

FY25 ERB Program Information Sheet: Integrating Observations and Modeling for Process Understanding Relevant to Solar Radiation Modification Research

Program Name

Earth's Radiation Budget (ERB) Program

Program Missions

The ERB grants program is managed as part of 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 beginning in 2020, NOAA is leading a multi-year research program to investigate natural and human activities that might alter the reflectivity of the atmosphere, and the potential impact of those activities on the Earth system. The CPO ERB grants program is the competitive research arm of [NOAA's ERB Program](#), which seeks to improve the understanding of aerosol impacts on Earth's energy balance by: establishing a capability to observe and monitor stratospheric conditions; developing capabilities to detect and accurately simulate 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.

Focus for FY25

In FY 2025, the ERB Program is soliciting proposals focused on model-based research which incorporates observational constraints to improve the understanding and representation of chemical and physical processes in models that will provide a path toward more realistic simulations relevant to Solar Radiation Modification (SRM) research. SRM is a set of climate intervention strategies designed to reflect a fraction of incoming sunlight back into space in order to counter the warming effects of greenhouse gases and other climate pollutants.

Funding for FY25

Expect to fund 2 to 4 proposals. Most proposals should budget for approximately \$300K per year over 2-3 years. Projects will start in FY25, contingent on available funds.

Competition Information

Background:

The major gaps in our understanding of aerosol processes in the atmosphere relevant to activities that might alter the reflectivity and radiative balance of the atmosphere, including SRM

methods, form the basis for NOAA's current and future research priorities within the ERB Program.

Observations from ground-based, ship-based, airborne, and space-based platforms have made large contributions to Earth science over many decades and can be expected to contribute very significantly to SRM research going forward. A major focus of the ERB Program since its inception has been making observations to improve the understanding of the present state of the atmosphere that would be perturbed by SRM methods, to reduce uncertainties associated with aerosol and aerosol-cloud processes, and to inform model evaluation and improvement.

Climate or Earth System Models (ESMs) are useful tools to assess the climate response to SRM. However, current ESMs have limitations regarding their representation of key processes relevant to SRM approaches and the changes to atmospheric conditions, including the Earth's radiative budget. Global models capture large-scale circulations well but do not adequately represent the small-scale dynamical, microphysical, and chemical processes that control the formation and distribution of aerosols and cloud-aerosol interactions in the background or perturbed atmosphere ([National Academies, 2021](#)). Similarly, large-eddy simulation (LES) and cloud-resolving models are effective tools for evaluating processes, but they cannot represent the full range of scales necessary to understand global impacts ([Feingold et al., 2024](#)). Bridging these scales and filling the process knowledge gaps is important to fully understand and simulate natural and human activities that may alter the reflectivity and radiative balance of the atmosphere.

Motivated both by the emphasis on the “timely transfer of information from process and observations studies into climate and earth system models” put forth by the [2021 National Academies report on solar geoengineering](#), as well as from feedback from the [NOAA 2023 Earth's Radiation Budget Science Meeting](#), this competition is intended to promote interactions between the observational and modeling communities involved in ERB research. The focus of this competition is to facilitate the transfer of knowledge from observational and process-oriented research to model development across scales and with the common goal of improving the representation of the processes that underlie SRM.

Competition Information:

In FY 2025, the ERB Program is soliciting proposals focused on model-based research which incorporates observational constraints to provide a path toward more realistic simulations relevant to SRM research. The primary SRM approaches of interest to the ERB Program are stratospheric aerosol injection (SAI) and marine cloud brightening (MCB), although cirrus cloud thinning (CCT) and mixed-phase cloud thinning (MCT) proposals may also be considered. Proposals focused on natural analogs and related events relevant to SRM (e.g., wildfires, volcanic eruptions, ship tracks, and rocket emissions) will also be considered.

Proposers should ensure proposed modeling work adequately leverages observational data to constrain models, including the use of historical in-situ and remote-sensing observations from ground, aircraft, or other platforms as well as from satellite sensors. Proposers should demonstrate the availability and suitability of these data for the proposed research.

Key processes include, but are not limited to, dynamical processes such as transport and mixing, atmospheric chemistry, aerosol and cloud microphysics, aerosol indirect radiative effects, and subgrid-scale mixing.

Methods to integrate observations and models relevant to SRM research include but are not limited to:

- Simulations with observationally constrained models at global and smaller scales to provide process-specific information needed to interpret observations and to further understand the processes underlying SRM, its effectiveness, and its impacts;
- Use of observations to improve physical parameterizations of unresolved processes and/or to incorporate realistic causal links between processes;
- Evaluations of the trade-offs in computational resources and simulation accuracy between grid resolution and aerosol representation;
- Use of observations to develop direct and indirect constraints on models' sensitivity to aerosol perturbations and to apply those constraints to reduce the uncertainty of model projections;
- Combining measurements with model sensitivity studies around specific case studies.

Collaborative Opportunities with NOAA:

ERB encourages, but does not require, collaborations between the external community and NOAA centers, laboratories, cooperative institutes, programs, and affiliated projects that complement and accelerate NOAA research. Please explore the [ERB Program's website](#) for more information on current NOAA projects and potential collaborators.

Program Contact Information:

For questions related to the competition, please contact the Competition Managers Victoria Breeze (victoria.breeze@noaa.gov) and Gregory Frost (gregory.j.frost@noaa.gov).

Additional General Guidelines for Applicants

- *Letter of Intent (LOI)*: Investigators are strongly encouraged to submit an LOI prior to developing and submitting a full proposal. LOIs should be [submitted directly through this Google Form](#). ERB will only accept and review LOIs submitted through this form. In the event that investigators need to submit an LOI after the date specified in the NOFO, please contact the Competition Managers directly for guidance.
- *Webinar*: A webinar will be offered to potential applicants soon after publication of this announcement. For information on webinar timing and registration procedures please check the CPO FY25 NOFO Announcement.

Data Management Guidance

The Responsible NOAA Official for questions regarding this guidance and for verifying accessibility of data produced by funding recipients: Victoria Breeze
victoria.breeze@noaa.gov

The ERB Program requires that all products and deliverables produced via this solicitation reside in the open access / open source domain, freely available to the public. Public access to grant/contract-produced data will be enabled in one of the following ways (select one):

- Funding recipients are planning to submit data to NOAA National Centers for Environmental Information (NCEI), which will provide public access and archiving. Point of Contact for NCEI is Nancy Ritchey (Nancy.Ritchey@noaa.gov)
- Data are to be submitted to an International Council for Science (ICSU) World Data System facility: <https://www.icsu-wds.org/community/membership/regular-members>)
- An existing publicly accessible online data server at the funded institution is to be used to host these data (describe in proposal).
- An existing publicly accessible online “cloud” service is to be used to host the data (describe in the proposal).
- Data are to be submitted to a public data repository appropriate to this scientific domain (describe in proposal).
- Proposal may request permission not to make data publicly accessible (proposal to explain rationale for lack of public access, and if funded approval to be obtained from Responsible NOAA Official listed above).

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 and/or archiving in their budgets within solicitation specified proposal cost limit. Proposed methods and approaches should use reasonable means to minimize data management costs.