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EarthScope Seismic Station A21K (A21K-6) Field Campaign Report

M Staats R Busby K Aderhold P Dorr

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EarthScope Seismic Station A21K (A21K-6) Field Campaign Report

M Staats, Permitting Coordinator, Incorporated Research Institutions for Seismology (IRIS)

K Aderhold, Project Associate, IRIS R Busby, Project Manager, IRIS Perle Dorr, Public Outreach Manager, IRIS

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Acronyms and Abbreviations

AEC	Alaska Earthquake Center
ARM	Atmospheric Radiation Measurement
AVO	Alaska Volcano Observatory
CHIS	Canadian Hazard Information Service
DMC	Data Management Center
ESEC	Exotic Seismic Events Catalog
IRIS	Incorporated Research Institutions for Seismology
MADIS	Meteorological Assimilation Data Ingest System
NCAR	National Center for Atmospheric Research
NOAA	National Oceanic and Atmospheric Administration
NTWC	National Tsunami Warning Center
NWP	numerical weather prediction
PVC	polyvinyl chloride
RDA	Research Data Archive
USGS	U.S. Geological Survey

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1	Construction of borehole using an auger drill (left) and placement of PVC casing (right)1
2	Seismometer before being lowered into borehole (left) and completed station (right)

1.0 Summary

Seismic station A21K has been successfully operating over the last seven years. The station was constructed on 4/24/2014 by creating a borehole using an auger drill and inserting a PVC pipe casing. Roughly one month later, on 6/2/2014, the seismometer, weather station (Vaisala WXT520 meteorological sensor), enclosure, and electronics were installed. Collected data is being reported in real time and is publicly available. On rare occasion, the station has required in-person service/maintenance visits, occurring on 4/29/2015 (fix faulty cable), 4/5/2016 (swap VIE), and 8/4/2017 (general check-up visit while in the area). On 3/2/2021 the station was adopted/transferred to the Alaska Earthquake Center (AEC) at the University of Alaska, Fairbanks. The station is no longer operated by IRIS/Transportable Array project, but is now a part of the permanent Alaska Regional Seismic Network, and any further service/maintenance visits would be conducted by the AEC.



Figure 1. Construction of borehole using an auger drill (left) and placement of PVC casing (right).



This station is one of a ~280-station seismic array/grid that make up the temporary EarthScope: Transportable Array (USArray) project, funded by the National Science Foundation and operated by the Incorporated Research Institutions for Seismology (IRIS), a nonprofit 503(c) Corporation founded in 1984, that is a consortium of over 100 U.S. universities dedicated to the operation of science facilities for the acquisition, management, and distribution of seismological data.

The main objective of the project was and is to improve the understanding of the active tectonics and geologic history of the North American continent. The data collected by the USArray is being used to image the deep structure of the earth, from depths of about 5 km to the core. Listed below are some notable news and research papers published during the operation of the USArray project. Although network operations have fully ended as of September 2021, scientists will continue to use the free and publicly available (archived) data for years to come.

2.0 Results

IRIS operates the USArray and provides free and open data to the public and researchers. All data from the project were forwarded in real time to the U.S. Geological Survey (USGS) National Earthquake Information Center in Golden, Colorado, Alaska Earthquake Center (AEC), the Canadian Hazard Information Service in Ottawa (CHIS), the Alaska Volcano Observatory (AVO), and the National Oceanic and Atmospheric Administration (NOAA)'s National Tsunami Warning Center (NTWC), as well as distributed to hundreds of researchers worldwide through the IRIS Data Management Center (DMC). The data help scientists gain new insights into earthquake processes and source characteristics, expand our understanding of earthquakes and lower crustal processes, and improve earthquake and tsunami warning systems for hazard mitigation.

Specifically, metadata for the seismic station A21K are available at <u>http://ds.iris.edu/mda/TA/A21K/</u> and <u>http://anf.ucsd.edu/stations/TA/A21K</u> and <u>http://anf.ucsd.edu/stations/TA/A21K</u>. Data can also be viewed in a very accessible way through the IRIS Station Monitor (<u>https://www.iris.edu/app/station_monitor/#Today/AK-A21K/webicorder/)</u>. The meteorological data from this station are ingested by <u>MesoWest</u> and archived automatically at the Research Data Archive (RDA) at the National Center for Atmospheric Research (NCAR). NOAA incorporates real-time pressure observations from USArray stations in numerical weather prediction (NWP) models. Through MesoWest, these data are forwarded to the Meteorological Assimilation Data Ingest System (MADIS) at NOAA. Stations are included in the Arctic Observing Viewer at: <u>arcticobserving.utep.edu/aov_viewer/</u>.

Attached to this report are several handouts distributed to landowners, agencies, and the public highlighting the science made possible by the EarthScope: Transportable Array project.

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3.1 Publications and Presentations

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3.2 News, Popular Science Articles, Outreach, Etc.

