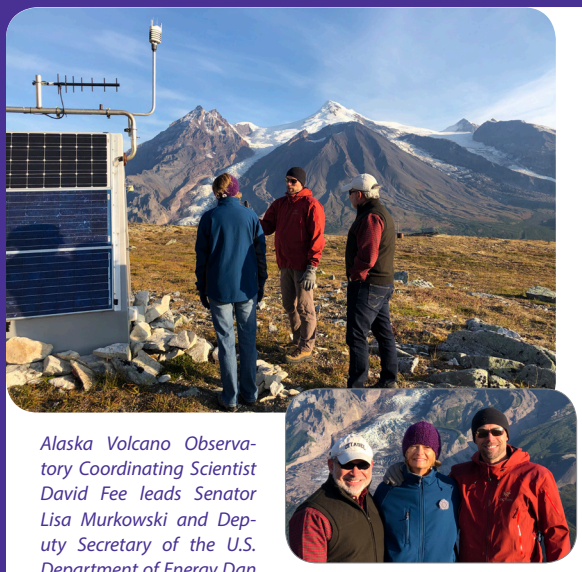
EarthScope's Transportable Array Spans Alaska, the Last Frontier

Transitioning Stations for Longer-Term Operation

The Alaska Transportable Array, funded by the National Science Foundation as part of the EarthScope program, is a network of 281 temporary seismic stations installed throughout the state about 50 miles apart to record earthquakes and other ground motions for at least two years. The goal of EarthScope is to better understand and image the structure of the North American plate. Each station is equipped with seismic, infrasound, and meteorological sensors and is built to endure the harsh conditions experienced in Alaska. The Alaska Transportable Array stations contribute valuable information to the Alaska Earthquake Center (AEC), improving their ability to monitor seismic hazards in the state. The AEC received funding through the U.S. Geological Survey to integrate 43 of these stations into Alaska's permanent seismic network. Over the past year, IRIS has worked with the AEC to apply for permits, transfer the equipment, and set up data collection so that these stations, located in the southern, central, and southeastern regions of the state, can continue to operate and record earthquakes within Alaska and around the world.

View recordings from a seismic station near you using the IRIS Station Monitor at **www.iris.edu/app/station_monitor** or download the free Station Monitor app from the Apple or Google Play stores.

Alaska Transportable Array Station Specialist Jeremy Miner (right) and AEC Seismic Network Technician Evan McArthur (left) install a new seismometer at station O20K on Slope Mountain located southwest of Anchorage and on the western side of Cook Inlet. This station has been transitioned to the AEC for long-term operation. Photo: Tim Dittmann, UNAVCO

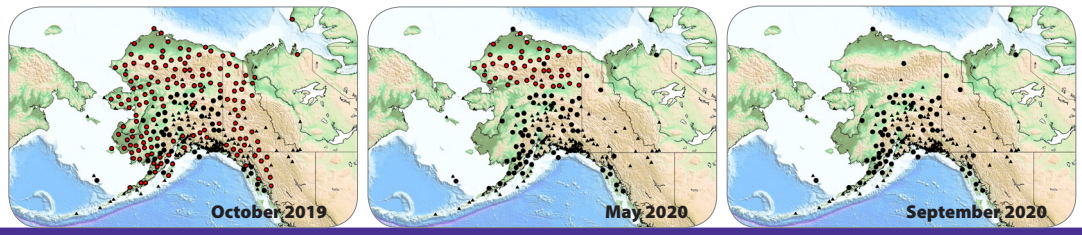


Alaska Volcano Observatory Coordinating Scientist David Fee leads Senator Lisa Murkowski and Deputy Secretary of the U.S. Department of Energy Dan Brouillette on a tour of Transportable Array station N20K. This station is collocated with existing Alaska Volcano Observatory monitoring equipment near the Mount Spurr stratovolcano 80 miles west of Anchorage and will be transferred to AVO in 2020. Photos: David Fee, AVO/UAF/GI.

Future of the Alaska Transportable Array

The Alaska Transportable Array will be decommissioned during the 2020 and 2021 field seasons. The removal process for a station will occur in a single day, taking roughly three to five hours with round-trip helicopter flights to haul out equipment and transport personnel. The hut enclosure and contents will be removed along with the sensor cable conduit and borehole seismometer. The 15 cm diameter casing will be left in place but cut below the surface, plugged or capped, then buried and covered with local materials to look as natural as possible.

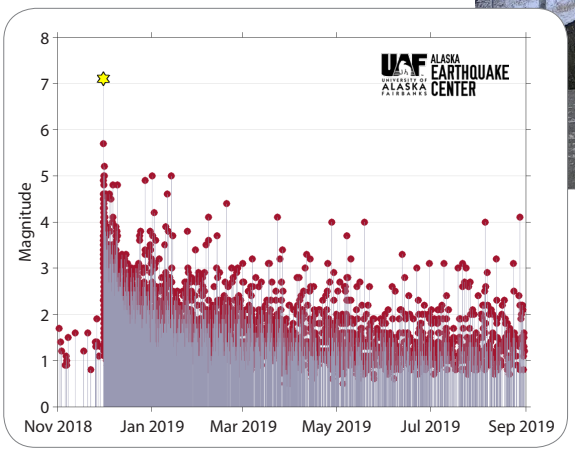
As the Alaska Transportable Array concludes, an additional 18 stations will be transitioned to other operators, including the Alaska Earthquake Center and the Alaska Volcano Observatory, making a total of 61 Alaska Transportable Array stations that will remain for longer-term operations. The stations in the northern regions of the state will operate through September 2020 and will be removed during the 2021 field season. These northern stations are continuing to record aftershocks from the August 12, 2018, magnitude 6.4 Kaktovik earthquake and the eastern Brooks Range earthquake swarm that began in early 2018. IRIS will work with interested organizations and agencies to support any further station adoptions in order to fully utilize the observational infrastructure of this network and the National Science Foundation's investment in Arctic science.

