

A.48 UNDERSTANDING CHANGES IN HIGH MOUNTAIN ASIA

NOTICE: Amended on January 7, 2016. This amendment presents a new opportunity in Program Element A.48 Understanding Changes in High Mountain Asia. Because data management plans are part of the main body of the proposal (see Section 3.4) they will not be collected on the NSPIRES cover pages. Notices of Intent to propose are requested by March 7, 2016, and proposals are due April 15, 2016.

1. Introduction

High Mountain Asia (HMA), extending from the Hindu Kush and Tien Shan in the west to the Eastern Himalaya, is the world's largest reservoir of perennial glaciers and snow outside of the Earth's polar ice sheets. The region is home to a range of unique landforms, ecosystems, hazards, and cultures; and HMA supplies water to more than a billion people. Changes in the region's glaciers, snow, permafrost, and precipitation patterns have altered this water supply, while also transforming regional ecology, land utilization practices, and the hazards associated with landslides and glacial-lake-outburst floods.

Satellite remote sensing observations offer the possibility to characterize these changes; gain insight into the Earth system processes that control them; and inform decisions, management actions, and policy development.

2. Scope of Program

This solicitation funds investigations into HMA's glaciers, snow, permafrost, and precipitation to improve our understanding of regional changes, water resources, and induced impacts, while furthering NASA's strategic goals in Earth system science and societal applications. Through expanded knowledge of the processes controlling change in HMA, the program intends to improve regional forecasts and address vulnerabilities in human and biogeophysical systems.

2.1 Requirements

The program has the following requirements of all investigations:

- 1) Investigations must be based on satellite remote sensing observations, but should, as appropriate, be integrated with *in situ* measurements and models.
- 2) Every investigation must be framed to contribute to the development or refinement of tools to foster interdisciplinary research, forecast change in the region, and/or support policy development and related work. Tools should be interoperable and will be linked as possible to form a Glacial Melt Toolbox (GMELT).
- 3) GMELT development and utilization for science, forecasts, and assessments will be enabled by NASA's High Mountain Asia Team (HiMAT). Key investigators associated with each project selected under this solicitation will receive support to participate as members of HiMAT.
- 4) Understanding and forecasting change in HMA requires the coordinated efforts of a diverse group of scientists. Beyond HiMAT, this solicitation encourages integrative, interdisciplinary proposals from groups of scientists of up to \$1M per year.

2.2 Specific investigations

Specific investigations to be supported under this solicitation include, but are not limited to, the following elements:

Earth Science, including:

- Satellite remote sensing studies aimed at better characterizing and understanding the processes controlling change of snow, glaciers, permafrost, precipitation, and ecosystems.
- Modeling of these processes to support Earth science research and regional forecasts.
- Obtaining and developing data sets to understand the underlying causality of change through determination of the specific processes involved, as well as to validate and support process and modeling studies.
- Optimizing high-resolution meteorological models for HMA, preferably spanning the time period from 1980 to the present, aimed at understanding the drivers of change in the glaciers, snow, permafrost, and precipitation of the region.

Improved forecasts, preferably through the development and/or utilization of GMELT tools, to support:

- Hazard mitigation studies for the HMA region, especially:
 - a) Improvements to assessments of hazards from melting of snow and ice and permafrost thaw; such as landslides, debris flows, ecosystem and infrastructure impacts, and integrated assessments of cascading hazards.
 - b) Improvements to forecasting and predictive tools, including early warnings for glacial outburst floods.
- Policy support studies for the HMA region, especially:
 - a) Construction of decision support tools to forecast regional change in water resources over the next 1-100 years.
 - b) Application of hazard assessments to support regional planning.

3. Proposal Details and Review information

Proposed research investigations must meet the following criteria, and each of these should be specifically addressed in the proposal:

- Proposals must address at least one of the areas listed—Earth Science, Hazard Mitigation, or Policy Support—and must identify clearly which area or areas are being addressed.
- Proposals must be based on satellite observations, but should include suborbital sensors and *in situ* information, as appropriate.
- Earth science proposals must go beyond creation or correlation of data sets and seek to understand the underlying causality of change through determination of the specific processes involved.
- Hazards and policy proposals must address the targeted end user(s), including their needs, use of the tools, and policies to be impacted.
- Proposals must explain how the research will be integrated into and/or benefit from GMELT tools, and how the tool will be documented to enable use by the broader community.

- Proposals must discuss how the Principal and Co-Investigators (PIs and Co-Is) will work with the HiMAT team for regional forecasts, interdisciplinary research, and integrated development of GMELT.
- Studies that require a focus on small spatial scales, such as specific events or geographic regions, must describe how the results will be made scalable and extensible to the broadest possible areas, timescales, and forecasts.

3.1 GMELT contributions and development

It is expected that all proposals will contribute to or utilize GMELT, which will be comprised of individual tools to assess and forecast change in the water, ice, snow, hazards, and related phenomena in HMA. Tools will be linked as appropriate, but may stand alone.

Proposals for Earth science research should be framed to either develop or contribute to the development or refinement of GMELT, either through quantification of processes to improve models or production of regional data sets and assessments that can be used for tool validation.

Proposers that strictly intend to use tools for hazard mitigation or policy support must develop collaborative relationships with proposers planning to develop tools, but may submit independent proposals.

