A.50 CITIZEN SCIENCE FOR EARTH SYSTEMS PROGRAM

NOTICE: This program requires submission of an NOI, see Section 3.

Proposals submitted to this program will be evaluated using a dual-anonymous review process. Proposals must be prepared according to the guidelines in Section 4 and in the associated "Guidelines for Anonymous Proposals" document under "Other Documents" on the NSPIRES page for this program element.

1. Scope of the Program

1.1 Overview

The primary goal of the Citizen Science for Earth Systems Program (CSESP) is to develop and implement capabilities to augment and enhance NASA scientific data and capacity through voluntary observations, interpretations, or other direct participation by members of the general public to advance understanding of the Earth as a system. The program complements NASA's capability of observing Earth globally from space, air, land, and water by engaging the public in NASA's strategic goals in Earth Science (see https://science.nasa.gov/about-us/science-strategy).

The program aims to advance the use of citizen science in scientific research about Earth by directly supporting citizen science activities, as well as by deploying technology to further citizen science research. This program element is a follow on to the 2020 CSESP ROSES Program element and for which the funded projects are described on the Citizen Science for Earth Systems Program page. While much of the focus of the original program element has remained, the solicitation has been simplified into a request for full projects of up to three years with annual budget limits. There is no longer a prototype phase or separate proposal types.

For the purpose of this program element, citizen science is defined as efforts or projects that use voluntary public participation in the scientific endeavor, including – but not limited to – formulating research questions, conducting experiments, collecting and analyzing data collected by citizen and/or professional scientists, interpreting results, making new discoveries, and/or developing or deploying technologies and applications. Crowdsourcing, another frequently used term describing voluntary contributions, is included under citizen science in this program element.

This program element directly supports NASA's response to Section 402 of the *American Innovation and Competitiveness Act* of 2017, which encourages and grants authority for citizen science activities and enumerates the benefits including: "accelerating scientific research, increasing cost effectiveness to maximize the return on taxpayer dollars, addressing societal needs, providing hands-on learning in STEM, and connecting members of the public directly to Federal science agency missions and to each other".

1.2 Scientific Focus

The Citizen Science for Earth Systems Program is using this program element to promote the use of citizen science, crowdsourcing, and the data they generate in concert with NASA Earth observation data and applications to dramatically advance

Earth science. Citizen scientist projects can have a high impact by significantly extending the scope and quality of satellite-based observations to answer important scientific questions that cannot otherwise be addressed. For example, massive field-based training data sets gathered by citizen scientists can increase the level of effective resolution in model-based predictions produced by certain remote sensing applications such that the resulting dataset can be used to answer new and important questions that could not previously be resolved. See further details on NASA's Earth Science data at https://earthdata.nasa.gov/ and NASA's Earth observing satellites at https://eospso.nasa.gov/content/all-missions/. Projects that significantly enhance the quality and/or quantity, or spatial extent, of gathered citizen science data by applying new or previously unexploited technologies that directly enhance the data accession capabilities of Citizen Scientists are very welcome.

1.3 Award Type, Duration and Budget

NASA anticipates making awards for up to three years. Funded projects will have budgets of no more than $300,000 per year, including indirect costs.

2. Proposal requirements

NASA will support development of new research projects or significant enhancement or major refocusing of existing projects that use citizen science to advance scientific understanding of the Earth system. Projects must use citizen science or crowdsourcing platforms or techniques to advance our scientific knowledge of the Earth system and to complement the research currently conducted using NASA's Earth-observing systems.

Proposals must include the collection of new data, although integration and/or enhancement of existing citizen science data (especially from other NASA funded work) may or may not be a significant part of the proposed work. Projects leveraging the capabilities or data of the Global Learning and Observations to Benefit the Environment (GLOBE) Program [www.globe.gov] are welcome. Projects may include crowdsourced observations using instrumentation with established specifications, analysis of citizen science data or joint analysis by incorporating NASA satellite-based data products, or development of user interface applications, algorithms, and websites to increase the efficiency and accuracy of crowdsourced data.

Projects should aim to address real-world problems at the local, regional, continental, or global scales; to complement NASA observation systems by increasing temporal or spatial sampling; to contribute to the validation of NASA data products derived from satellite observations; to dramatically enhance the quality and quantity of data collected by individual NASA-focused citizen scientists; to achieve a combination of the above; or to implement other innovative methods to enhance the utility of NASA's observation systems from space, air, land, and water.

Areas of investigation can include any of the Earth Science focus areas: Atmospheric Composition, Weather and Atmospheric Dynamics, Climate Variability and Change, Water and Energy Cycle, Carbon Cycle and Ecosystems, or Earth Surface and Interior.

