

Not My Fault: The volcano – safety dilemma

Lori Dengler/For the Times-Standard
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New Zealand's Whakaari/White Island volcano erupted last Monday. The volcano is located in the Bay of Plenty, 30 miles off the NE coast of the North Island. It was a short-lived eruption, lasting only a few minutes, but long enough to prove deadly. As I write, the eruption has claimed 15 lives, and caused 30 injuries, 22 still considered critical. Two people are missing and presumed lost, making this New Zealand's fourth deadliest eruption in historic times.

Eruptions are no surprise in New Zealand, a country that straddles two subduction zones. There are at least thirty potentially active volcanoes, eight of which have erupted in historic times. Eleven eruptions caused one or more fatalities. Like most volcanoes associated with subduction zones, they are composite cones with complex eruptive histories, sometimes oozing relatively placid lava flows and at other times exploding thousands of tons of material violently into the sky.

New Zealand's volcanoes are extremely variable in eruptive characteristics and history. Some, like the supervolcanic complex in Taupo, may be dormant for many centuries and then produce catastrophic eruptions like the one 26,500 years ago argued to be the largest anywhere on earth in the past 70,000 years. Whakaari is at the opposite end of the activity spectrum, frequently producing small eruptions. It erupted nearly continuously between 1976-2000 and from 2011 to the present and is currently New Zealand's most active volcano.

The island is uninhabited but was the site of mining operations from the 1880s into the 1930s. In 1914, part of the crater rim collapsed sending a debris avalanche onto the housing area, killing all 10 people in the mining camp. Today, Whakaari is privately owned but several tour operators and cruise ship lines have been permitted to access the island, offering boat rides around the cone and hikes into the crater itself. All of the victims of this week's eruption were tourists or employees of the tour companies.

"What caused the volcanic eruption on New Zealand's White Island and why was there no warning?" read the

headline from The Guardian Newspaper (12/9/19). We know the cause – a sudden blast of steam and other gasses. Like the activity of the past few decades, this was a phreatic eruption, powered by superheated gas. There is magma (molten rock) beneath the island, but no evidence that any made it to the surface in this eruption. Magma is a complex mixture of different compounds. As it rises or rests beneath the surface, some gas slowly leaks out. Much of the gas may seep out at the surface but some may slowly accumulate in underground pockets. At a certain point, these gas pockets suddenly and unpredictably become unstable and explosively burst to the surface, blasting rock fragments into the air.

New Zealand volcanologists (among the best in the world) are very familiar with this process. Whakaari has been monitored for decades. Instruments measure gas emissions, tiny seismic tremors that may signal moving magma and surface ground deformation. It's not true there was no warning. In late October, GNS, the New Zealand agency responsible for volcano alerts, noticed a slight increase in gas emissions and seismic signals and noted "Whakaari/White Island may be entering a period where eruptive activity is more likely than normal."

By November 18th, the gas emissions and seismic activity had become strong and variable enough for GNS to up the alert level from 1 to 2. New Zealand uses an alert system similar to the US where zero means no threat and five is a major eruption in progress. Two means heightened activity and an increased volcanic threat. The bulletins issued over the next two weeks continued to note the increased activity.

Phreatic eruptions are extremely difficult to predict on a short time scale. Primary eruptions, where magma moves upward until it breaks through to the surface, usually leave a bigger footprint of precursory activity for scientists to measure. The rising magma produces earthquakes, tremor, ground deformation and gas signals, which, if sufficiently instrumented, can sometimes forecast major eruptions within days or weeks. The small pocket(s) of gas accumulation that caused Monday's eruption are impossible to see. GNS did recognize an activity uptick and made as specific a warning as they could, and noted an eruption could occur at any time.

A third question not asked in The Guardian headline is more troublesome – why were tourists allowed access to a place which, in hindsight, was very dangerous to visit. Touring White Island became an attraction about thirty years ago and has become more popular as interest in geology and ecotourism has increased. Although in an

“active phase” for much of that time, there had never been an injury or death due to volcanic activity before this week.

This was a small eruption and the only way to be injured or killed was to be right on top of it during its two-minute blast. As a privately owned piece of real estate, access to the island is a matter of agreement between tourist concessions and the owner. Tour companies usually required tourists visiting the island to sign a liability release acknowledging they were aware of potential hazards, but the online materials I’ve seen did not emphasize this could be a very risky thing to do. The chair of the White Island Tour’s holding company told Radio New Zealand that this week’s GNS advisory level didn’t meet their thresholds for stopping operations.

Even had there been no advisory increase, a volcano prone to phreatic eruptions is very tricky to forecast and all of the GNS statements warned eruptions could occur without warning at any time. Geologists had raised concerns for years, saying it was a disaster waiting to happen. Whakaari is very different from relatively placid basaltic Hawaiian volcanoes whose behavior can be predicted on the scale of days or weeks. I have very fond memories of sitting only twenty feet away from a lava flow pouring into the ocean on a Hawaiian holiday. During the 37-year recent Kilauea eruption period, five deaths were reported, but all because people hiked into areas where they shouldn’t have gone.

I spent part of my sabbatical year in New Zealand in 2001. It is a geological/natural disaster theme park for earth scientists and it is one of the most memorable places I’ve ever seen. From the rivers to the glaciers to the volcanic terrain, it is a chance to observe geologic processes in near real time. I was never tempted to visit Whakaari on that trip but I understand the attraction. At first thought – what a great idea to see a volcano puffing away. That is, until last Monday. New Zealand, the country that invented many extreme sports, is far more relaxed about people risking life and limb than the United States. Their health insurance covers the cost of care for people injured in accidents regardless of nationality. But it is a no-fault country, meaning that organizations cannot be found at fault or sued. But police are investigating what went wrong and it will be interesting to see if access policies to Whakaari change.

Note: Volcano/eruption data from NOAA’s National Center for Environmental Information <https://www.ngdc.noaa.gov/hazard/>. Bulletins from GNS can be found at <https://www.geonet.org.nz/>

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