Transportable Array Seismology:

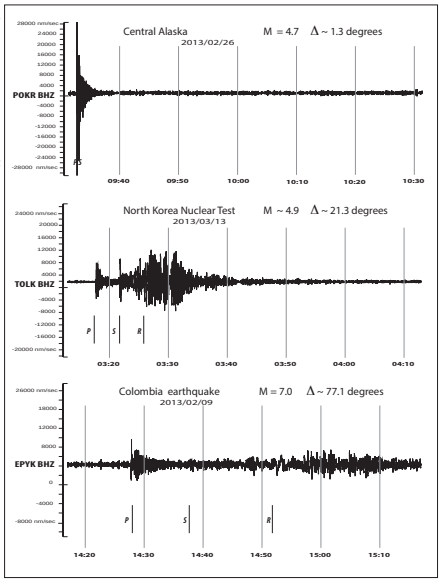
Imaging the Earth's Interior

www.earthscope.org

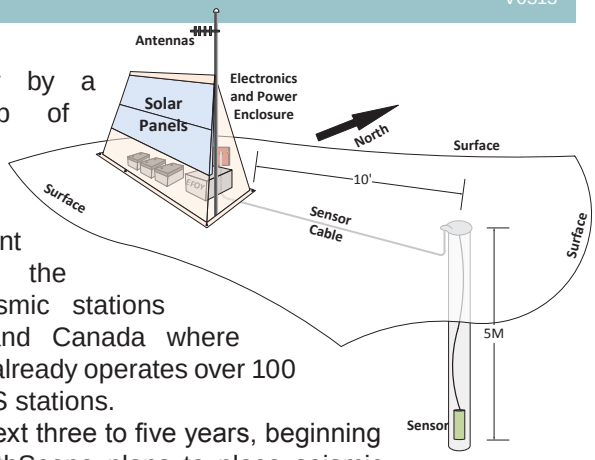
V0313

Since 2003, EarthScope has been installing a network of seismometers – known as the Transportable Array – across the continental United States and southern Canada. The seismometers record earthquakes that occur locally, regionally, and throughout the world. These earthquake data are analyzed to produce high-resolution images of the Earth's interior and to study the origin and characteristics of earthquakes and earthquake faults. Scientists integrate these images with other types of geological data to resolve details of the continental structure, and its evolution and dynamics. The Transportable Array will reach the east coast of the United States at the end of September 2013 and is then expected to continue in Alaska.

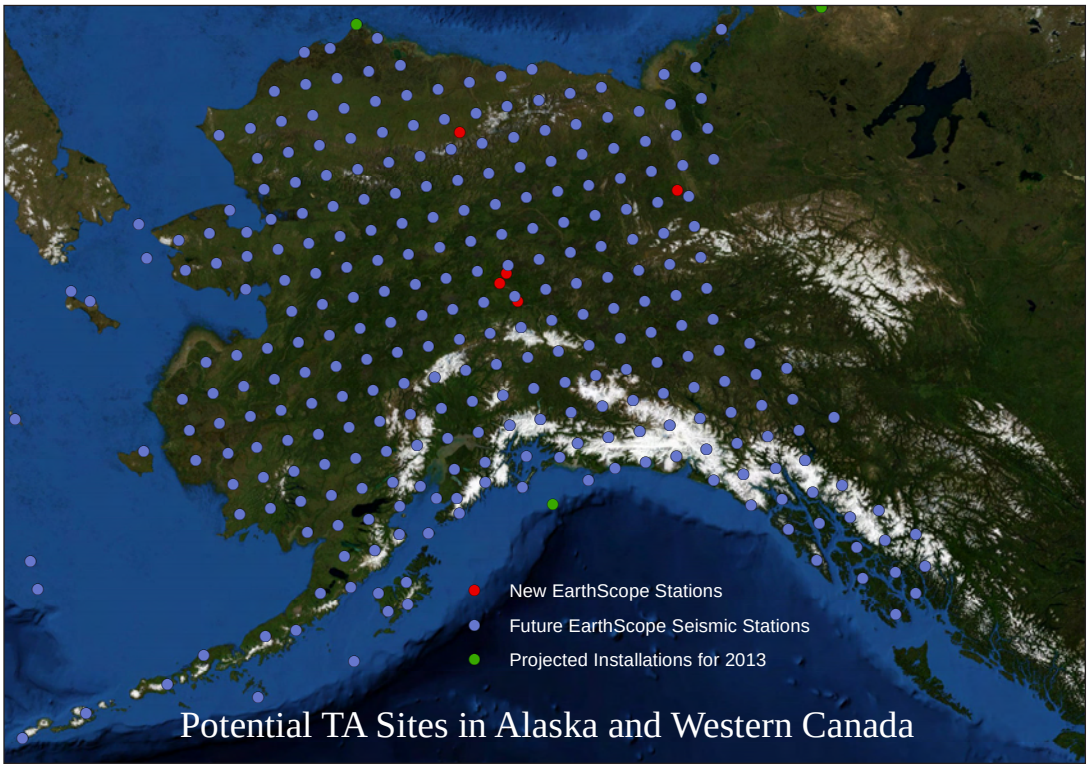
EarthScope is supported by the National Science Foundation and is operated cooperatively by a small group of university research consortia. This document describes the planned seismic stations in Alaska and Canada where EarthScope already operates over 100 geodetic GPS stations.