All proposals must demonstrate clear linkages between citizen science and NASA observation systems to advance NASA's Earth science.. Clear linkage may be demonstrated by documented inclusion in the mission calibration and/or validation

activities, demonstrated extension of Earth observing mission (or mission data) capabilities/resolution/predictiveness, or other compelling substantiation that the project goes well beyond simply using NASA earth observing data in visualizations or simple correlations. Simply stating that a project *could* be used to enhance or extend an earth observing system is not sufficient. Projects that demonstrate value in adding or enhancing crowdsourcing in scientific workflows are encouraged. Calibration and validation, augmentation, or enhancement to significantly increase the quality, resolution, scope, or extent of remotely sensed data are all possible focal areas. Combination of remotely sensed data with other data sources in concert with a citizen science effort to dramatically advance an area of Earth science is also welcome.

Proposals must address all aspects of recruitment and retention of citizen scientists, as well as commit to open sharing of the data collected through NASA-approved data and information systems throughout the project. Data acquisition and retention should follow best practices for assurance of data quality (see the recommendations and standards outlined in the *NASA ESDS Citizen Science Data Working Group White Paper*).

3. Proposal Preparation and Submission

3.1 Required Notice of Intent

A Notice of Intent (NOI) is required for all submissions to facilitate the early recruitment of a conflict-free review panel. Proposals that are not preceded by an NOI will be returned without review.

3.2 Program Specific Questions

Accompanying the proposal cover page will be a "Program-specific Questionnaire," where the proposer must specify the type of proposal being submitted, the scientific focus, and the relevant current or future NASA Earth-observing satellite(s). All proposals will go through Dual-Anonymous Peer Review and must adhere to the requirements described below.

3.3 Open Science and Data Management Plan

All proposals must provide an anonymized "Open Science and Data Management Plan" (OSDMP) of up to two pages in length, immediately following the references and citations for the Science/Technical/Management section of the proposal. The OSDMP must address how publications, data, and software will be made available, see Section 1.1 of A.1 Earth Science Research Program Overview, the ROSES Open Science and Data Management Plan FAQ and the SMD Open-Source Science Guidance at http://science.nasa.gov/oss-guidance. A template for the OSDMP may be found at https://www.earthdata.nasa.gov/engage/data-management-guidance#osdmp. The OSDMP does not count against the page limit for the S/T/M section and the sufficiency of the "Open Science and Data Management Plan" will be assessed as part of the evaluation of Merit.

All data and information acquired and data products produced as part of the solicited research must be made publicly available, with no period of exclusive use, in compliance with the NASA Earth Science Data Policy.

All resulting software resulting from projects funded through this opportunity, along with source code, must be released as open-source software.

All data resulting from funded projects will be open-source and made openly available in a NASA approved repository.

3.4 Citizen Science Policy Requirements

All proposals must be responsive to the Science Mission Directorate Policy on Citizen Science, which specifies a sunset plan. All proposals must include funding for participation by a team member in The Citizen Science for Earth Science Data Working Group including time for regular teleconferences and other participation. This resource estimate should include travel and time for at least one face-to-face meeting per year.

Proposals must describe a strategy for monitoring data quality and consistency throughout the lifetime of the project. Proposals must commit to the use of open-source formats and metadata standards to increase interoperability with other Earth observation data. See: *NASA ESDS Citizen Science Data Working Group White Paper* by the NASA Citizen Science Data Working group (CSDWG) as well as NASA recommended standards (https://earthdata.nasa.gov/user-resources/standards-and-references).

4. Instructions for Dual-Anonymous Peer Review Proposals

Proposals submitted to this program will be evaluated using a dual-anonymous peer review (DAPR) process in which not only are proposers unaware of the identity of the reviewers, the reviewers are not told the identity of the proposers until after the evaluation of the anonymized proposal (see below). The objective of dual-anonymous peer review is to minimize bias in the evaluation of the merit of a proposal.

Proposers must follow the instructions in the "Guidelines for Anonymous Proposals" document under "Other Documents" on the NSPIRES page for this program element that explains how to properly prepare the proposal for dual-anonymous peer review.

The forms filled out on the NSPIRES web pages with Proposal Summary, Budget, Proposal Team and Program Specific and Business Data known as the NSPIRES "cover pages" will be partly hidden for the peer reviewers. The Proposal Summary must be anonymized but all other sections of the NSPIRES cover page should be completed as normal and NSPIRES will hide the identifying information from the reviewers. The proposal document must be anonymized, and proposers must upload a separate "Expertise and Resources Not Anonymized" document, that contains all of the personally (and organizational) identifying information.

Review panels will evaluate the anonymized proposals without taking into account the qualifications and capabilities of the proposers. After the evaluation of the anonymized proposal has been finalized for all proposals, panelists will be provided with the "Expertise and Resources Not Anonymized" documents, typically for a subset of proposals that scored highly (depending on the grades and projected selection rates). The panel will then assess the qualifications and capabilities of the team for these proposals and provide comments to NASA.

