A.65 FIRESENSE IMPLEMENTATION TEAM

NOTICE: Amended October 11, 2023. This amendment presents a new program element in ROSES-2023. Notices of Intent are due December 11, 2023, and Proposals are due January 18, 2024. The S/T/M section of proposals is limited to 5 pages.

1. Synopsis

In Fiscal Year 2023 the NASA Science Mission Directorate began a new project called NASA FireSense which is focused on delivering NASAs unique Earth science and technological capabilities to operational fire management agencies, striving towards measurable improvement in U.S. wildland fire management (Section 3 of this solicitation describes the FireSense project in more detail). This solicitation seeks proposals for individual membership on the FireSense Implementation (FSI) Team. Awardees will receive annual baseline funding for their participation in the FSI team; this baseline funding enables the core activities of the team membership. Once formed, under the direction of FireSense project leadership, the FSI team will organize and work with stakeholders to identify potential projects that provide agile, short-term action on emerging needs from operational fire management agencies in the U.S.

2. Background

Fire is a natural disturbance and fundamental to many ecosystems. Across the United States, however, due to a combination of increased fire season length, anthropogenic climate change, and an expanding wildland-urban interface (WUI), fires have become more frequent, larger, and more likely to occur at the same time. This leads to increasingly negative impacts on economic (loss of structures and communities), public health (e.g., loss of life and detrimental impacts of air pollution), and ecological aspects of society (e.g., shifts in vegetation and carbon storage). Exposure to dangerous smoke levels is becoming more common and changing seasonal patterns over large areas of North America indicate that wildfire smoke pollution could impact the health of millions of people, often far removed from the fire. Postfire impacts extend to landslides and debris flows, contaminated water and soil, tree regeneration failure and changes in biodiversity, as well as the health and resilience of ecosystems, wildlife, and human populations. The wildfire crisis is being highlighted globally and within federal agencies with efforts to identify proactive and strategic response through expanded engagement of scientists, managers, policymakers, and citizens.

3. Scope of Program

NASA's Earth Science Division (ESD) is prioritizing improvements in the prediction, management, and the understanding of overall impacts of wildfires within the United States and around the world. As part of this effort, NASA ESD has established the FireSense Project, which is an effort focused on delivering NASA’s unique Earth science and technological capabilities to operational fire management agencies, striving towards measurable improvement in U.S. wildland fire management. The goals and objectives of the FireSense project are being established based on the results of an ESD-led stakeholder engagement workshop that was held in February 2022. The purpose of the workshop was to solicit input from wildland fire management

stakeholders with regards to gaps and visions for successful wildland fire management in the U.S. During the workshop, participants, including representatives from operational fire management agencies, were asked to identify:

- Barriers the community has in integrating science, technology, and knowledge into the fire management challenge.
- Areas where NASA can help enable collaborative programs and partnerships across the fire lifecycle, including preparedness and adaptation, response, and recovery.
- Key opportunities and priorities to make progress in pre-, active, and post-fire management.
- Partners and programmatic activities that guide near- and long-term action in wildland fire management.

The primary deliverable from the workshop was a whitepaper describing current barriers faced by agencies responsible for managing fire across its life cycle (pre-, active, and post-fire), which can be accessed here: https://aam-cms.marqui.tech/aam-portal-cms/assets/ki2yd52vavkccskc. Proposers are also encouraged to read and consider findings from other wildfire related workshops led across the U.S. Government including, for example, the wildland fire workshops led by the Interagency Council for Advancing Meteorological Services (ICAMS; https://www.icams-portal.gov/meetings/firewx/fireworkshop.html)

Based on the ESD-led stakeholder engagement workshop feedback and the resulting whitepaper, the Wildland FireSense project has been designed to initially focus on the following four uses cases:

- Pre-fire: Assessment of state, composition and/or potential change in fuel structure and/or moisture occurring at multiple spatial and temporal scales before a fire event to inform resource allocation and/or management activities (e.g., prescribed fire, fuel reduction, fuel breaks, restoration, etc.).
- Active Fire: Delivery, coordination and/or use of complex data during fire events via satellite, airborne, and ground-based imagery with higher spatial resolution and update frequency, pushing towards 24/7 detection and tracking.
  Development of new, innovative sensors for precisely tracking and locating fires, fuel conditions, and smoke plumes.
  Improvement of fire behavior models for projection of fire front, fire behavior and effects and smoke plumes with the potential to inform resource allocation and/or management activities or integrate into models at different spatial scales.
- Post-Fire: Improved assessment of the consequences of fire on ecosystem state and services to inform potential rehabilitation, including, but not limited to burn severity, potential debris flow and landslide risks, and potential watershed impacts.
- Air Quality: Improvement of models for projection and tracking the nature, extent and feedbacks of fire behavior and effects onto emissions with the potential to inform forecasts of air quality impacts.

