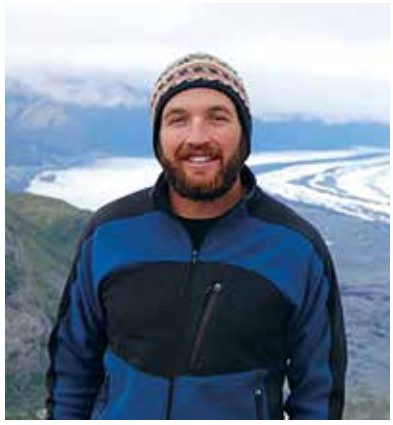
The Big Idea

Q. How can you predict the melt rate of a glacier?

A. Send in a team of scientists, including two OU researchers, for an in-depth study of an Antarctic glacier with global impact.

By Susan Grossman

We have all dropped a few too many ice cubes into a glass of water. The ensuing spill over the sides is a mess but containable with a handful of paper towels. This principle may sound simple, but is similar to a process at work on a glacier in Antarctica the size of Florida. However, the chunks of ice naturally breaking off this glacier ultimately could have massive global consequences that paper towels won't fix.



Jake Walter

Nori Nakata

To help understand this phenomenon, two University of Oklahoma scientists are contributing their expertise to a team of 100 international researchers studying the movement of the Thwaites Glacier in Antarctica. This unusually broad and fast-moving glacier flows into the Pine Island Bay, part of the Amundsen Sea, and is being closely watched for its potential to raise sea levels.

Jake Walter, seismologist with the Oklahoma Geological Survey, and Nori Nakata, assistant professor of geology at OU, will each be going to Antarctica as part of the International Thwaites Glacier Collaboration to study the speed of its retreat and the effect its collapse might have on coastal communities around the globe.

This international collaboration is a joint venture between the United States and the United Kingdom. Funded by the Natural Environment Research Council and the National Science Foundation, it is the largest joint project in Antarctica between the two countries in more than 70 years. Scientists from South Korea, Germany, Sweden, New Zealand and Finland will also be joining the project with researchers from universities such as Stanford, the University of Texas at El Paso and the University of Cambridge.

The $25 million project is organized into eight sub-projects all directed at trying to predict global sea-level rise resulting from the collapsing of the Thwaites Glacier.

Ice breaking from the glacier moves as if on a giant conveyor belt headed toward the ocean, explains Walter. This is a natural process. When snow falls in Antarctica, it accumulates,

Huge chunks of ice are breaking from the Thwaites Glacier in Antarctica faster than they are being replaced, which may contribute to a rise in sea level. Two OU scientists are part of an international team that will study the phenomenon and help determine its effect worldwide.

forming ice, and the resulting melting and flowing of glaciers from this accumulation is usually balanced.

The problem with the Thwaites Glacier lies in the fact that more chunks of ice are moving off of it than are being replaced, and at a faster rate, with nothing to hold this ice back from its path to open water.

"When the ice breaks off the glacier it raises sea levels," Walter says. "It is similar to ice you put in drinks. If things are out of balance and more ice is delivered to the ocean at a faster rate, sea levels will rise sooner rather than later."

To fully grasp what is causing the Thwaites Glacier to move so quickly, researchers will study the ice itself, the water underneath it, the edges, the ocean nearby and the climate in the region. Global warming could be a contributing factor in the glacier's accelerated melt rate, which has nearly doubled since the 1990s.

Nakata, an expert in seismic imaging, says his portion of the project involves creating multi-dimensional images of the glacier and what lies beneath it.

"I will be part of the team that will study the seismic structure of the glacier," he says. "The ice is thick, up to two kilometers, so we will use some techniques, similar to those we use to study earthquakes, to understand the properties of its movement, particularly underneath."

Summertime in Antarctica is two months long, December and January, offering the only window of opportunity for researchers to go to the region. Getting to the southernmost and coldest point on the planet is no easy feat. More expedition than trip – the nearest research station is nearly 900 miles from the glacier itself – planning is well under way for Walter's sojourn scheduled for this January. This will be his fourth trip to Antarctica.

"It's a complicated process," he says of his upcoming departure. "We fly commercially to New Zealand, and from there will take a military cargo plane to a landing site, then a smaller plane closer in, and finally a Skidoo to the base camp. While we will have satellite phones, we are basically on our own and have to take everything we need with us."

Nakata has never been to Antarctic and will go to the research site in two years. His group will use a variety of techniques to generate seismic waves to capture two- and three-dimensional images of what is underneath the glacier.

"Our team will be extracting the details of these images so we can create models of the ice to understand when and how the glacier is moving," he says. "We will see what is below affecting its behavior. This will help with predicting by how much, and when, sea levels will rise."

Those of us living far from open bodies of water may not worry about this retreating glacier on the other side of the globe. But it will have an impact in other ways.

"Our piece of the project is to hone in on the science and understand the physics of the ice flow," Walter says. "While ocean rising may not seem to have an effect on us here in Oklahoma, this phenomenon does affect us. When coastal areas flood, our tax money goes to disaster relief. We are connected all over the world by what happens with this glacier."

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