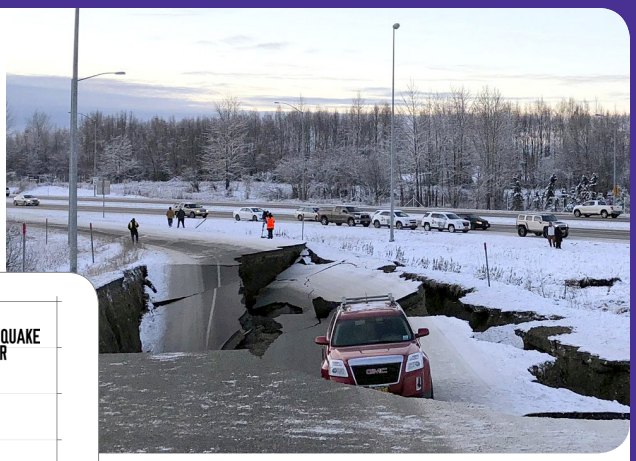


Operation and removal plans for the Alaska Transportable Array. Red circles are IRIS-operated stations and black symbols are other operators.

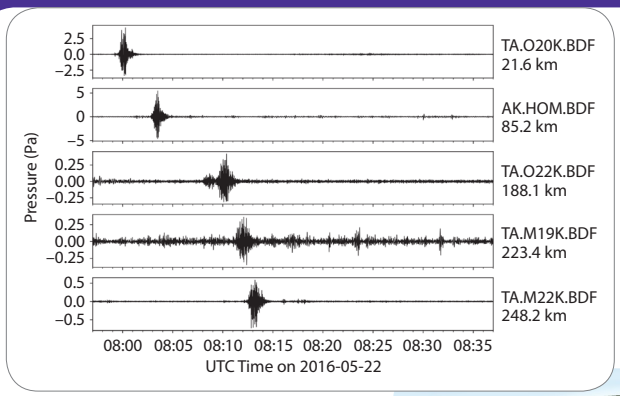
Anchorage Earthquake and Aftershocks

The magnitude 7.1 earthquake that occurred on November 30, 2018, in Anchorage was well recorded by the new and contributing stations of the Alaska Transportable Array. Aftershocks continue to be detected and located by Alaska Earthquake Center staff with over 10,000 recorded so far; most of those occurred within the first month. This earthquake sequence is projected to last for two and a half years before the area returns to background seismicity levels. The majority of aftershocks are too small to notice, but the occasional magnitude 3, 4, or 5 has been felt by residents across the region.





LEFT. The aftershocks of the magnitude 7.1 Anchorage earthquake displayed by magnitude over time. Aftershocks decrease in magnitude and frequency with time, but it will take about 2.5 years for seismicity levels to return to normal. Figure: Natalia Ruppert, AEC. ABOVE. An off-ramp from Minnesota Drive to International Airport Road in Anchorage sustained significant damage from the earthquake on November 30, 2018, but was repaired and opened just a few days later. Photo: Dan Joling, AP



Detecting Landslides with Infrasound

The Alaska Volcano Observatory uses data from the infrasound sensors installed at each of the Alaska Transportable Array seismic stations to detect low-frequency signals generated by volcanic activity, but they also use the data to investigate signals generated by landslides. Alaska Transportable Array stations were selected to complement and provide more complete coverage of existing permanent seismic stations and other monitoring equipment. In the last few years, these stations recorded many significant landslides, some at active volcanoes like this avalanche on May 21, 2016, giving researchers at the University of Alaska Fairbanks plenty of opportunities to utilize and refine their analysis techniques.

ABOVE. An avalanche in 2016 on stratovolcano Mount Iliamna, 130 miles southwest of Anchorage, is recorded by the infrasound sensor on Transportable Array seismic stations at increasing distances from the volcano. Figure: Liam D. Toney, UAF/GI. RIGHT. A Landsat-8 satellite image taken two days after the avalanche shows the mix of ice, snow, and rock covering about 2.7 square miles of Red Glacier on the east flank of Iliamna Volcano. Figure: Dave Schneider, AVO/USGS.

Information about the Alaska Transportable Array is available at: www.usarray.org/Alaska

This material is based upon work supported by the National Science Foundation under award EAR-1261681. Staff at the IRIS Alaska Operations Center are supported by the Array Operations Facility at New Mexico Tech, the Array Network Facility at the University of California, San Diego, the IRIS Data Management Center in Seattle, Washington, and IRIS Headquarters in Washington, DC. Support from the Alaska Earthquake Center has also been invaluable, along with the cooperation of the Alaska Volcano Observatory, Alaska Tsunami Warning Center, UNAVCO, Canadian Hazards Information Service, Yukon Geological Survey, Government of Yukon Wildland Fire Management, and Natural Resources Canada.