Lightning Strikes from the Mouths of Volcanoes

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Volcanoes can trigger earthquakes, avalanches and devastating lava flows. Add to this list lightning, which has now been detected striking from the mouth of a mountainous beast.

A new study reveals the first direct observations of this well-known but poorly understood volcano-electrical phenomenon.

“Lightning is often seen during [a] volcanic eruption,” said study author Ronald Thomas of New Mexico Tech. “It occurs mostly during the big part of the eruption, when there are big volcanic plumes being produced.”

‘Hisses and pops’

To get a better look at the lightning, Thomas and his colleagues set up radio receivers around Mount Augustine, an Alaskan volcano on an uninhabited island in Cook Inlet that erupts about every 10 years.

Thomas has used the same radio system to study lightning produced elsewhere by thunderstorms. Just like this lightning, volcanic lightning emits impulses. (During a thunderstorm, these can be heard as “hisses and pops” on a car radio.)

The radio receivers at multiple stations pick up the impulses, and the researchers can use them to pinpoint where the lightning occurred in a cloud based on when the impulses arrived at each station, similar to the way seismologists find the epicenter of an earthquake.

“So we can get a picture, in 3-D, of what the lightning looks like inside the cloud,” Thomas said.

Two phases

The lightning in a volcanic eruption occurs because the ash and other debris blasting out of the volcano are highly charged.

Though lightning was known to occur in the debris clouds above the volcano, the researchers found an earlier phase of volcanic lightning that had never before been observed and occurred right at the volcano's mouth just as it began erupting. The details of the study are described in the Jan. 23 issue of the journal *Science*.

Thomas described this phase as “big sparks maybe going just from the mouth of the volcano up into the column that’s shooting out of the volcano, and then some lightning that went upward from the top of the volcano up into the cloud that was forming.”

As the debris cloud gathered over the volcano, lightning began to form in the cloud itself.

"That lightning up in the big cloud is much like thunderstorm lightning, with lots of branches and lashing about for about half a second like it does in the thunderstorm," Thomas told *LiveScience*.

During the second phase of the Augustine eruption, the scientists only saw lightning that traveled within the cloud, but volcanic lightning has been known to strike the ground before. During the eruption of Mount St. Helens in 1980, volcanic lightning caused forest fires in the surrounding area, Thomas said.

A 'very vigorous thunderstorm'

The lighting lasted for only 10 minutes during the Augustine eruption, but during that time the researchers saw 300 lightning bolts, which Thomas says compares to a "very vigorous thunderstorm," like those seen during the summer in the Midwest.

Thomas suspects that the occurrence of lightning could have to do with the strength of the eruption and the type of volcano. Stronger eruptions produced more highly charged debris and so may produce more lightning.

"In other big eruptions, it seems to be pretty common," Thomas said.

Volcanoes like those in Hawaii, which for now produce only lava flows, he said, likely do not generate any lightning.