FY23 ERB, AC4, CVP, Program Information Sheet: Applications of satellite data to aerosol research

Program Name

Earth's Radiation Budget (ERB) Program

Atmospheric Chemistry, Carbon Cycle and Climate (AC4) Program

Climate Variability & Predictability (CVP) Program

Program Missions

The ERB, AC4, and CVP programs sit within the Earth System Science and Modeling (ESSM) Division of the NOAA Office of Oceanic and Atmospheric Research (OAR) Climate Program Office (CPO; see http://cpo.noaa.gov).

At the direction of Congress in 2020, NOAA is leading a multi-year research initiative to investigate natural and human activities that might alter the reflectivity of the stratosphere and the marine boundary layer, and the potential impact of those activities on the Earth system. The ERB program is the competitive research arm of NOAA's ERB Initiative, which seeks to improve the understanding of aerosol impacts on Earth's energy balance through: establishing a capability to observe and monitor stratospheric conditions; detecting and accurately simulating the impacts of natural and human-caused aerosol injections in the stratosphere and troposphere; and deriving co-benefits for Earth system prediction through better understanding of aerosols and clouds.

AC4 is a competitive research program that incorporates research on atmospheric chemistry and the carbon cycle. In collaboration with the NOAA Laboratories and the academic community, the AC4 program supports research to determine the processes governing atmospheric concentrations of trace gases and aerosols in the context of the Earth System. The program aims to contribute a process-level understanding of the Earth System through observation, modeling, analysis, and field studies to support the development and improvement of models, and to inform carbon and air pollution management efforts.

CVP supports research that enhances our process-level understanding of the climate system through observation, modeling, analysis, and field studies. This vital knowledge is needed to improve climate models and predictions so that scientists and society can better anticipate the impacts of future climate variability and change. To achieve its mission, the CVP Program supports research carried out at NOAA and other federal laboratories, NOAA Cooperative Institutes, and academic institutions. The Program also coordinates its sponsored projects with major national and international scientific bodies including the World Climate Research Programme (WCRP), the International and U.S. Climate Variability and Predictability (CLIVAR/US CLIVAR) Program, and the U.S. Global Change Research Program (USGCRP).

Focus for FY23

Applications of satellite data in aerosol research

Funding for FY23

Expect to fund 3 to 5 proposals. Most proposals should budget for up to $250K per year over 2-3 years. Projects will start in FY23 or FY24, depending on the needs of the project and the availability of funding.

Competition Information

For several decades, aerosol optical depth (AOD) has been a useful but limiting measure of aerosol concentrations in the atmosphere, particularly in the troposphere. Meanwhile, some current and upcoming satellite missions are carrying increasingly useful instruments that could provide additional information about aerosols (e.g., speciated particulate matter (PM), deriving aerosol composition from single scattering albedo, particle size, etc.) and precursor trace gases, including TROPOMI (already in orbit), TEMPO, MAIA, PACE, and instruments on NOAA's Geostationary Extended Observations (GeoXO) satellite mission.[1]

As the application of satellite data to improve process understanding and modeling becomes more routine, the increasing number of instruments means more data will be available. This necessitates a comprehensive approach for using trace gas and aerosol data.

Satellite observations of atmospheric composition, including aerosols, are essential to fulfilling NOAA's numerous, long-standing legislative, executive, and international mandates for forecasting, monitoring and scientific research.[2] For example, changes to aerosols can impact solar and terrestrial radiative forcing (ERB focus area) and cloud formation and properties (CVP focus area), making atmospheric composition a key component of comprehensive coupled Earth System Models for weather and climate prediction. Atmospheric composition is fundamental to understanding changes in air quality, the stratospheric ozone layer, and climate, as well as their corresponding impacts on human health and natural and engineered ecosystems (AC4 focus area).

