Geophysicist sprints to monitor quake aftershocks in Alaska

August 27 2021, by David Nutt

Geoffrey Abers, the William and Katherine Snee Professor in Geological Sciences, deploys a temporary seismometer on Kodiak Island in August. Credit: Cornell University

When an 8.2-magnitude earthquake struck off the coast of Chignik, Alaska, on July 29, geophysicist Geoffrey Abers did the logical—if not

simple—thing.

He raced to Alaska with a group of collaborators to record its aftershocks.

The data they collect could provide new insight into the mechanics of crustal faults and possibly help researchers understand and anticipate future earthquake clusters.

"This was the biggest earthquake in the U.S. since 1965," said Abers, the William and Katherine Snee Professor in Geological Sciences and chair of the Department of Earth and Atmospheric Sciences in the College of Engineering. "There are very few good recordings of earthquakes this large anywhere on the planet. So that's a big motivation for trying to understand the sequence as sort of an archetype. We know enough about the area and its past history that we can put it in context."

Because Alaska rests atop a subduction zone, where it is regularly jarred by shifting tectonic plates, the country is a wellspring of seismic activity, and Abers has been studying its earthquakes for three decades.

In 2017, he led the Alaska Amphibious Community Seismic Experiment (AACSE), a $4.5 million project that deployed 105 high-end seismometers along a 435-mile-long stretch of the Alaska peninsula's coast.

The July 29 quake had a whiff of déjà vu. It occurred in almost the exact same spot as the AACSE research.

"I thought if anybody's going to figure this out, it's us, because we know the logistics of it," he said.

Unfortunately, the AACSE seismometers had been collected in 2019 to

harvest the data, which meant Abers and his collaborators needed to acquire new instrumentation more or less from scratch. On the plus side, they knew precisely where to put it all. They just needed to get there quickly.

"You're racing against time because every day there are fewer aftershocks on average. That happens less and less the longer you wait," he said.

Abers reconnected with his main AACSE collaborator, Jeff Freymueller, a geodesy specialist at Michigan State University, and researchers with the University of Alaska Fairbanks, the University of California Santa Cruz and the University of Colorado, Boulder. The team received a $154,000 rapid grant from the National Science Foundation, which had funded the AACSE. For their equipment, they turned to the IRIS Program for the Array Seismic Studies of the Continental Lithosphere (PASSCAL) instrument center, an NSF-supported user facility at New Mexico Tech.

"This all happened really fast. It's kind of a blur," Abers said. "Almost literally at the 11th hour, we were still assembling the team of people."

The researchers began arriving in Alaska on Aug. 8. Abers spent several days deploying five temporary seismometers on Kodiak Island. Each seismometer consists of a sensor, roughly the size of a large coffee mug, that is buried about two feet underground and connected by cable to a data logger, which converts electrical signals to digital bits and stores them on a disk. The units are powered by air-alkaline technology that keeps the seismographs running all year. The electronics and batteries are housed in sturdy aluminum boxes, specially designed to resist the prying paws of the numerous brown bears on the island.

Freymueller's group traveled further out on the Alaska Peninsula to

install continuous GPS sites that will record post-seismic movements with precise timing, as well as additional seismometers.

The team also revived their old AACSE blog to document their efforts.

By Aug. 18, the researchers were returning home. They won't be able to analyze their data until they travel to Alaska in late spring to collect the instruments. Their data will be sent to the IRIS Data Management Center, where it will be publicly accessible for anyone interested.

"The Alaska peninsula section has been especially interesting," Abers said. "These plates are steadily converging. The stresses are building up. This is the place it's been the longest since the last big earthquake (circa 1938), so seems like the most likely for the next one."

Abers once thought of earthquake prediction as a "fool's errand," but he's become more optimistic that by understanding how stresses can spread to other segments, seismologists may be able to develop a mechanism for specific causal prediction.

While the team must wait until next year to reap the full rewards of their research, they did experience seismic activity in real time. At least some of them did.

"There was a 6.9 aftershock while we were up there," Abers said. "But it was the middle of the night, so I slept through it."

More information: AACSE Blog: alaskaamphibious.wordpress.com/

Provided by Cornell University