A summary of the key requirements for anonymized proposals, reproduced from the "Guidelines for Anonymous Proposals" document, is listed below:

Item	Requirement
Proposal Document PDF file	In addition to anonymizing the content, ensure that any PDF bookmarks are anonymous, and the document properties do not reveal names of author or organization.
Science-Technical-Management (S/T/M) section of proposal	The S/T/M section must be anonymized. Omit all names of team members and names of their organizations.
References	References must be in the [1], [2] format.
Open Science and Data Management Plan	The Open Science and Data Management Plan must be anonymized. Two pages are allotted for the Plan. See Section 3.3 above.
Biographical Sketches	Do not include in main proposal document. Include in separate "Expertise and Resources Not Anonymized" document.
Table of Personnel and Work Effort	Include in an anonymized fashion (e.g., PI; Co-I#1; Co-I#2) in the main proposal document and in non-anonymized fashion in the separate "Expertise and Resources Not Anonymized" document.
Current and Pending Support	Do not include in main proposal document. Include in separate "Expertise and Resources Not Anonymized" document.
Letters or Statements	All Statements of Commitment and Letters of Support, Feasibility or Endorsement are to be included in the separate "Expertise and Resources Not Anonymized" document.
Redacted Budget and Narrative	Include both redacted budget and narrative in proposal document in an anonymized format. Redacted budgets must not include institutional logos or insignia.
Facilities and Equipment	The Facilities and Equipment Section is to be placed only in the separate "Expertise and Resources Not Anonymized" document. However, the S/T/M Section of the anonymized proposal should address the need for and capabilities of facilities and equipment necessary for the proposed research in an anonymized fashion. Any unique/identifying descriptions of facilities and evidence of access to or affiliation with facilities are to be included in the separate "Expertise and Resources Not Anonymized" document.
Separate "Expertise and Resources Not Anonymized" document	Upload as a separate document in NSPIRES. Choose Attachment Type = "Expertise and Resources Not Anonymized". This document provides a list of all team members, their roles, institutional affiliations, expertise, and contributions to the work. The document should also discuss any specific resources, including facilities and equipment, that are key to completing the proposed work, as well as a summary of work effort. Statements of Current and Pending Support must

	also be included. Any formal relationship with the sponsoring agency's mission shall be described in this section. Membership in ongoing mission science teams that may overlap with the proposed research shall be described in this section. Letters of support, e.g., from facilities or archives, must be included in this section.
Total Budget	Upload as a separate document in NSPIRES. Choose Attachment Type = Total Budget. The mandatory total budget file is full and complete with all costs for those at U.S. organizations, including those at government laboratories. It is not redacted or anonymized.
High-End Computing request	Submit optional not-anonymized PDF HEC form as attachment type "Optional HEC request" in NSPIRES. The S/T/M section in the main proposal must state that a HEC request is included and must provide an outline of the computing resources required in an anonymized fashion.

5. Proposal Evaluation Criteria

Proposals will be evaluated vs. the three standard criteria: intrinsic merit, relevance, and cost reasonableness as defined in the *NASA Proposer's Guide*. The general information provided in Section VI of *ROSES-2024 Summary of Solicitation* about the proposal review and selection process applies to this program element. Additionally, the direct connection between NASA Earth observation systems and citizen science, as well as responsiveness to the proposal requirements (e.g., described in Section 2 of this program element) will be used in the assessment of relevance.

6. Summary of Key Information

Expected total program budget for new awards	~$2M per year total.
Number of new awards pending adequate proposals of merit	~6-10 proposals will be selected. Each will be funded for up to 3 years.
Maximum duration of awards	3 yrs
Due date for mandatory Notice of Intent to propose (NOI)	See Tables 2 and 3 of this ROSES NRA
Due date for Proposals	See Tables 2 and 3 of this ROSES NRA
Planning date for start of investigation	6 months after proposal due date
Page limit for the central Science-Technical-Management section of proposal	15 pp; see also Table 1 of ROSES-2024.
Relevance	This program is relevant to the Earth Science questions and goals in the NASA Science Plan. Proposals that are relevant to this program are, by definition, relevant to NASA.
General information and overview of this solicitation	See the *ROSES-2024 Summary of Solicitation*.

General requirements for content of proposals	See A.1 the Earth Science Research Program Overview, and Section IV and Table 1 of the *ROSES-2024 Summary of Solicitation*.
Detailed instructions for the submission of proposals	See NSPIRES Online Help, Sections 3.22-4.4 of the *NASA Proposer's Guide* and Section IV(b) of *the ROSES Summary of Solicitation*.
Submission medium	Electronic proposal submission is required; no hardcopy is required.
Web site for submission of proposal via NSPIRES	http://nspires.nasaprs.com/ help desk available at nspires-help@nasaprs.com or (202) 479-9376
Web site for submission of proposals via Grants.gov	http://grants.gov/ help desk available at support@grants.gov or (800) 518-4726
Funding opportunity number for downloading an application	NNH24ZDA001N-CSESP
Points of contact concerning this program, both of whom share this postal address: Earth Science Division Science Mission Directorate, NASA Headquarters Washington, DC 20546	Gerald "Stinger" Guala Telephone: (202) 255-3366 Email: gerald.f.guala@nasa.gov Katie Baynes Email: kathleen.baynes@nasa.gov