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Not My Fault: Iceland erupting again

Lori Dengler for the Times-Standard
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View of the February 8 eruption looking WSW towards the town of Grindavik. Lava flows severed the hot water pipeline leading from the Svartsengi Power Station to communities on the western end of the Reykjanes Peninsula (Iceland Met).

On February 8, a volcanic fissure eruption began on Iceland's Reykjanes Peninsula. The eruption was no surprise to the Iceland Meteorological Agency (Iceland Met) who closely monitors all of the country's volcanic centers. They had noted steady inflation of the ground since the last eruption ended in mid-January. A half hour before lava fountains spewed forth, a burst of earthquakes occurred, and evacuation orders were reinstated.

Eruptions appear to have become the new normal on the Reykjanes Peninsula. But earthquakes and eruptions are indications of a planet in constant change, and it would be a mistake to assume the pattern of the last two months is a predictor of what will happen in the next months and years. What is happening in Iceland has lessons for all of us. Geologic processes just occur much more rapidly on this small island in the Northern Atlantic.

The Reykjanes Peninsula is the most populated area of Iceland, and more than half its citizens live within thirty miles of the current eruptive center. The capitol Reykjavik is at the eastern end of the Peninsula and residents have been treated to spectacular views of lava fountains in the dim winter light near the arctic circle. There are no volcanic hazards in the capitol, and I would have no qualms to visit there right now.

The Volcanic Explosivity Index (VEI) is a qualitative descriptor of eruption style. It is an open-ended scale that runs from 0 to 8 for known eruptions and is based on the height of the eruptive plume and the volume of material ejected. We've never witnessed an 8, but geologic evidence points to the last cataclysmic eruption of the Yellowstone Caldera 600,000 years ago as reaching this value. The eruption Mt. Mazama in Oregon the created Crater Lake was a 7 and the 1980 Mt. St. Helens eruption earns a 5 on the VEI scale.

Almost all Iceland eruptions fall on the low end of the VEI scale, 0s and 1s. A VEI of 0 means effusive and flowing. It may have a few lava fountains that make it a hundred feet into the air. A 1 is not much bigger, with fountains up to 600 feet high but still producing no pumice or ash. The reason for this non-explosive behavior is the basaltic composition of the magma. All magmas are made up primarily of silica – a mixture of silicon and oxygen. When cooled, it crystallizes into the silicate minerals, like quartz and feldspar and form the most common rock types on the planet.

The higher the percentage of silica, the more viscous the magma. All magmas contain gas. The gas is held in solution by the pressure deep below ground. But as the magma rises to the surface, the gas escapes. In a low viscosity magma, the gas can easily bubble out. In a high silica magma, the gas is trapped and when the magma reaches the surfaces it explodes violently, propelling particles of magma high into the atmosphere.

The two most common places in the world to observe these low silica eruptions are Hawaii and Iceland. Volcanologists have appended the terms 'Hawaiian' and 'Icelandic' to describe their eruptive styles. The only significant difference is that Hawaiian eruptions usually erupt from a single center and Icelandic are most often fissures, elongated rifts several miles in length with lava emitted at the same rate along the entire rift.

Not all Iceland eruptions are 'Icelandic' in character. The most dangerous volcanoes are in the central and southeastern part of the Island. There are several reasons why these volcanoes can by more violent. Most are capped by glaciers and even low silica magmas can become explosive when interacting with water. The highest volcanic blast ever observed with modern instruments was the January 2022 eruption in Tonga, likely driven in part by the influx of sea water. NASA scientists were able to measure the water plume it carried into the stratosphere, enough to fill 58,000 Olympic-sized swimming pools (see note below).

When Iceland's volcanoes erupt beneath glaciers, they can pose hazards both nearby and far away. Melting vast quantities produces glacial outburst floods (jökulhlaup) that can sweep across the landscape quickly burying everything in its path in thick mud. When ice and water come into contact with molten rock, it can quickly flash to steam and, like Tonga, propel ash high into the atmosphere. This happened in the 2010 eruption of Eyjafjallajökull when the jet stream carried the particulate to Europe and caused hazardous conditions for air travel.

This is not the situation for the Reykjanes Peninsula. The last glaciers melted from this part of Iceland roughly 15,000 years ago and as long as eruptions are on land, they pose little threat of ash and explosions. There have now been six eruptions in this area since 2021 and all have fallen into the VEI 0 class. Only one death has been attributed to the sequence and it was not

the direct result of an eruption. A man working to fill in a crack in Grindavik caused by surface deformation fell into the fissure; his body was never retrieved.

There have been consequences. Grindavik is still uninhabitable, and it is unclear whether the town can ever be reoccupied. Thursday's eruption severed the hot water pipe from the Svartsengi Power Station to the rest of the Peninsula, including Keflavik International Airport. Disruption of a hot water line in Iceland has a different meaning than the rest of the world. Almost all of Iceland's heating is provided by these geothermal waters. Losing the line meant approximately 10% of Iceland's population is without heat and it is frigid at this time of year.

Iceland has been quick to respond to the threats posed by the current volcanic activity. Lava barriers constructed after unrest in November have diverted the recent flows from both the Svartsengi Power Station and Blue Lagoon. The Power Station can be remotely controlled so that no personnel are on site. Awork on a back up water line started the day before the eruption and is expected to be completed today.

The Reykjanes Peninsula was volcanically quiet for roughly 800 years. It re-awoke in 2021 with eruptions spaced nearly a year apart in 2022 and 2023. It seems to have entered a new phase in late 2023 with eruptions in December followed quickly by similar eruptions in January and last Thursday. These latest eruptions have all started with eruptive fountains and lava flows that quickly abate, lasting only a few days. Icelandic Met expects another eruptive round in perhaps three weeks.

We always want to find a pattern in what is going on. Patterns mean predictability and are easier to manage. But the landscape and the stress regime are constantly changing with each eruptive cycle. Icelanders are bracing themselves for what could be many years of volcanic uncertainty. The last eruptive period in the ninth century persisted for nearly 100 years.

Icelandic ingenuity shows how quickly and effectively people can respond to an immediate crisis. Volcanic eruptions are abrupt, and the consequences are obvious to everyone. We are not nearly as good at recognizing the more subtle impacts of slower onset disasters such as climate change. Unfortunately, those consequences are likely to be far more dire. We need to approach it with as much urgency as Icelanders facing their volcanic hazards.

Note: more on how much water the Tonga eruption blasted into the atmosphere at https://www.nasa.gov/centers-and-facilities/goddard/tonga-eruption-blasted-unprecedented-amount-of-water-into-stratosphere/

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-Standard's. All Not My Fault columns are archived online at https://kamome.humboldt.edu/taxonomy/term/5 and may be reused for educational purposes. Leave a message at (707) 826-6019 or email Kamome@humboldt.edu for questions and comments about this column. The new 2023 edition of the preparedness magazine "Living on Shaky Ground" is posted at https://rctwg.humboldt.edu/prepare/shaky-ground.