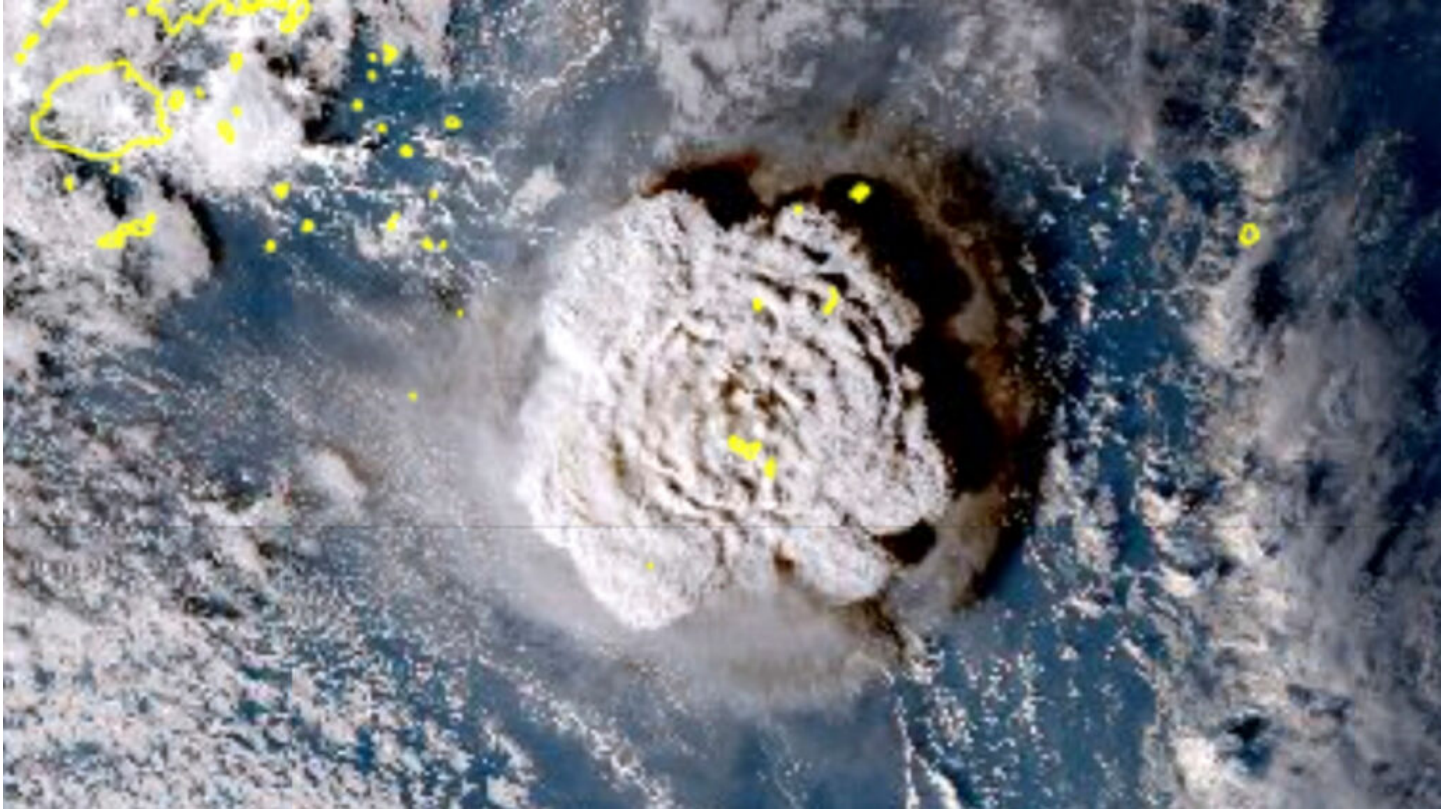


EARTH

A volcanic eruption sparked the highest lightning ever seen

The eruption plume caused flashes up to 30 kilometers (nearly 19 miles) above sea level



In 2022, a volcano erupted in Tonga, a country in the South Pacific. This image from a weather satellite shows the eruption's plume of gas and ash. During the eruption, lightning flashed through the plume far above the ground.

JAPAN METEOROLOGY AGENCY VIA AP

By **Skyler Ware**

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In 2022, an underwater volcano in the South Pacific island nation of Tonga made history. It spewed a plume of ash and water high enough to touch space. It also [launched a tsunami as tall as the Statue of Liberty](#). Now, scientists find that it triggered lightning at the highest [altitudes](#) ever seen.

The eruption plume [sparked lightning flashes](#) that began 20 to 30 kilometers (about 12 to 19 miles) above sea level. That's all the way up in

the [stratosphere](#) — even higher than most airplanes fly.

Researchers shared these findings on June 28. The work appeared in *Geophysical Research Letters*.

Let's learn about lightning

Lightning is most often born inside storm clouds. But lightning can also form inside a volcano's eruption plume. That plume is made of tiny bits of ash, gas and dust. When these tiny bits bump into each other, they make static electricity. Once enough static electricity builds up, lightning zips through the plume.

Alexa Van Eaton led a team that looked at how high the Tonga eruption's lightning was. She's a volcano scientist at the U.S. Geological Survey's Cascades Volcano Observatory. That's in Vancouver, Wash.

To estimate the lightning's height, Van Eaton's team looked at a few different types of data. One was radio waves created by the lightning. They also examined satellite images of the eruption plume and [infrared](#) light from the flashes.

These data revealed the lightning started more than 20 kilometers (12 miles) above sea level. Lightning doesn't typically start that high. Air pressure at that height is usually too low to form lightning "leaders." These are the channels of hot [plasma](#) that make up the lightning in thunderstorms.

Explainer: The volcano basics

The rising eruption plume may have increased the air pressure over the volcano, says Van Eaton. That might have been enough to create lightning leaders at strangely high altitudes.

In those eruption data, “we’re seeing stuff that we’ve never seen before,” says Jeff Lapierre. He’s a coauthor on the study. He’s also the principal lightning scientist at the Advanced Environmental Monitoring. It’s a company based in Germantown, Md.

This eruption has “completely changed the way we think of how natural events can change the atmosphere,” Lapierre says. It’s also changed “the environment where we thought lightning could exist.”

CITATIONS

Journal: A. Van Eaton et al. [Lightning rings and gravity waves: Insights into the giant eruption plume from Tonga’s Hunga Volcano on 15 January 2022](#). *Geophysical Research Letters*. Vol. 50, June 28, 2023. doi: 10.1029/2022GL102341.