in clouds and aerosols	NASA ROSES - PACE		Anin Puthukkudy (UMBC)

Use of the Enhanced AirHARP-2 suite for airborne validation of the PACE algorithms for aerosol, cloud, and surface properties	NASA ROSES - PACE		Anin Puthukkudy (UMBC)
Analysis of PACE data on variations in cloud droplet size and ice crystal orientation	NASA ROSES – PACE	Tamas Varnai (UMBC)	
Following Cloud-Bows over the Southern Ocean: Linking Marine Stratiform Cloud Droplet Collision-Coalescence Efficiency and Shortwave Radiative Effects using HARP2 and OCI Observations	NASA ROSES – PACE	Colten Peterson (UMBC)	Daniel Miller (UMBC), Brent McBride (UMBC)
Keeping PACE with Aerosol Atmospheric Rivers and their Impacts to Clouds and the Oceanic Carbon Cycle in the Southern Ocean	NASA ROSES – PACE		Brent McBride (UMBC), Pengwang Zhai (UMBC),
Terrestrial Ecosystem Dynamics from PACE	NASA ROSES – PACE	K. Fred Huemmrich (UMBC)	Petya Campbell (UMBC)
Investigating Antarctic Radiative Properties: Drivers of Spectral Reflectivity and Brightness Temperature Changes during the CALIPSO Era and Beyond	NASA ROSES - PMM		Manisha Ganeshan (MSU)
Analysis of CALIOP and ATLID observations to better understand oxygen absorption remote sensing	NASA ROSES – PMM		Tamas Varnai (UMBC)
Assessment of the regional and global impact of North American wildfire smoke using active and passive sensors and model,	NASA ROSES – PMM		Huisheng Bian (UMBC)
Enhancing soil erosion risk assessments with SMAP soil moisture	NASA ROSES - SMAP	Robert Emberson (UMBC)	
Assessment of TEMPO NO ₂ and HCHO retrieval with integration of aerosol observation	NASA ROSES - TEMPO	Mijin Kim (MSU)	
Estimation of Ground-level PM _{2.5} from the Synergy of TEMPO and GOES-ABI Observations through Machine Learning	NASA ROSES – TEMPO		Hiren Jethva (MSU)

Satellite-based Continuous Emissions Monitoring System (Sat-CEMS): Space monitoring of NO _x and CO ₂ from power plants near cities using TEMPO, OCO-2/3, and Machine Learning	NASA ROSES – TEMPO	Doyeon Ahn (MSU)	Daniel Anderson (UMBC), Zhining Tao (MSU)
Observations and Analysis of Water Vapor and Ozone, Essential Tracers of PyroCb-induced Perturbations to UTLS Composition	NASA ROSES - EVS-4		Jason St. Clair (UMBC)
Earth system pathways to extreme events in observations and GEOS sub-seasonal and seasonal forecasts: A multi-scale machine learning approach	NASA ROSES MAP		Young-Kwon Lim (UMBC)
QBO modulation of the MJO in the next generation of GEOS earth system models	NASA ROSES MAP		Young-Kwon Lim (UMBC)
Assessing the Environmental Impact of AI in Cardiovascular Conditions: A Path Toward More Sustainable Healthcare	NIH		Amin Dezfuli (UMBC)
Source Attribution of U.S. Urban Formaldehyde Exposure	NOAA AC4	Jason St. Clair (UMBC)	
Using NOAA Aircraft Data to Improve Space-based CO ₂ and NO _x Emissions Monitoring for Urban Planners	NOAA AC4	Doyeon Ahn (MSU)	
Assessing impacts of emission and meteorological conditions on urban surface ozone variations: A machine learning approach to daytime and nighttime sensitivity	NOAA CPO	Junhua Liu (MSU)	Zhining Tao (MSU), Daniel Anderson (UMBC)
Collaborative Research: Constraining Greenland Glacier Dynamics using 1940s Historical Aerial Photography	NSF Arctic Natural Sciences		Liz Ultee (MSU)
The WAVE: Water AVailability reanalysis and scenario Exploration to map natural and anthropogenic impacts on future global freshwater cycle	Schmidt Future	Fadji Maina (UMBC)	
Accelerating HARP2 Aerosol and Surface Property Retrieval with Machine Learning-Driven Radiative Transfer	UMBC START	Anin Puthukkudy (UMBC)	

