

Fumarole Encyclopedia Article

Fumarole

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Contents

Fumarole Encyclopedia Article.....	1
Contents.....	2
Fumarole.....	3

Fumarole

Any opening in the ground that emits hot steam or gas is a fumarole. Fumaroles are common on the flanks of volcanoes as well as in their craters and calderas. Extensive fumarole fields occur in areas where a shallow volcanic heat source is overlaid by water-permeable **rock**, as at Yellowstone National Park in the United States and Rotorua in New Zealand.

All fumaroles require both heat and a source of gas or **water**. They are most often supplied with heat and gas by **magma** or masses of freshly ejected volcanic rock and with water by **precipitation** that seeps into the ground. Subterranean heated water also produces hot **springs** and geysers; hot springs are more common than fumaroles, geysers less common. Geysers are distinguished from both hot springs and fumaroles by their specialized plumbing systems, while the difference between a hot spring and a fumarole is simply the degree of heating. If the heat source is not strong enough to boil water, the result is a hot spring. Even if water is boiled, the resulting steam may be condensed by passing through liquid **groundwater** before reaching the surface, in which case the result is still a hot spring. Only if steam reaches the surface is a fumarole produced. Some vents are hot springs in the wet season and fumaroles in the dry, when there is less groundwater to condense steam rising from below.

A deposit of hot ash and shattered rock laid down by an explosive volcanic eruption may cover many square miles of ground and be hundreds of feet deep. During the years it takes to cool, such a deposit may produce a vast field of fumaroles. This occurred in the Valley of Ten Thousand Smokes in Alaska, where a thick ash-and-rock layer was laid down by a large eruption in 1912. Immediately after deposition, this layer was dotted by tens of thousands of fumaroles, some venting from openings many feet across. Over the next half-century, as the underlying mass cooled, most of these fumaroles became extinct.

Fumaroles whose gases are particularly sulfurous are termed solfataras. (Some geologists use the terms fumarole and solfatara synonymously regardless of sulfur content.) Furthermore, some gas-emitting vents have temperatures below the boiling point of water and emit mostly **carbon dioxide** (CO₂) and other gases with little water vapor; geologists term such dry, cool vents mofettes to distinguish them from fumaroles.

See Also

Crater, Volcanic; Hydrothermal Processes; Volcanic Vent