Earth System Science Scope

Compelled by our planet's rapid change, the Earth Science Division (ESD) is exploring and innovating to understand the Earth system, make new discoveries, and enable solutions for the benefit of all (e.g. Earth Science to Action Strategy). ESD's investments in technology, global observation data, groundbreaking foundational science and applications deliver trusted actionable Earth science data that support the US economy, national security through valuable information and tools, decision-making that affects human health, and improve the nation's ability to forecast and respond to natural hazards and improve quality of life.

For Earth Science, this NOFO requests proposals that focus on innovative uses of recently launched Earth Science missions. Proposals must demonstrate the relevance of the research activities to support one or more of the ESD Programs as described in ROSES-2025 A.1 Earth Science Research Overview, as well as the Earth System Science Research Program website for additional details. Earth Science welcomes research supporting state and local preparedness. Proposals must include the following two requirements:

Requirement A: Use of ESD Missions – SWOT, TEMPO, PACE, and NISAR

Proposals must incorporate observations from Surface Water Ocean Topography (SWOT), Tropospheric Emissions: Monitoring of POllution (TEMPO), Plankton, Aerosol, Cloud, ocean Ecosystem (PACE), and/or NASA-ISRO Synthetic Aperture Radar (NISAR) (listed in order of launch date; note there is no specific mission priority in this solicitation) to address science questions related to the Earth system. Proposals must justify how the proposed work will significantly advance foundational knowledge of our home planet using the innovative capabilities of the mission(s), particularly by better quantifying change in processes and/or constituents across scales.

Proposers should leverage products and algorithms previously developed by science teams for the mission(s) previously listed to ensure proposed investigations are unique and build on the existing capabilities of the sensor(s). The proposed science should advance state of the art approaches and should include a brief description of risk mitigation to the approach. Only minor (not to exceed 20% of the total budget) and well justified laboratory and/or field data collection to support specific science questions will be considered. It is recommended that proposers place emphasis on addressing science gaps rather than the development of new products, although developing new products is permissible so long as it is novel, while enabling the team to answer their stated science questions.

It is strongly suggested that proposers review the mission home pages, listed below in alphabetical order.

- NISAR: https://science.nasa.gov/mission/nisar/
- PACE: https://pace.gsfc.nasa.gov/

- SWOT: https://swot.jpl.nasa.gov/mission/overview/
- TEMPO: https://tempo.si.edu/

Proposals submitted in response to this program element will be expected to characterize uncertainties and quantify errors associated with data, analytical approaches, model results, and scientific interpretations, and must do so within the body of the proposal; a description in the Open Science and Data Management Plan should include how proposers will be reported with the data and products to be shared and archived.

Proposals that incorporate non-NASA data, including international satellite data, commercial satellite data, and social science data are also welcome but the **main source must be NASA data from the missions mentioned above.** Proposals may also utilize data acquired via NASA's Commercial SmallSat Data Acquisition (CSDA) Program (available at no cost to U.S. Government-funded researchers). Any data proposed to be analyzed from any source, including NASA and other satellite data, ancillary data, and data from commercial sources, must be publicly available, in the sense that these data are openly accessible. Proposals should reflect the principles of Open Science as described on the Earthdata website.

Proposals planning to request High-End Computing (HEC) should follow the HEC Program guidance. The HEC program provides a specialized computational infrastructure to support NASA's research community. Any need for HEC resources must be justified by completing a request for resources for inclusion with the proposal. The PI completes and submits a request in the HEC Request Management System (RMS) at https://request.hec.nasa.gov/. The purpose of this step is to inform reviewers at NASA of your computational needs, and if the proposal is selected, establish eligibility to use HEC resources. The form includes a written justification of how the computational resources would support the investigation as well as a multi-year resource-phasing plan, in annual increments, identifying the computing time and data storage requirements covering the duration of the proposed award period. If your proposal is selected for funding, your HEC request will be evaluated by the SMD's HEC Allocation Authority. SMD allocates quarterly in October, January, April and July. Out of cycle allocation requests are handled on a case-by-case basis. The HEC program will then issue letters identifying yearly allocations of HEC resources for the duration of the project, which again, may differ from your request due to limited availability of resources. However, PIs may submit requests to increase or decrease allocations of HEC resources if there are unexpected changes to computational needs.

Requirement B: Collaboration with ESD ECR FIES2A

ESD is committed to enabling early engagement to cultivate a variety of Earth science communities and to support workforce development. The ESD Early Career Research Program (ECR) creates opportunities to advance the development and

implementation of the Earth Science to Action Strategy. ECR is striving for excellence in Earth science by supporting outstanding and innovative scientific research, enabling greater participation through scientific leadership, fostering a sense of community through sustained relationships, and making Earth science data more usable and impactful for all. One of several ECR opportunities includes the First Immersion in Earth Science to Action (FIES2A). FIES2A provides an opportunity for young Earth science-interested students, including community college and early undergraduate students to get immersed in a workforce development experience to conduct Earth science research. By providing this first immersion, ECR is exposing students to NASA Earth science information, data, and resources highlighting these as national assets and contributing to train the future workforce.

Proposers must host and allocate funds for 3 students over each summer to be part of a FIES2A Summer Cohort (each summer for the duration of the grant). Proposers must work in collaboration with ECR for planning and logistics. Proposals must include a summer project plan, which includes the feasibility of the proposed research, alignment with requirement A of this solicitation, an appropriate scope for undergraduate capabilities and mentorship responsibilities, and a timeline reasonability (10-week interns with additional time for mentor planning).

FIES2A/EPSCoR Requirements:

- Students research projects must be aligned with proposed research in requirement A.
- Institution must allocate a stipend of $8,200 per student per summer in the budget, a computer (if applicable), and physical space (lab or office).
- Institution should follow OSTEM intern eligibility and selection criteria.
- Institution should assign a mentor to guide and oversee the 3 students over the summer and be the liaison between the institution and ECR.
- ECR will assign a NASA FIES2A Mentor to provide additional scientific and technical support from the appropriate ESD mission/sphere.
- FIES2A Summer Cohort dates vary per year. Here is an estimated timeline for 2027 (Start June 7 and end August 6). Additional dates:
  - ECR FIES2A Team Meeting: ~Early December
  - Student selection by: ~Early May
  - Final FIES2A Cohort Presentations: August 6