START Funding to Stop the Loss of the Art of Radiative Transfer Simulation	UMBC START	Sergey Korkin (UMBC)	Andrew Sayer (UMBC)
Anticipating the Unprecedented: Climate-Driven Disease Modelling and Anticipatory Action for Community-Led Outbreak Prevention in a Changing Climate	Welcome Trust, Climate Impacts Awards		Assaf Anyamba (UMBC)

ACRONYMS

ACCDAM	Atmospheric Composition Campaign Data Analysis and Modeling
ACCLIP	Asian Summer Monsoon Chemical & CLimate Impact Project
ADDA	Amsterdam Discrete Dipole Approximation
ATBD	Algorithm Theoretical Basis Document
AEROMMA	Atmospheric Emissions and Reactions Observed from Megacities to Marine Areas
AERONET	Aerosol Robotic Network
AI	Artificial Intelligence
AIRS	Atmospheric Infrared Sounder
AK FirE-SAFE	Alaska Fire Event Situational Awareness From Earth Observations
AOD	Aerosol Optical Depth
AOS	Atmospheric Observing System
APARC	Atmospheric Processes And their Role in Climate
ARCSIX	Arctic Radiation-Cloud-Aerosol-Surface Interaction Experiment
Arctic COLORS	Arctic-COastal Land Ocean interaction
ASIA-AQ	Asian Air Quality
ASIC	Application Specific Integrated Circuit
A-RIP	Reanalysis Intercomparison Project
ATBD	Algorithm Theoretical Basis Document
AVDC	Aura Validation Data Center
AVIRIS	Airborne Visible/Infrared Imaging Spectrometer
AVIRIS-NG	Airborne Visible/Infrared Imaging Spectrometer Next Generation
BioSCape	Biodiversity Survey of the Cape
BLUEFLUX	Blue Carbon Prototype Products for Mangrove Methane and Carbon Dioxide Fluxes
BOEM	Bureau of Ocean Energy Management
CAMEL	Combined ASTER and MODIS Emissivity database over Land
CAMP2Ex	Cloud, Aerosol and Monsoon Processes Philippines Experiment
CASA / MiCASA	Carnegie-Ames-Stanford Approach (CASA) / Más informada CASA (MiCASA)
CASALS	Concurrent Artificially-intelligent Spectrometry and Adaptive Lidar System
CBS-FVCOM	Coastal Beaufort Sea Finite Volume Community Ocean Model
CCM	Chemistry-Climate Model
CCS	Carbon Cycle Science project
CESAS	Committee on Earth Science and Applications from Space
CHIRP	Climate Hyperspectral Infrared Radiance Product
CMIS	Compact Midwave Imaging System
CoDAS	Constituent Data Assimilation
CORRA	COmbined Radar-Radiometer Algorithm
COSMIC-2 RO	Constellation Observing System for Meteorology Ionosphere and Climate-2 Radio Occultation
COWVR	Compact Ocean Wind Vector Radiometer
CrIS	Cross Track Infrared Sounder