The FireSense project is working to codevelop enhanced capabilities within each of these use cases with interagency partners such as the National Oceanic and Atmospheric Administration, the U.S. Forest Service, the U.S. Geological Survey, the California Department of Forestry and Fire Protection, among others. The overarching

goal is to contribute NASA resources in such a manner that the end-to-end management of wildfires in the U.S. is improved.

The FireSense project is being implemented in complement to and coordination with activities that include technology development (A.59 Technology Development for Support of Wildland Fire Science, Management, and Disaster Mitigation**),** airborne science and demonstration, and information delivery. Technology development efforts are focused on: (i) enhancing existing instruments used for monitoring pre-fire, active fire, and post-fire environments, (ii) developing next-generation aerial platforms as well as instruments for small spacecraft and aerial platforms for wildland fire applications, (iii) enabling measurements from multiple vantage points through model-directed, coordinated observations, (iv) addressing computational challenges for modeling and data acquisition, fusion, and real-time processing, and (v) facilitating artificial intelligence to create new data products needed for wildfire management and for management of observing platform constellations. The primary purpose of the airborne science and demonstration component of the FireSense project is to (i) test existing and enhanced instruments used for monitoring pre-fire, active fire, and post-fire environments, (ii) evaluate existing and novel aerial platforms and next-generation instruments for wildland fire applications, (iii) leverage airborne data to support research and application development in the FireSense use cases, and (iv) demonstrate to key stakeholders the utility of existing and newly developed technology in the management of wildland fire across the pre-fire, active fire, and post-fire environments. Finally, the Information Delivery efforts are focused on (i) working with stakeholders to develop wildland fire data systems and solutions that are flexible and aligned with desired capabilities, (ii) ensuring existing and new datasets (static and real-time) can be integrated into existing user-friendly web platforms for decision support, and (iii) enabling the seamless exchange of information between spaceborne, airborne, and in situ assets.

Across the current scope of the project, a series of airborne field campaigns are being planned for which the technology and related capabilities developed through FireSense activities will be implemented and tested, culminating with a capstone mission (in the 2027-2028 timeframe) to demonstrate the investments and their contribution to progress in wildland fire management. Planning for the airborne campaigns is currently underway, with the first one taking place in October 2023 in the Fish Lake National Forest in central Utah. This campaign is being coordinated with the U.S. Forest Service's Fire and Smoke Model Evaluation Experiment (FASMEE; https://www.fasmee.net). In October of 2023 NASA plans to fly a variety of existing airborne instruments including AVIRIS-NG, UAVSAR, and MASTER, among others to characterize the pre-, active, and post-fire environments. For more information on the October 2023 FireSense campaign please see the information here: https://espo.nasa.gov/firesense/. In future years additional sensors and platforms may be added.

4. Proposal Opportunity

4.1 Implementation Team Membership

This program element solicits proposals from individuals to contribute to the previously described FireSense use cases (Pre-fire, Active fire, Post-fire, and Air-quality), and provide limited support for the FireSense implementation areas (Technology Development, Airborne Science and Demonstration, and Information Delivery). Selected principal investigators will become members of the FireSense Implementation (FSI) Team. Following selection, the FireSense Implementation Team will work together to further develop and design the FireSense use cases and support activities under the FireSense implementation areas. The implementation team will be led by the FireSense Project Scientist, with support from the Project Manager and Systems Engineer who are part of the FireSense Project Office at NASA Ames Research Center, with oversight from the FireSense program manager at NASA Headquarters.

The FSI team will be comprised of team members from proposals selected (Principal Investigators and Co-Investigators) in response to this solicitation. The FSI team will be organized under the guidance of the FireSense project office and NASA Headquarters programmatic leadership and ultimately will conduct ad hoc projects of mixed duration and size to address the priority needs in each of the previously described use cases. In coordination with the FireSense project office and NASA Headquarters programmatic leadership, the FSI will identify projects through engagement with end users and partners, including operational fire management agencies. The intent is to provide agile, short-term action on emerging needs from operational fire management agencies in the U.S.

Members of the FSI team will be funded with additional, supplemental funds available for the FSI team activities (see Section 5.1). The Program Manager will review requests and inputs from the wildland and prescribed fire management community when determining which project(s) to move forward with. The FSI team activities will only be funded based on these targeted needs of wildland and prescribed fire end users and partners. FSI team members will work in collaboration with end users and managers from the wildland and prescribed fire communities as a transparent, inclusive and accountable team that implements action on the identified needs. The Project Office will share resources and/or assist in facilitation of inclusive meeting best practices.

Please note that submissions to this program element shall not propose any specific FSI team activities (e.g., individual research projects) beyond team membership, as these will be determined after the FSI team selection is complete.

