

Project Summary

Facilitating New Discoveries in Seismology and Exploring the Earth: The Next Decade

Incorporated Research Institutions for Seismology is a consortium of 114 Voting Members, comprising virtually every university in the US with a seismology research program. IRIS also includes still growing numbers of US, Foreign, and Educational Affiliates. This proposal to the National Science Foundation is for renewal of support to continue the Consortium's management of "core facilities" to acquire, manage and distribute seismological and related geoscience data.

At the request of NSF, the proposed term of a new Cooperative Agreement is 27 months, and an important task is to move towards joint management of the "core facilities" and the USArray facilities, which have been constructed and operated under separate Agreements between IRIS and NSF. The objective is integrated management of seismological services to investigators, so that going forward it will be reasonable and useful for NSF to negotiate a single Cooperative Agreement for all of these services.

The services managed by IRIS fall into three areas.

- *Instrumentation Services*, including operation and support for permanent broadband stations distributed around the world and portable instruments for denser deployments both in the US and abroad.
- *Data Services*, including Data Collection Centers for permanent networks, software and training to facilitate good data management broadly, and the Data Management Center for the most reliable archiving and distribution.
- *Outreach and Education Services*, creating tools for faculty members and others to use seismological data in fostering broad understanding of geosciences.

Continuous reliable functioning of the core facilities over 25 years and an unwavering commitment to free and open data availability have embedded supportive attitudes among new generations of geoscientists. These attitudes underlay a new era of still-accelerating growth in geoscience information and deeper understanding of dynamic Earth systems. The consensus in favor of open data facilitates use of research products to serve society in applications that include environmental monitoring, hazard mitigation, natural resources discovery, and national security. During the transition to integrated management of all of these services, IRIS proposes to continue operation of the existing facilities.

- *The Global Seismographic Network* is a network of high dynamic range, broadband sensors distributed around the world that is operated jointly with the US Geological Survey and through a subaward from IRIS to the University of California, San Diego.
- *The Program for Array Seismic Studies of the Continental Lithosphere* supports Earth science experiments through loans of portable instrumentation and through support services.

- *The Data Management System* collects, assesses, archives and distributes data from PASSCAL, the GSN, USGS networks, and other sources.
- *The Education and Outreach Program* fosters broad use seismological data by teachers, students, museum-goers, and web/mobile device users .
- *Community Activities* facilitate institutional collaboration to do geoscience research more effectively and to form partnerships that extend beyond seismology.

Within each existing facility we propose to complete improvements that are already underway and to explore possibilities for modifying them to offer additional and better-integrated services. Our proposed improvements to the existing facilities come at a small increment to the costs of continuing operation of the facilities in their current form and are intended to produce many-fold returns in efficiency and scientific results.

INTELLECTUAL MERIT OF THE PROPOSED WORK

Seismological Grand Challenges in Understanding Earth's Dynamic Systems is a long-range plan for geosciences research. Seismology – the study of elastic waves in the Earth – affords us information about both the Earth's interior and earthquakes at higher resolution than any other investigative tool. As shown in a collection of nearly 250 project descriptions appended to this proposal, IRIS services continue to facilitate numerous discoveries. And yet, *Seismological Grand Challenges* suggests that we are poised for profound and perhaps even more plentiful discoveries in the near future. Seismology is a rich source of information that, when coupled with other types of data in the growing number of interdisciplinary studies to which IRIS is committed, is likely to reveal previously unknown aspects of Earth history and dynamics.

BROADER IMPACTS OF THE PROPOSED WORK

Seismology is among the most important of all disciplines of the geosciences for protecting society from natural disasters and discovering natural resources. IRIS services help to reduce or even avert disasters in the aftermath of earthquakes through preparation and rapid response based on better data, nearer to real time. The transience of earthquake signals combined with the availability of real time data from stations worldwide creates an immediacy in classrooms, museums and other learning fora that is rarely matched in presentations from other fields of science, and intuitively demonstrates benefits from international cooperation. The standard of data openness that IRIS has successfully fostered around the world enhances monitoring of nuclear tests, contributing directly to national security, and serves as an example of the benefits of data openness for other science disciplines, contributing indirectly to benefits from other data.