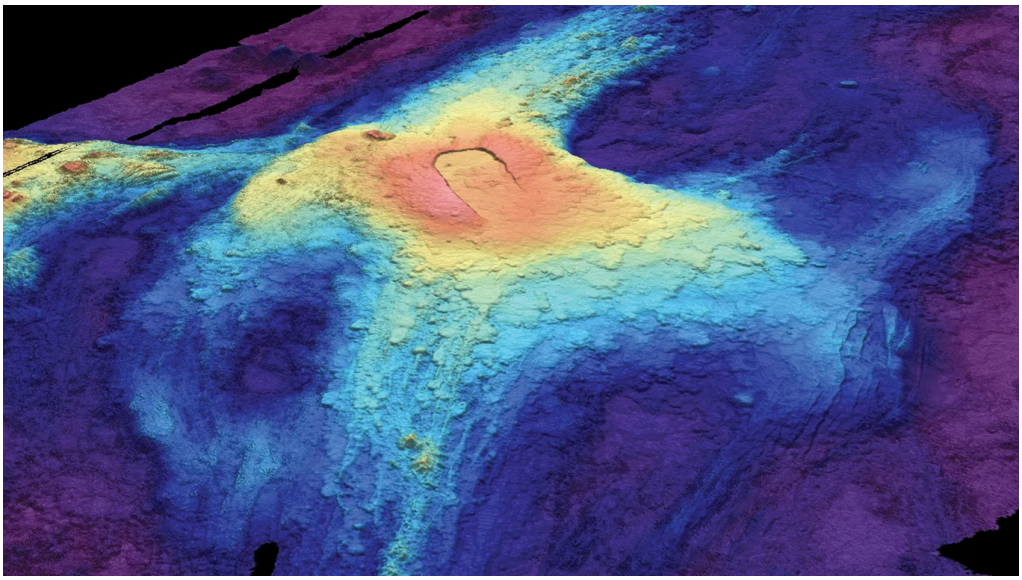
NEWS EARTH

Scientists predict an undersea volcano eruption near Oregon in 2025

Real-time data from Axial Seamount provides a good test case for eruption forecasting



A 3-D bathymetric (seafloor) map of Axial Seamount in July 2014 shows lava flows from previous eruptions. Red indicates lava at the highest elevation above the seafloor, while dark blue at the edges shows where lava flow was thinnest.

SUSAN MERLE/OREGON STATE UNIVERSITY

By Rachel Berkowitz

DECEMBER 27, 2024 AT 9:15 AM

An undersea volcano is likely to erupt sometime in 2025.

This much advance notice is a big deal, because forecasting eruptions more than hours ahead is “pretty unique,” says geophysicist William Chadwick. But 470 kilometers off the Oregon coast and over a kilometer beneath the

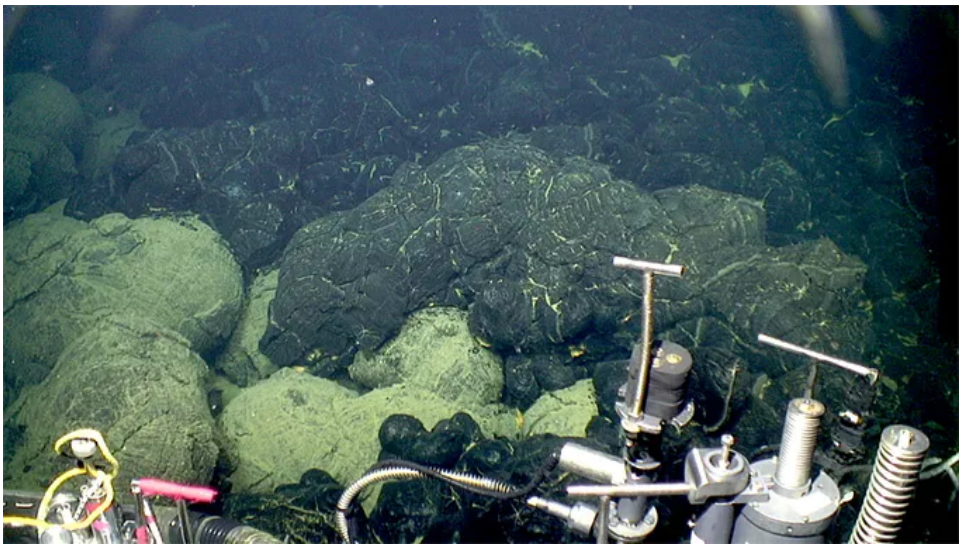
waves, a volcano known as Axial Seamount ticks all the boxes that hint at imminent activity, Chadwick and his colleagues reported December 10 at a meeting of the American Geophysical Union in Washington, D.C.