5. Programmatic Information

This Section provides information about the expectations of budget and eligibility (5.1), content to include in a proposal (5.2), as well as other suggestions (5.3).

All proposals submitted to ROSES must strictly conform to the formatting rules in Section IV(b)ii of the *ROSES-2023 Summary of Solicitation*. Proposals that violate those rules may be rejected without review.

5.1 Budget

Awardees will receive annual baseline funding for their participation in the FSI team; this baseline funding enables the core activities of the team membership. NASA will provide additional, supplemental funds (outside of this solicitation) for the FSI team to conduct targeted projects. The allocation of these supplemental funds is based on the nature of the needs, FSI team project focus, required expertise from within the team, and other relevant factors. Individual team members will not necessarily receive equal allocations of supplemental funds.

The expected annual program baseline budget for awards associated with this solicitation is approximately $2 million per year. Proposers are strongly encouraged to keep the total cost per investigation to approximately $100,000 - $125,000 per annum, depending on the complexity of the proposed effort. This includes salaries, overhead and indirect costs, despite the fact that these costs are to be redacted in the proposal. (For more information on this, see Section IV(b)iii of the *ROSES-2023 Summary of Solicitation* and the SARA website at https://science.nasa.gov/researchers/sara/how-to-guide/nspires-CSlabor/). Thus, all Co-Investigators, including civil servants, must share their total costs, including salaries, overhead and indirect costs, with the submitting organization.

After the FSI team is formed via this solicitation, it is expected that an additional approximately $2 million in supplemental funds will be available per year (for 3 year projects) for these FSI teams; however, these potential funds must not be reflected or addressed in the proposal, rather this proposal should describe the PIs expertise in wildland fire research and applications, stakeholder engagement activities, and approaches to working on large teams (more details are provided in Section 5.2).

Proposal budgets must allow for a minimum of one FireSense project meeting per year (alternating yearly between the east coast (e.g., Washington DC) and west coast (e.g., Mountain View, CA). Budgets should also include funds for travel to approximately two conferences or symposia per year, particularly ones organized by community end users and partners, and any proposed additional travel to meet with end users and managers to address applications and project progress. Hybrid and/or virtual engagement can be noted and budgeted as well.

5.2 Mandatory Proposal Information

Because of the novel nature of this opportunity, care should be taken to document the PI's qualifications for possible FSI team membership and additional expertise within their proposal team members. Proposers are not asked to provide specific project ideas for meeting the operational needs of stakeholders in wildland fire management.

The proposer must provide evidence of expertise and knowledge in areas relevant to the primary use cases and implementation areas of the FireSense Project. All proposers must explain the knowledge and skills they have to offer and why they are important for operational prescribed and wildland fire management activities and how they will apply to FSI team activities associated with the co-development of research, data products, or related capabilities with stakeholders from operational agencies and organizations in the wildland fire management space. Proposers should articulate

their expertise and skill in engaging end-users, partners, and managers to identify and successfully address stakeholder needs. Proposers should include information illustrating their experience, skill, and success working in team settings, especially large interdisciplinary teams and teams focused on the co-development of research, data products, or related capabilities with stakeholders from operational agencies and organizations.

Specifically, proposers must provide the following information:

- Relevancy of their field of study and expertise to goals of the FireSense Project and associated use cases and implementation areas
- Expertise in approaches contributing to a large multi-disciplinary project team
- Expertise in modeling, measurement analysis, algorithms, or instrumentation in the context of wildland fire management
- Expertise with, and approach to, stakeholder engagement
- Expertise and roles in developing research, technology, data products or related capabilities in a “research to operations” framework

In addition, proposers should provide a statement describing how their expertise can contribute to FireSense project use cases and implementation areas. Examples of the type of work that will contribute to the overall success of the FSI team include, but are not limited to, refining FireSense objectives and use cases, developing stakeholder engagement plans, and contributing toward writing the FireSense Implementation plan. Proposers should also describe the steps they would employ to work towards achieving the objectives of FireSense project, e.g., as described in Sections 1 and 2.

Proposers are strongly encouraged to use the Work Effort and Current and Pending Support templates available on the SARA webpage at https://science.nasa.gov/researchers/templates-for-earth-science-division-appendix-a-roses-proposals.

6. Summary of Key Information

Expected program budget for first year of new awards	~$2 M
Number of new awards pending adequate proposals of merit	20
Maximum duration of awards	3 years
Due date for 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	3 months after proposal due date
Page limit for the central Science/Technical/Management section of proposal	5 pp; see also Table 1 of ROSES-2023.

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-2023 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-2023 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 hard copy is required or permitted.
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 proposal via Grants.gov	https://www.grants.gov/ (help desk available at support@grants.gov or (800) 518-4726)
Funding opportunity number for downloading an application package from Grants.gov	NNH23ZDA001N-FSIT
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