

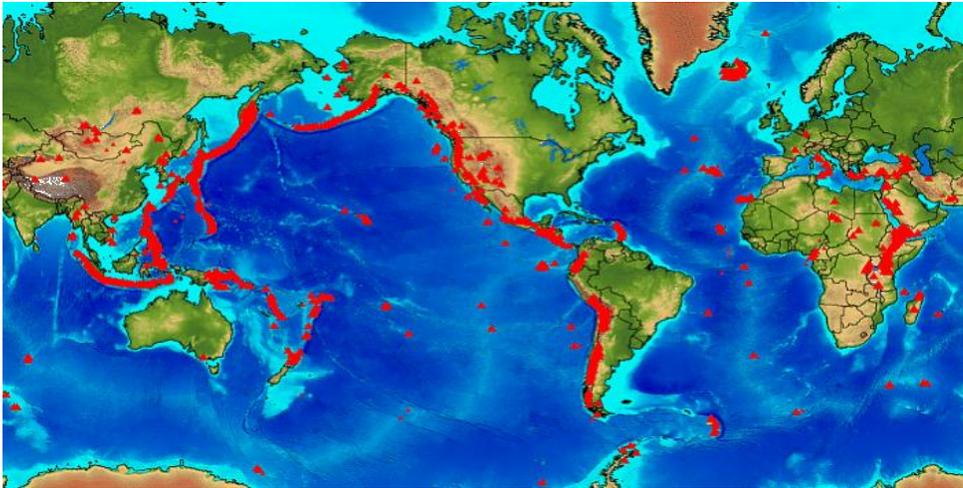
# Volcanoes

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A volcano is a rupture in the Earth's crust which allows magma/ash/gases to escape from beneath the surface. When magma reaches the surface of the Earth, it is called lava.

Most volcanoes occur along or near the margins of tectonic plates, where plates move away from each other or collide.

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**At divergent plate boundaries**, oceanic plates move away from each other and hot magma rises and cools to form new crust. That means most volcanic activity occurs under the sea. Where there is a lot of activity, volcanic material can build up above sea level, forming an island such as Iceland.

**At convergent plate boundaries**, oceanic "lithosphere" (the crust and upper mantle) sinks back into the mantle, often forming a deep ocean trench. The volcanoes that can form near to these trenches are amongst the most dangerous on Earth, because they are typically explosive and many are located near populated coastlines.

**In the middle of plates** volcanoes sometimes occur. Some geologists think this is because of hot mantle plumes, which create chains of volcanoes as the plate moves over them – but not everyone agrees! The Hawaiian islands are the best known example – the Big Island of Hawaii rises 10 kilometres above the ocean floor.

## Volcanoes in the UK?

Great Britain no longer has active volcanoes as we are now in a tectonically quiet part of the world. But we had an eruptive past. You can still see evidence of volcanoes in the Lake District, Snowdonia, NW Scotland and Northern Ireland, from eruptions that happened millions of years ago. Arthur's Seat in Edinburgh is part of a 350 million year old volcano.



Arthur's Seat from Blackford Hill

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## Did you know?

Ash blasted into the atmosphere during an eruption may cause intense thunder and lightning.

Major volcanic eruptions eject sulphurous gases high into the atmosphere, causing temporary cooling at the Earth's surface. Volcanoes also emit carbon dioxide - but only about 1% of what human activities add annually, so not enough to contribute to global temperature rise.

## Significant historical eruptions

Volcanic eruptions are classified on a numerical scale called the Volcanic Explosivity Index (VEI), from 0 to 8

Year	Location	Major features
1783	Iceland (Laki fissure)	Eight month long eruption; Europe-wide environmental disaster. A fifth of Iceland's population was killed mostly as a result of famine.
1815	Indonesia (Tambora, Sumbawa Island)	The largest eruption in recorded history: Magnitude 7. It triggered the "Year without a summer" in 1816
1883	Indonesia (Krakatau, between Java and Sumatra)	Massive pyroclastic flows and tsunamis; (which killed around 36,000 people) smaller waves even recorded in the English Channel.
1902	Martinique (St Pierre)	29 000 inhabitants of St Pierre killed in seconds by pyroclastic flows.
1980	USA (Mount St Helens)	An eruption triggered by an earthquake led to the largest debris avalanche in recorded history. Covered Washington State in fine grey dust.
1985	Columbia (Nevada del Ruiz)	Sudden melting of the icecap on the volcano's summit produced mudflows killing 23 000 people
1991	Philippines (Mount Pinatubo)	Major explosive eruption with pyroclastic falls and ash falls.

### Did you know?

Despite the danger, millions of people live close to active volcanoes, sometimes through lack of choice. Chemical weathering of volcanic deposits can release minerals that become a natural fertilizer. One example is the intensely cultivated area around Naples, Italy, which has the eruptions of Mount Vesuvius to thank for its rich soils and top quality fruit and vegetables.

### Can we predict an eruption?

Because they are hazardous, volcanoes need to be monitored. Unlike earthquakes, it is possible to predict a volcanic eruption. Earthquake sensors (seismometers) and gravity meters can track the movement of magma and gas to the surface.

The swelling of a volcano can be monitored using tiltmeters, laser rangefinders and global positioning system (GPS) equipment. All this technology means prediction is getting more accurate – but is still not perfect.

### What comes out of volcanoes?

**Lava:** the chemical composition of the lava will determine whether an eruption is explosive or more gentle. When gases can escape easily the eruption will be less violent

**Explosive particles:** hot fragments of lava that are ejected by volcanoes cool as they fall through the air. These 'pyroclasts' range in size from very large bombs and blocks to ash or tephra

**Pyroclastic flows:** a mixture of hot gas and tephra that can flow at hurricane velocity. It was pyroclastic flows from Vesuvius that wiped out Pompeii and Herculaneum in AD79.

**Lahars:** Slurry flows of ash and tephra, which flow from a volcano. They have roughly the consistency of concrete.



Soufriere Hills volcano in Montserrat erupting in 1995. Image copyright: Barry Voight (Wikicommons).