GMELT will require development and documentation such that all tools can be used independently by the broader community. All investigations that will develop and/or refine GMELT tools must include explicit development and documentation plans in the proposal, including delivery of all relevant codes, algorithms, and documentation to a to-be-selected NASA DAAC, in compliance with NASA standards (<https://earthdata.nasa.gov>).

3.2 Team Participation, Meetings, and Leadership

PIs and Co-Is on selected proposals will become members of HiMAT. The team will have a range of responsibilities and goals, including:

- Facilitating the collaborative development of GMELT.
- Fostering interdisciplinary Earth system science.
- Utilizing GMELT for improved forecasts of HMA.
- Improving hazard assessments and identification of policy options for HMA.

Proposals must discuss their approach to collaboration within HiMAT, including details on their contributions to GMELT.

All proposals should include in their budget support to attend two meetings of HiMAT each year, one in the continental U.S. and another in Asia (e.g., Kathmandu, Nepal).

3.3 Team Leader

HiMAT will be led by a Team Leader who will facilitate the integration of the team's work; organize, plan, and chair HiMAT meetings; foster regional forecasts; and be responsible for producing a yearly team report. Proposers wishing to serve as Team Leader should state so in their proposal, and are allowed up to two (2) additional pages to describe their qualifications,

interests, and approach to leadership. Team Leader activities should not be included in the proposal budget. Team leaders will receive an additional \$80,000 per year to support their leader activities, and the successful proposer will revise their budget during final award negotiations.

3.4 Data Policy

Proposals developing significant datasets must include a data management plan, including delivery to a to-be-selected NASA DAAC in compliance with NASA data standards (<https://earthdata.nasa.gov>). For investigations that collect new data, proposals must clearly state when the data will be fully released. There will be no period of exclusive use and it is expected that all data collected under this program will be released publicly as soon as possible.

3.5 Fieldwork

This solicitation is intended to support work based on available remote sensing observations and is not intended to support large field deployments to collect new observations. Small field programs to specifically improve the utility of remote sensing observations and/or provide calibration and validation data for models are appropriate, but must be fully justified. Please consider the estimated budget in Section 4. Summary of Key Information in developing work plans, and note that only proposals for up to a \$1M per year are encouraged.

Investigators proposing activities involving aircraft must contact Mr. Bruce Tagg, the NASA Airborne Science Program Manager, at Bruce.Tagg@nasa.gov during proposal preparation to discuss aircraft selection and budgeting, to ensure that NASA requirements for airworthiness are met, regardless of whether it is proposed to use NASA-, commercially-, or partner-supplied aircraft. Proposals must include the cost of the flight time for the specified field program for these aircraft in their budget.

3.6 Collaborations and Co-Investigators

Given the broad scope of work required under this solicitation and the unique challenges of HMA, the solicitation is open to collaborative proposals with budgets that are larger than those traditionally supported for a solicitation at this funding level. However, proposers are reminded that the role and necessity for each Co-I must be specifically justified and integrated into the work plan.

3.7 International Collaboration

International collaborations are encouraged, but, as required by law, proposals to this solicitation may not involve collaboration with institutions in China. This includes development, design, planning, promulgation, implementation, or execution in bilateral collaboration with Chinese entities, including participation in the NASA HiMAT team as PIs, Co-Is, or otherwise. However, it is NASA's intention that the progress and results from awards will be presented to parties working on similar issues, including those from the Chinese Academy of Sciences, at periodic meetings held in international locations, such as Kathmandu, Nepal.

3.8 Review Details

NASA may have separate peer review processes and panels for each element in Section 2.2, and proposals will be assigned to one or more panels based on NASA's assessment of proposal content. While NASA expects to select proposals in each of these elements, NASA reserves the right to select proposals in none, some, or all of these depending on the nature, quality, and distribution of proposals received.

4. Summary of Key Information

Expected program budget for first year of new awards	~ \$3.5M per year
Number of new awards pending adequate proposals of merit	~12
Maximum duration of awards	3 years
Due Date for Notice of Intent to Propose (NOI)	March 7, 2016
Due date for delivery of proposals	April 15, 2016
Planning date for start of investigation	August 1, 2016
Page length for the Science-Technical-Management section of proposal	15 pages; see also Chapter 2 of the <i>NASA Guidebook for Proposers</i> . Note: Proposals with a team leader section are allowed an additional two pages
Relevance to NASA	This program is relevant to the Earth science strategic goals and sub-goals in NASA's <i>Strategic Plan</i> ; see ROSES Table 1 and the references therein. Proposals that are relevant to this program are, by definition, relevant to
General information and overview of this solicitation	See the <i>ROSES Summary of Solicitation</i> .
Detailed instructions for the preparation and submission of proposals	See the <i>NASA Guidebook for Proposers</i> at http://www.hq.nasa.gov/office/procurement/nraguidebook/ .
Submission medium	Electronic proposal submission is required; no hardcopy is required or permitted. See also Section IV of the <i>ROSES Summary of</i>
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 package from Grants.gov	NNH15ZDA001N-HMA

Main NASA point of contact concerning this program	Thomas Wagner Earth Science Division Science Mission Directorate National Aeronautics and Space Administration Washington, DC 20546-0001 Telephone: (202) 358-4682 E-mail: thomas.wagner@nasa.gov
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General questions about the Program should be directed to the point of contact above by email. Questions about specific sub-elements should be directed to those listed below by email.

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