CRTM	Community Radiative Transfer Model
CSDA	Commercial Smallsat Data Acquisition
CSS-DESIS	Commercial Small Sat DESIS evaluation
CyAN	Cyanobacteria Assessment Network
DA	Data Assimilation
DCOTSS	Dynamics and Chemistry of the Summer Stratosphere
DEEP-VIEW	Deep learning for Environmental and Ecological Prediction-eValuation and Insight with Ensembles of Water quality
DESIS	DLR Earth Sensing Imaging Spectrometer
DRCS	Disaster Response Coordination System
DSCOVr	Deep Space Climate Observatory
DT	Dark Target
DUSA	Dust Source Attribution
EarthCARE	Earth Cloud Aerosol and Radiation Explorer satellite mission
ECCOH	Efficient CH ₄ -CO-OH chemistry module
ECS	Equilibrium Climate Sensitivity
EIS	Earth Information System
EMIT	NASA Earth surface Mineral dust source InvesTigation
EPE	Extreme Precipitation Events
EPIC	Earth Polychromatic Imaging Camera
E-PROBED	E-region Prompt Radio Occultation Based Electron Density model
ESTO	Earth Science and Technology Office
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EXRAD	ER-2 X-band Doppler Radar
FG-AI4NDIM	Focus Group on AI for Natural Disaster Management
FILDA	Fire Light Detection Algorithm
FloX	Fluorescence box
FLUID	Framework for Live User-Invoked Data
G7 FSOI	G7 Future of the Seas and Oceans Initiative
GAFIS	Global Air Quality Forecasting and Information System
GEE	Google Earth Engine
GEOBON	Group on Earth Observation Biodiversity Observation Networks
GEOS	Goddard Earth Observing System
GEOS-ADAS	Global Earth Observing System-Atmospheric Data Assimilation System
GEOS-LDAS	Global Earth Observing System-Land Modeling and Data Assimilation System
GEOS-CF	GEOS Composition Forecast system
GEOS-FP	GEOS Forward Processing system
Geo-XO	Geostationary Extended Observations Program
GES DISC	Goddard Earth Science Data and Information Services Center
GFDL SPEAR	Geophysical Fluid Dynamics Laboratory's Seamless system for Prediction and Earth system Research
GHGC	Greenhouse Gas Center
GHRC	Global Hydrometeorology Resource Center
GIS	Geographic Information Systems
GLIMR	Geosynchronous Littoral Imaging and Monitoring Radiometer
GLOWS	Global L-Band Active/Passive Observatory for Water Cycle Studies
GNSS-RO	Global Navigation Satellite System Radio Occultation
GOCART	Goddard Chemistry Aerosol Radiation and Transport

GOCART-2G	Goddard Chemistry Aerosol Radiation and Transport 2 nd generation
GOTHAAM	Greater New York Oxidant Trace gas Halogen and Aerosol Airborne Mission
GPM	Global Precipitation Measuring
HARP2	Hyper-Angular Rainbow Polarimeter-2
HIPP	Hyper-angle Image Processing Pipeline
HMA	High Mountain Asia
HyMPI	Hyperspectral Microwave Instrument
HyperCP	HyperInSPACE community processor
IAGOS	In-service Aircraft for a Global Observing System
IASI	Infrared Atmospheric Sounding Interferometer
ICESat-2	Ice, Cloud, and land Elevation Satellite 2
ICIMOD	International Centre for Integrated Mountain Development (Nepal)
IGC	International GEOS-Chem
ILEOS	Intelligent Long Endurance Observing System
ILRS	International Laser Ranging Service
IMERG	Integrated Multi-Satellite Retrievals for GPM
IMPACTS	Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms
ISCCP	International Satellite Cloud Climatology Project
ISS	International Space Station
ITRF	International Terrestrial Reference Frame
JCSDA	Joint Center for Satellite Data Assimilation
JEDI	Joint Effort in Data Integration
KMG	Kinetics Generating Software
LADAS	Land-Atmosphere Data Assimilation System
LARES-2	Laser Relativity Satellite 2
LHASA	Landslide Hazard Assessment for Situational Awareness
LIS	Lightning Imaging Sensor
LST	Land Surface Temperature
MAIAC	Multi-Angle Implementation of Atmospheric Correction
MAP	Modeling, Analysis, and Prediction
MAP	Multi-Angular polarimeter
MBARS	Microwave Barometric Radar and Sounder instrument
MC	Mid-latitude Cyclones
MCSSA	Monte Carlo code for Spherical Shell Atmosphere
MiCASA	Más informada CASA
MJO	Madden-Julian Oscillation (MJO) simulations
MIDAS	Method of Moments Integral-equation Decomposition for Arbitrarily-shaped Scatterers
MISATEAM	CTM-Independent SATellite-derived Emission estimation Algorithm for Mixed-sources
MLS	Microwave Limb Sounder
MOBY	Marine Optical Buoy
MODIS	Moderate Resolution Imaging Spectroradiometer
MPA	Marine Protected Areas
NCCS	NASA Center for Climate Simulation
NDACC	Network for the Detection of Atmospheric Composition Change
NEON	National Ecological Observatory Network

