

## **INTEROP: Earth Sciences Semantic Interoperability Network**

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Technological advances are vastly expanding the nature and complexity of scientific data. The increasing amount of data and heterogeneity of formats, protocols, and terminology make it difficult for scientists to discover, select, and use data of interest. The National Research Council report, "IT Roadmap to a Geospatial Future", expresses the need for methods and technologies to dynamically categorize geospatial data and support data concepts and categorizations from different geospatial communities.

The semantic web offers solutions to the data interoperability challenges in Earth sciences by facilitating the creation of ontologies (formal representation of concepts) and mappings among concepts from different ontologies. The semantic web allows distributed heterogeneous data to be linked, and this linkage has furthered scientific discovery in domains, such as the biomedical sciences, that have implemented these technologies. However, the Earth sciences community has not yet come together to share ontologies, semantic web tools, and experiences in a common way.

### **Intellectual Merit**

The ultimate vision is to make all Earth sciences knowledge and data available and semantically interoperable so that they are more useful for advancing the understanding of Earth sciences phenomena. We propose to advance this vision by building the foundation of a coordinated community for the Earth sciences. This community, called the Earth Sciences Semantic Interoperability Network (ESSIN), will be composed of students, educators, technologists, scientists and data managers from biological sciences, geosciences and information sciences. ESSIN will define, adapt, and create a set of tools, technologies and educational materials for use in a broad spectrum of interoperability demonstration projects, and eventually by the community at large. ESSIN will advance the methodologies for using semantic service components in modern Earth sciences information systems. The proposal team has broad experience with standardization working groups, community development projects (including leading the Marine Metadata Interoperability project), collaborative tools, and relevant domain sciences.

### **Broader Impacts**

ESSIN will further cross-disciplinary science by advancing interoperability solutions across the biodiversity, atmospheric, terrestrial, marine, and freshwater domains. ESSIN will enable the documentation of the *meaning* of raw and computed scientific data, and make these meanings available to people and computer systems, thereby advancing the understanding of multidisciplinary phenomena. ESSIN will provide methodologies, best semantic practices, and system architecture that can be re-used widely in Earth science cyberinfrastructure, saving time and costs. ESSIN scientific and technical outcomes, including educational resources and tools will be broadly published in modern formats, and available at no cost under an open source license. Three undergraduate students will be supported and positions will be widely advertised to minority-serving institutions.