- An exhibit at the Anchorage Museum by Stuart Hyatt titled "Stations" incorporates mapping elements from this project as well as equipment from a Tranportable Array station in a multisensory experience for visitors https://www.anchoragemuseum.org/exhibits/stuart-hyatt-stations/
- "Listening to avalanches half a state away" <u>https://www.adn.com/alaska-news/science/2021/04/17/listening-to-avalanches-half-a-state-away/</u>
- "Piecing together the Alaska coastline's fractured volcanic activity: Seismologists' work advances understanding of volcano distribution" – https://www.sciencedaily.com/releases/2020/11/201117192555.htm

- "Dozens of Alaska's seismic stations are going offline, but earthquake monitoring is still on solid ground" <u>https://www.ktoo.org/2021/04/30/dozens-of-alaskas-seismic-stations-are-going-offline-but-earthquake-monitoring-is-still-on-solid-ground/</u>
- "Recent 6.1 earthquake stirred many across Alaska, but the beat goes on" <u>https://www.adn.com/alaska-news/science/2021/06/05/recent-61-earthquake-stirred-many-across-alaska-but-the-beat-goes-on/</u>
- "Tracking down a fireball in the sky over Alaska" <u>https://www.adn.com/alaska-news/science/2020/10/24/tracking-down-a-fireball-in-the-sky-over-alaska/</u>
- On a tour of the ARM facilities, Station Chief Bryan Thomas pointed out the A21K station and had the visiting high school students perform a "jump test." The resulting signal showed up nicely on the seismometer and we were able to post their experience to social media.
 - https://twitter.com/kaseyaderhold/status/1022898525716275200
 - https://www.instagram.com/p/BlrAuMvH3W6/?utm_source=ig_web_copy_link



Nice jump! High schoolers touring the NOAA Climate Observatory up in Utqiaġvik (Barrow) tested our seismometer on Wednesday. These **#NSFfunded** stations installed across Alaska send data back in real-time... so we know when someone (or some bear) is visiting!

instagram.com/p/BIrAuMvH3W6/ ...



- In December 2018, the USArray was featured on an Alaska-based science radio program and in the *Anchorage Daily News*:
 - Kachemak Science radio program (<u>https://www.kbbi.org/post/kachemak-science-december-29-2018</u>)
 - Anchorage Daily News (<u>https://www.adn.com/alaska-news/2019/01/05/officials-push-to-keep-dozens-of-earthquake-sensors-slated-for-removal-across-alaska/</u>)
- The Outreach Coordinator at sub-awardee University of Alaska-Fairbanks was interviewed for a news story published in the *Anchorage Daily News* in December 2017 about the record number of earthquakes now being detected in Alaska (<u>https://www.adn.com/alaska-news/science/2017/12/13/alaska-logs-record-number-of-earthquakes-in-2017-with-help-from-a-growing-network-of-seismic-stations/</u>).
- USArray Convenes Symposium to Highlight Observatory Capabilities: The Alaska Transportable Array team and representatives from federal and state agencies in Alaska gathered in Anchorage on October 18, 2017, at the Campbell Creek Science Center to discuss the impact of the fully operational state-of-the-art science observatory spanning the entire state of Alaska and portions of Canada. The half-day program focused on the capabilities of this new network and the effects it has already had on scientific research and operational monitoring in areas as diverse as earthquakes, weather forecasting, volcanoes, tsunamis, and ecosystems. Participants also had the opportunity to view the components in a demonstration station that was on display in the meeting room. About 50 stakeholders from more than a dozen agencies, companies, native corporations and other organizations attended the event.
- Staff from the Alaska Transportable Array field team presented an evening "Fireside Chat" on October 18, 2017, at the Campbell Creek Science Center in Anchorage, Alaska. Members of the public learned about the Alaska Transportable Array project and earthquakes, and heard stories from field team members about deploying stations in remote areas of Alaska and Canada over the past three summers. A full-size seismic station was also on display in the meeting room. Max Enders, along with station specialists Ryan Bierma and Jeremy Miner, explained the function of each part of the station, and Kasey Aderhold provided a first-hand account of how the project has impacted the individuals who have been part of the USArray Team. A reporter and cameraperson from Anchorage TV station KTUU attended the event, interviewed members of the team, and produced a story that was broadcast a few weeks later (<u>http://www.ktuu.com/content/news/Earthscope-US-Array-Project-Alaska-461142493.html</u>).
- A two-credit, 15-week professional development course that provides teachers with the knowledge, tools, and resources to teach earthquake topics to a wide range of students was created. The course concluded with 33 of 40 participants successfully completing all course requirements at 100%. IRIS EPO partnered with sub-awardee University of Alaska-Fairbanks and the University of Alaska-Anchorage College of Education Professional and Continuing Education Department to offer the course.
- The Exotic Seismic Events Catalog (ESEC) data product, created in collaboration with Kate Allstadt (USGS) and Steve Malone (UW/PNSN), was released. This catalog is a compilation of data on non- earthquake seismic sources, such as landslides, debris flows, dam collapses, floods, and avalanches, which generate seismic signals but are rarely included in common earthquake catalogs.

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The ESEC contains over 100 events with basic source parameters and references to waveforms. New entries will be added to the database as information regarding new recent and historic events becomes available. The catalog is searchable and accessible via IRIS's Searchable Product Depository (SPUD).



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