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EarthScope – progress and opportunities

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EarthScope is a large program designed to investigate the structure and dynamics of the North American continent under the United States.

EarthScope is sponsored by the US National Science Foundation and conducted in partnership with the US Geological Survey. The scientific goals of EarthScope are: to explore the structure and evolution of the continent and deep Earth earthquake processes, to investigate earthquake processes and to reduce earthquake hazards, to investigate magmatic processes and reduce volcanic hazards, to understand active deformation and tectonics, to explore continental geodynamics, and to study the role of fluids in the crust in earthquakes.

The EarthScope program is composed of a facility, a science program and an educational program. As described in the NSF Program announcement for EarthScope, the EarthScope facility is a multi-purpose array of instruments and observatories that will greatly expand the observational capabilities of the Earth Sciences and permit us to advance our understanding of the structure, evolution and dynamics of the North American continent. Theoretical, computational, and technological advances in geophysics, satellite geodesy, information technology, drilling technology and downhole instrumentation have made an experiment like EarthScope possible. The EarthScope observational facility consists of the Plate Boundary Observatory (PBO), the San Andreas Fault Observatory at Depth (SAFOD), and the USArray. It provides a framework for broad, integrated studies across the Earth sciences, including research on fault properties and the earthquake process, crustal strain transfer, magmatic and hydrous fluids in the crust and mantle, plate boundary processes, large-scale continental deformation, continental structure and evolution, and composition and structure of the deep-Earth. In addition, EarthScope offers a centralized forum for Earth science education at all levels and an excellent opportunity to develop cyberinfrastructure to integrate, distribute, and analyze diverse data sets.

EarthScope is being constructed by two formal consortia, UNAVCO and IRIS, and one informal collaboration, the SAFOD science team. EarthScope has data policies in place to insure maximum access to all data produced without restriction of artificial delay. Much of the data will be accessible to anyone anywhere in the world as soon as it can be moved from the instrument to a data archive.

By themselves, ANSS, EarthScope and similar experiments in Canada, Japan, New Zealand, Taiwan, China, Europe and other places form powerful tools for understanding the continents and reducing earthquake and volcano hazards. However, strategic partnerships between these experiments in different countries could greatly enhance their effectiveness. Earthquakes and volcanoes do not observe political boundaries. It is now obvious to everyone that countries around the Indian Ocean would have greatly benefited from a Tsunami warning system like that deployed in the Pacific Ocean. We should begin to tie these geodetic and seismic networks together into global networks. A key element of the success of such global networks will be open access to their data.