NSF LSAMP	NSF Louis Stokes Alliances for Minority Participation program
NSIDC	National Snow and Ice Data Center
NOMAD	NASA bio-Optical Marine Algorithm Dataset
NURTURE	North American Upstream Feature-Resolving and Tropopause Uncertainty Reconnaissance Experiment
OBB	Ocean Biology and Biogeochemistry
OCI	Ocean Color Instrument
OCO-2	Orbiting Carbon Observatory 2
OMI	Ozone Monitoring Instrument
OMPS-NM	Ozone Mapping Profiler Suite – Nadir Mapper
OSE	Observing System Experiments
OSSEs	Observation System Simulation Experiments
PACE	Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission
PACE-PAX	Plankton, Aerosol, Cloud, ocean Ecosystem Post-launch Airborne eXperiment
PARSIVEL	Particle Size Velocity
PBLH	Planetary Boundary Layer Height
PCC	Phytoplankton Community Composition
PICS	Pseudo-Invariant Calibration Sites
PIERS+	Platforms for In-situ Estimation of Rainfall Systems
PIP	Particle Imaging Package
PL	Polar Lows
PLUG	PACE Land Users Group
PMCs	Polar Mesospheric Clouds
PyTOAST	Python Top of Atmosphere Simulation Tool
QBO	Quasi-Biennial Oscillation
RoboHypo	Robotic Hyperspectral Polarimeter for the Ocean
ROZE	Rapid OZone Experiment
RRTMG	Rapid Radiative Transfer Model Global
SAFE	Structure and Function of Ecosystems
SALaD	Semi-automated Landslide Detection (SALaD) system
SARP-East	Student Airborne Research Program-East
SATAL	South American Tropopause Aerosol Layer
SCERIN	South Central and Eastern European Regional Information Network
SDC	Surface Deformation and Change mission
SeaBASS	SeaWiFS Bio-optical Archive and Storage System
SeaPRISM	Sea Photometer Revision for Incident Surface Measurements,
SLR	Sea-Level Rise
SMAP	Soil Moisture Active and Passive Mission
SMOS	Soil Moisture and Ocean Salinity
SNPP	Suomi National Polar-orbiting Partnership
SNWG	Satellite Needs Working Group
SSS	Sea Surface Salinity
SSEM PP	Station Systematic Error Model Pilot Project
S2S	Subseasonal to Seasonal (S2S) forecast model
SVC	System Vicarious Calibration
TC	Tropical Cyclones
TEMPO	Tropospheric Emissions: Monitoring of Pollution spectrometer
TIM	Total Irradiance Monitor

TOAR	Tropospheric Ozone Assessment Report
TOBAC	Tracking and Object-Based Analysis of Clouds
TRMM	Tropical Rainfall Measuring Mission
TROPICS	Time-Resolved Observation of Precipitation structure and storm Intensity with a Constellation of Smallsats mission
TROPOMI	TROPOspheric Monitoring Instrument (TROPOMI)
TSIS-1	Total and Spectral solar Irradiance Sensor
TTE	Tundra-Taiga Ecotone
UFO	Unified Forward Operator
WMO	World Meteorological Organization
WSF-M	Weather Satellite Follow-on-Microwave