

Not My Fault: Eruption in the Atlantic raises tsunami fears

Lori Dengler/For the Times-Standard
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A volcanic eruption began three weeks ago on La Palma in Spain's Canary Islands, about 300 miles off the coast of Africa. The eruption of Cumbre Vieja volcano has produced lava flows extending two miles downslope into populated areas resulting in more than 5000 evacuations. Hundreds of buildings have been damaged/destroyed and ash fall has covered 14,000 acres.

Much of the media coverage has not been about the current eruption but focused on the potential for a catastrophic landslide producing a megatsunami. It is useful to look at the basis of the media hype and what the likely outcomes of the current eruption.

The Canaries include seven inhabited islands and a number of smaller islets that are home to over 2.1 million people. It is a major tourist destination with at least 4 million annual visitors in pre-pandemic times. The islands owe their existence to a geologic hotspot, a concentrated plume of hot rock originating deep within the earth's mantle, that formed beneath the African plate about 70 million years ago.

The Canary islands likely formed, succumbed to erosion, and reformed many times since then. The oldest rocks (~20 million years) are on the island of Fuerteventura on the east. La Palma is one of the newest; its earliest rocks are less than 2 million years. It has also been the most volcanically active with seven documented historic eruptions since 1470.

La Palma is dominated by Cumbre Vieja, a volcanic ridge running nearly the length of the island from north to south. The largest historic eruptions were in 1677 and 1971 and rated a two on the Volcanic Explosivity Index (VEI), a qualitative measure of the size and vigor of an eruption. Two means modest explosions - more ejecta than a typical Hawaiian eruption but not nearly as violent as Mt. St. Helens.

The current eruption began with the sudden onset of seismic activity on September 11. Spain maintains a

network of instruments to monitor volcanic activity in the Canaries. The initial earthquakes were small in magnitude (<M3.5) and about 20 miles beneath the surface but became shallower over the next few days. The network recorded over 22,000 small earthquakes in the following week.

Three days after the onset of seismic activity, the regional government raised the volcanic alert level to yellow, the second stage of Spain's 4-stage alert system. Tilt meters and GPS monitoring detected a few inches of swelling, confirming a likely rise in magma. Localized evacuations were ordered.

A fissure eruption began on September 19, with lava flows observed in the Cabeza de Vaca area just east of the city of El Paso and the eruption alert level raised to the highest level (red). The initial flows were effusive (VEI 0), but the proximity to residences prompted the evacuation of at least 5000 people. A week into the eruption, small explosions spread ash over much of the central and southern part of the island and raised the VEI to 2. Involcan, the Canary Islands volcano institute, estimates about 10,000 tons of sulphur dioxide gas continues is emitted in the atmosphere every day as the eruption continues.

What next? If it follows a similar pattern to 1971, eruptive activity will soon slow and in a few weeks, Cumbre Vieja will settle back into dormancy. Evacuation orders will be lifted, structures rebuilt, and the new ash will become incorporated into the rich soils that support the many banana plantations of the west side of the island.

But there is always uncertainty about an event in progress. It's quite possible the current eruption could last longer than 1971. Some European volcanologists are forecasting it could continue into November, with continued lava flows and modest explosive activity. No one is forecasting that the eruption will turn far more explosive.

Where does a tsunami fit in? Volcanic eruptions can produce tsunamis. Two of the deadliest tsunamis on record were associated with volcanism. Thirty-seven hundred years ago, a violent eruption of Santorini in the Aegean sea triggered a tsunami that devastated Crete and dealt a blow to the Minoan civilization. In 1883, the eruption of Krakatoa in Indonesia was followed by a tsunami that likely killed 36,000 people.

There is no evidence that a Santorini or Krakatoa-scale eruption is likely in the Canary Islands. Those were both huge eruptions (~VEI 6) and the geologic setting of the

Canaries doesn't lend itself to that scale a blast. The La Palma tsunami buzz comes from a different source. Tsunamis can also be caused by submarine landslides and some scientists have speculated that the Canary Islands are vulnerable to a catastrophic collapse.

In 2001, a paper was published about the collapse of the flank of Cumbre Vieja volcanic system and an ensuing great or megatsunami. Geologist Simon Day posed that La Palma was in the early stages of a collapse due to the migration of the African plate over the hotspot and changes in the plumbing system. He teamed with Steven Ward who modeled the tsunami. The story made headlines in the media and a resulted in a number of sensationalized documentaries postulating waves large enough to cause damage along the US east coast and in Europe.

Since then, the work has garnered substantial criticism both in the geology and tsunami communities. Assumptions in the modeling are argued as unrealistic and other modelers were not able to replicate the results. A credible summary of the Canary Islands tsunami potential is at

<https://www.e-education.psu.edu/earth107/node/1609>.

Steep ocean islands are inherently unstable, and landslides will occur. Over the course of many millennia, some of the slides in the Canary islands will be large enough to produce tsunamis. The largest of these could impact the adjacent African coast and possibly southern Europe but is unlikely to make waves as far away as the US. And there is no evidence that the current Cumbre Vieja eruption has made large landslides in the near future more likely. Stay tuned – I will let you know if this assessment changes.

Lori Dengler is an emeritus professor of geology at Humboldt State University, an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times-Standard's. All Not My Fault columns are archived online at

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