Events recorded at Earthscope arctic stations. The one-hour long waveforms are plotted at the same relative amplitude for all events and start at the origin time of each event.



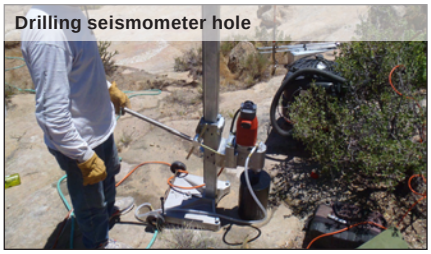
Over the next three to five years, beginning in 2013, EarthScope plans to place seismic sensors in approximately 300 locations in Alaska and Western Canada. The proposed station grid spacing of 85 km (51 miles) will enable scientists to gain new insights into the earthquake process and to generate 3-D images of the Earth from the crust to the core. The target locations will supplement or enhance existing seismic stations operating in Alaska and, when possible, will be co-located with existing GPS stations constructed by the EarthScope Plate Boundary Observatory. Similar to the Transportable Array in the lower 48, the distance between the proposed seismic stations will be much too large for detailed mineral and reservoir prospecting at depths shallower than 5 km. More information about this phase of EarthScope is available at www.usarray.org/alaska.



Potential TA Sites in Alaska and Western Canada

Hut at Toolik Lake Research Station

Drilling seismometer hole



For more information, contact usarray@iris.edu • 1-800-504-0357 (tel/fax)

Participating in EarthScope:

Hosting a Transportable Array Seismic Station

www.earthscope.org

EarthScope earthquake monitoring stations are constructed, operated, and maintained by the Incorporated Research Institutions for Seismology (IRIS) with funds from the National Science Foundation.

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EarthScope will be installing transportable seismic stations in Alaska and Canada to record earthquakes occurring locally, nationally, and worldwide. The data are used to produce images of the Earth's interior and provide new insights into the earthquake process. EarthScope is seeking participation and consent from federal and state agencies as well as from Native Corporations and First Nations to accomplish this university-based research experiment.

EarthScope will:

- Respect the property and privacy of landowners throughout the experiment, notifying the landowner whenever access is required.
- Be responsible for the security and operation of the station.
- Assume liability if the equipment is damaged or stolen, and hold the landowner harmless for any loss or injury.
- Provide the landowner with updates about the project and sample recordings from their station.

Seismic Station Description

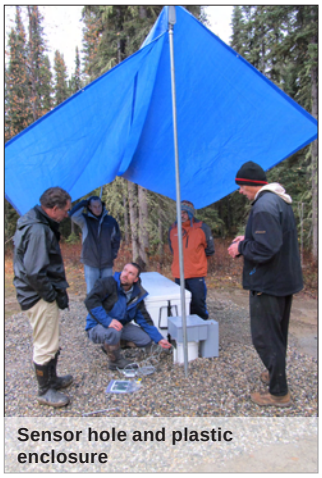
Transportable Array seismic stations have a low profile – there is no noise or motion associated with the equipment. To reduce interference from surface vibrations and to protect the sensor, the seismometer is placed 3 feet (1 m) to 15 feet (5 m) below the surface (depending on ground conditions) inside a 8-inch (20 cm) diameter augered or cored hole. A fiberglass hut with solar panels on the roof is placed about 10 feet from the sensor. In remote locations, a smaller plastic box with solar panels on a metal frame above it may be used. These enclosures house the batteries as well as the data collection computer and communication electronics. A 5-m cable inside a conduit connects the seismometer to the equipment in the enclosure. Data are transmitted to the EarthScope data processing center via cellular, broadband, or satellite communication systems. When satellite systems are used, the 3-foot dish and an enclosure with electronics will be located near a power source and linked by radio to the seismic station. All enclosures can be painted to blend in with the surroundings. The station installation footprint is anticipated to be approximately 10 feet (3 m) by 20 feet (6 m).

Installation and Maintenance

Installation of an EarthScope seismic station is expected to take one to two days. Many of the locations in Alaska and Canada will use helicopters to sling equipment into position at installation time to minimize ground disturbance. When possible, routine service is performed via fixed wing access. The seismometer and other equipment operate continuously and routine maintenance is performed remotely. If the equipment malfunctions, it is identified at the data processing center and a service trip may be necessary to correct the problem.

Placing sensor in hole

Equipment in plastic enclosure



Sensor hole and plastic enclosure

Relevant Links:

EarthScope Project Overview
www.earthscope.org

EarthScope Science Plan: 2010 to 2020
http://earthscope.org/ESSP

EarthScope: Transportable Array in Alaska
www.usarray.org/alaska

National Park Service and EarthScope
www.nature.nps.gov/geology/earthscope/

Big Science: EarthScope Epic Project
www.popsci.com/science/gallery/2011-07/big-science-universes-ten-most-epic-projects?image=9

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