

EarthScope: Accomplishments and Legacy

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The EarthScope program was initiated in 2003 with the goal of studying the structure and dynamics of the North American continent. During its 15 year observational program, EarthScope has deployed more than 2000 temporary seismic stations across the continental United States in the form of the USArray Transportable Array (with stations currently operating in Alaska), and more than 1100 high precision GPS and strain instruments in the form of the Plate Boundary Observatory (concentrated on the actively deforming western half of North America). EarthScope's open data have been used by thousands of researchers across the world. EarthScope has included a grants program within the National Science Foundation, which aims to support integrative science using the EarthScope facilities, and a National Office that carries out education, outreach and community engagement activities.

EarthScope has enabled a large number of studies, some on topics that were expected and many that were unexpected. EarthScope has provided new and higher resolution seismic images of the lithospheric and mantle structure for North America, along with unprecedented maps of deformation and strain. EarthScope data have revealed that the structure at the bottom of the North American plate is complex even in some places where the topography at the top is flat. EarthScope data were critical in some of the early studies that tied the increase in mid-continent earthquakes to wastewater disposal. EarthScope data have provided new constraints on soil moisture, snow depth and other kinds of environmental sensing, and have imaged large-scale water mass/water resource variations such as the recent drought in the western United States.

EarthScope has already helped inspire other integrative efforts in other parts of the world, such as the European Plate Observing System (EPOS), AuScope and GeoNet in Australia and New Zealand, the SinoProbe/SinoProbe II projects in China, and the nascent CCArray and EON-ROSE projects in Canada. The powerful combination of seismic imaging and high precision geodetic data is an excellent tool for studying actively deforming regions.

EarthScope is now in its final wrap-up stages. The EarthScope grant program ends this year, and the regular operational support for the networks will end as of September 30, 2018. The final portion of the USArray Transportable Array, in Alaska, will be removed in the summers of 2019 and 2020 except for some stations that will be adopted by the Alaska Seismograph Network that will remain. Future facility support for seismology and geodesy is planned as part of the National Geophysical Observatory for Geoscience (NGEO), although as of this writing the National Science Foundation has not yet made an award for NGEO and thus details remain to be resolved. We expect that NGEO will include support for the great majority of the GPS instruments installed as part of the Plate Boundary Observatory; NGEO is expected to continue support for temporary seismic deployments but does not include anything like the Transportable Array.