For the past decade, a suite of devices have been monitoring Axial's every action — rumbling, shaking, swelling, tilting — and delivering real-time data via a seafloor cable. It's "the most well-instrumented submarine volcano on the planet," says Mark Zumberge, a geophysicist at Scripps Institution of Oceanography in La Jolla, Calif., who was not involved in the work.

But in November, a particular milestone caught Chadwick's eye: Axial's surface had ballooned to nearly the same height as it had before its last eruption in 2015 — fortuitously, just months after monitoring began. Ballooning is a sign that magma has accumulated underground and is building pressure.

The 2015 swelling allowed Chadwick, of Oregon State University's Hatfield Marine Science Center in Newport, and colleagues to predict that year's eruption — "our best forecasting success," he says. The recent swelling, along with increased seismic activity that indicates moving magma, has led the researchers to narrow in on the next one.

The broader team of Axial researchers also has a new tool for estimating the day-of magma burst that will set things off. And other researchers recently used artificial intelligence to dig into recordings of earthquakes that preceded the 2015 eruption and identified exactly what patterns they should see hours ahead of the next one . "Will this precursory earthquake detection work?" Chadwick asks.



The edge of the 2015 lava flow at Axial Seamount (the dark lava at right) where it overlies older sedimented lavas (lower left).

BILL CHADWICK/OREGON STATE UNIVERSITY, ROV JASON/WOODS HOLE OCEANOGRAPHIC INSTITUTION

If it does, it will be a field day for volcanologists such as Rebecca Carey (*SN: 1/25/18*). Detecting early warning signals offers the "exciting opportunity to deploy remotely operated vehicles to catch the eruption occurring," says Carey, of the University of Tasmania in Sandy Bay, Australia. In addition to volcanology insights, she says, catching the eruption in the act would offer a glimpse into its effects on hydrothermal systems and biological communities nearby.

For human communities, volcanoes on land generally pose a bigger hazard than ones underwater do (*SN: 9/2/22*). But there are exceptions. For example, the 2022 Hunga Tonga eruption in the South Pacific Ocean triggered a tsunami that caused an estimated $90 million in damages (*SN: 1/21/22*). In general, Chadwick says, "forecasting is difficult." One disincentive for experimental forecasting on land is the risk of false alarms, which could cause unnecessary evacuations, and future distrust . At Axial, he says, "we don't have to worry about that."

Forecasting is only possible thanks to extensive monitoring data and knowledge of how a specific volcano behaves. "There's no crystal ball," says Valerio Acocella, a volcanologist at Roma Tre University in Rome. Rather, predictions are based on the expectation that when a volcano's activity reaches some threshold that it reached before, it may erupt.

Geophysicist Michael Poland of the U.S. Geological Survey's Cascades Volcano Observatory in Vancouver, Wash., agrees. Because most of today's efforts rely on recognizing patterns, he says, "there's always the risk that a volcano will follow a pattern that we haven't seen before and do something

unexpected." Both Poland and Acocella hope that forecasts will evolve to be based on the physics and chemistry of the magma systems that underlie a volcano.

Until then, scientists will learn what they can from any successes. And Axial is a good place to try, Acocella says. It has relatively frequent eruptions, and each one is an opportunity to test ideas. That regular behavior makes Axial "a very promising volcano," he says. "We need these ideal cases to understand how volcanoes work."

Whatever happens in 2025 won't change the world of eruption forecasting. But, Acocella says, "we'll understand it better, and that will help us understand other volcanoes, too."

CITATIONS

W.W. Chadwick *et al.* Axial Seamount has suddenly woken up! An update on the latest inflation and seismic data and a new eruption forecast. American Geophysical Union meeting, Washington, D.C., December 10, 2024.

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Warm wishes for a joyful holiday season,
The Science News Team