

Volcanic Lightning

Science friction lights up the sky

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[Volcanic lightning](#) has very little to do with [tectonic activity](#), and everything to do with everyday [physics](#).

Volcanic lightning is not formed deep in the Earth. It only forms in a [volcanic plume](#), the [cylinder-shaped](#) column of [volcanic ash emitted](#) by some erupting volcanoes. [Volcanoes](#) that lack a thick volcanic plume usually lack volcanic lightning. Volcanoes in Hawaii, for instance, are more likely to [eject fluid lava fountains](#) than thick plumes of ash. These volcanoes rarely have volcanic lightning.

The tiny [particles](#) that make up a volcanic plume are tightly [compressed](#) beneath a volcano. The airy [atmosphere](#) aboveground, however, is much less [dense](#). This change in density contributes to volcanic lightning.

As densely packed particles are [violently](#) ejected in a volcanic plume, they rub against each other. This interaction is called [friction](#). Through friction, ash particles gain and lose [electrons](#)—they become electrically charged. As charged particles [ascend](#) the less-dense volcanic plume, the plume experiences [charge separation](#). Positively charged particles become increasingly separated from negatively charged particles.

When the charge separation becomes too great for air to resist the flow of [electricity](#), lightning tears through the volcanic plume to connect the positively and negatively charged particles.

Everyday Lightning

You don't need an actual volcano to get an idea of how volcanic lightning works. Friction creates charged particles when you rub a balloon across your hair or your socked feet across a carpet. You're covering the balloon or yourself with negative particles. This imbalance of electrons is called [static electricity](#).

Eventually, you come into contact with something—another person or a metal doorknob, for instance—that is not electrically charged. The static “shock” you receive is the lightning-fast [discharge](#) of electrons.

Questions

- Volcanic lightning is most often reported at night. Why do you think people are more likely to

report seeing volcanic lightning at night than during the day?

Volcanic lightning is most likely to appear at the beginning of an eruption, no matter what time of day that happens.

People are more likely to see volcanic lightning at night, however. Volcanic lightning may crackle during daytime eruptions, but is more likely to be lost in the sun's glare.

- Lightning from thunderclouds can appear as bolts, sheets, or balls. What shapes do you think volcanic lightning can take?

All of the above! During the 1980 eruption of Mount St. Helens, Washington, for instance, the thick volcanic plume produced bolts of lightning connecting to the ground, sheet lightning connecting in the plume itself, and ball lightning bouncing near the volcano.

- A common nickname for the conditions that support volcanic lightning is a "dirty thunderstorm." What makes this thunderstorm "dirty"?

The "dirt" is the **thick ash and rock of the volcanic plume**.

Vocabulary

Term	Part of Speech	Definition
ascend	<i>verb</i>	to go up.
atmosphere	<i>noun</i>	layers of gases surrounding a planet or other celestial body.
charge separation	<i>noun</i>	building of space between charged particles. Sometimes called static electricity.
compress	<i>verb</i>	to press together in a smaller space.
cylinder	<i>noun</i>	tube or long, circular object.
dense	<i>adjective</i>	having parts or molecules that are packed closely together.
discharge	<i>verb</i>	to eject or get rid of.
eject	<i>verb</i>	to get rid of or throw out.
electricity	<i>noun</i>	set of physical phenomena associated with the presence and flow of electric charge.
electron	<i>noun</i>	negatively charged subatomic particle.
emit	<i>verb</i>	to give off or send out.

Term	Part of Speech	Definition
erupt	<i>verb</i>	to explode or suddenly eject material.
fluid	<i>noun</i>	material that is able to flow and change shape.
friction	<i>noun</i>	force produced by rubbing one thing against another.
lava fountain	<i>noun</i>	phenomenon where lava is forcefully but not violently ejected from a volcano through a fissure or vent.
particle	<i>noun</i>	small piece of material.
physics	<i>noun</i>	study of the physical processes of the universe, especially the interaction of matter and energy.
static electricity	<i>noun</i>	motionless electronic charge that builds up on a material.
tectonic activity	<i>noun</i>	movement of tectonic plates resulting in geologic activity such as volcanic eruptions and earthquakes.
violent	<i>noun</i>	strong, destructive force.
volcanic ash	<i>noun</i>	fragments of lava less than 2 millimeters across.
volcanic lightning	<i>noun</i>	bolts of electricity produced in a volcanic plume. Also called a dirty thunderstorm.
volcanic plume	<i>noun</i>	cylinder-shaped structure of volcanic ash and gas emitted by an explosive volcanic eruption. Also called an eruption column.
volcano	<i>noun</i>	an opening in the Earth's crust, through which lava, ash, and gases erupt, and also the cone built by eruptions.

Articles & Profiles

- [Popular Science: Where Does Volcano Lightning Come From?](#)
- [Oregon State University: Volcanic Lightning](#)
- [Discovery News: Volcanic Lightning: How does it work?](#)

Images

- [National Geographic News: Volcanic Lightning Illuminated](#)



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