Improved capacity or understanding in how satellite observations resolve cloud and aerosol properties also responds to an observational need for solar radiation management,[3] which is one component of ERB's research as directed by Congress. The 2021 National Academies of Sciences, Engineering, and Medicine report, *Sunlight: Recommendations for Solar Geoengineering Research and Research Governance*, highlighted the value of satellite observations as an indispensable tool for characterizing the normal background concentrations

[1] https://www.nesdis.noaa.gov/next-generation/geostationary-extended-observations-geoxo

[2] Frost, et al. (2020). "A Value Assessment of an Atmospheric Composition Capability on the NOAA Next-Generation Geostationary and Extended Orbits (GEO-XO) Missions." NOAA Technical Report OAR CPO ; 8. https://doi.org/10.25923/1s4s-t405

[3] National Academies of Sciences, Engineering, and Medicine 2021. Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance. Washington, DC: The National Academies Press. https://doi.org/10.17226/25762.

and properties of key aerosols as well as potentially observing changes that may be induced by natural or anthropogenic injections.

In FY23, the ERB, AC4, and CVP programs, collaborating with NOAA's National Environmental Satellite, Data, and Information Service (NESDIS), invite proposals on satellite data applications focused on one or more of the following:

- Cloud-aerosol interactions,
- Composition and fate of wildfire smoke,
- Air quality forecasting,
- Earth's radiative budget,
- Health impact studies,
- Cloud processes,
- Other improvements of physics and chemistry in models used for weather prediction and climate projections.

Further, competitive proposals should consider the following as priority areas of interest for the programs:

- Building on previously funded NOAA efforts, including past research competitions, field campaigns, etc.
- Development of innovative aerosol satellite datasets, including aerosol speciation, aerosol layer height, etc.
- Model improvements, including development of observation operators (the link between components of the model state and observations)
- Targeted data analysis of existing aerosol datasets which contribute new understanding to one of the focus areas listed above.
- Satellite dataset validation with previously collected/funded data.

Proposals with NOAA collaborators, especially where satellite expertise could be entrained with NOAA models (e.g., AM4, WRF-Chem, HRRR-Smoke, RRFS-CMAQ, UFS-Aerosols), are encouraged but not required. Proposals may consider both stratospheric and tropospheric applications.

Proposals discussing both geostationary orbit (GEO) and low earth orbit (LEO) observing configurations will be considered.

Contact

For questions related to the competition, please contact the Competition Manager Victoria Breeze (victoria.breeze@noaa.gov)

Additional General Guidelines for Applicants

- Principal Investigators submitting a proposal in response to this Announcement are required to follow the Letters of Intent (LOI) and Proposal preparation and submission guidelines described in the Climate Program Office FY 2023 Federal Funding Opportunity announcement.
- Investigators are strongly encouraged to submit an LOI prior to developing and submitting a full proposal. LOIs should be emailed to victoria.breeze@noaa.gov.

Investigators will be notified by the Competition Manager as to whether a full proposal is encouraged based on the LOI within 30 days of the LOI due date.

- Administrative questions regarding the Federal Funding Opportunity (e.g. proposal formatting or submission guidelines) should be directed to Diane Brown (diane.brown@noaa.gov).

Data Archiving

Data Accessibility: The Climate Program Office requires that public access to grant/contract-produced data be enabled in the following way:

Funding recipients will establish their own data hosting capability (describe in proposal). Datasets or products that are intended to be sustained, beyond static archival, by NOAA after the duration of the award must include a plan for future maintenance and letters of support from the corresponding program, lab, or office in the supplemental materials.

Technical recommendations: There is no specific technical guidance; however, proposals are to describe their proposed approach. Use of open-standard formats and methods is encouraged.

Resources: Proposals are permitted to include the costs of data sharing or archiving in their budgets.

Datasets or products that are intended to be sustained, beyond static archival, by NOAA after the duration of the award must include a plan for future maintenance and letters of support from the corresponding program, lab, or office in the supplemental materials.