

Volcanoes



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Why do we have volcanoes?

The surface of the Earth is made up of rigid plates that move, at a rate of a few centimetres per year. When they collide, one plate can be pushed beneath another. As it sinks it heats up and begins to melt. This molten rock then rises and erupts on the surface as lava, building up a volcano.



This is why we see volcanoes along plate edges. Sometimes volcanoes can form in the middle of a plate because there happens to be a hot mantle plume there e.g. Hawaii.

Types of volcano

The shape of a volcano is determined by the kind of lava erupted.Very thick, viscous lava won't flow easily and therefore builds up around the vent forming a volcano with steep sides – we call this a **stratocone volcano** and it has the classic triangular shape. The opposite of this where thin lava spreads far from the source forming a volcano with gentle slopes is called a **shield volcano**.



Note, vertical scale has been exaggerated to highlight the difference in shape.





1 Mount St Helens, after the May the 18th eruption, USA, 1980. US Geological Survey, Department of the Interior/USGS

2 Mount St Helens, eruption plume, USA, 1980. US Geological Survey, Department of the Interior/USGS



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Mount Vesuvius is a complex volcano near Naples in Italy. The vent of Vesuvius actually grew out of an older crater called Mount Somma.



The hot magma rises because it is less dense than the surrounding rock. Trapped gases in the lava also force it upwards.

The famous eruption of AD79 completely engulfed the city of Pompeii and the harbour in Herculaneum. The population were quickly overcome by a rapidly moving cloud of dust and ash called a **pyroclastic flow**. Both the cities and victims were preserved in exquisite detail.





1 Pompeii, near Naples, Italy. Mount Vesuvius dominates the background to the ruins. Photo: ©Emma Ward 2007

2 Volcanic lava bomb, Hawaii, 1971. US Geological Survey, Department of the Interior/USGS photo by D W Peterson

Famous eruptions



For further information about plate tectonics and volcanoes:

www.bgs.ac.uk/education/volcanoes.html www.geology.usgs.gov/pdf/planet.pdf www.cotf.edu/ete/modules/msese/earthsysflr/plates1.html



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Volcano word search

Active Ash Dust Cone Crater Earthquake Extinct Crust Dormant Magma Plate boundary Hazard Lava **Ring of fire** Volcanic bombs Volcano Vent

Why no volcanoes?

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Why are there no active volcanoes in Britain?

There are several volcanoes in the UK, although they are all long since extinct. For example, there are 'supervolcanoes'

(ones which have had very large eruptions) in Snowdonia and the Lake District, but they are about 450 million years old; Edinburgh Castle is built on a volcano about 350 million years old, and many of the islands in the west of Scotland (Mull, Skye, Rum) are the roots of volcanoes about 60 million years old.

• Site of extinct volcano

Arthur's Seat and Salisbury Craigs, Edinburgh.

The reason why we haven't had any volcanoes for about 60 million years in Britain is that we are now in a in a tectonically quiet part of the world. Most volcanoes occur near the edges of the Earth's tectonic plates but Britain is now a long way from such geologically active areas. The most volcanically active area in the world is around the edge of the Pacific Ocean, from Indonesia to Japan, Alaska, the USA, Central America and South America. These volcanoes all lie on the edges of the Pacific plate (or smaller plates close by).

 A view of The Great Face, the island of Staffa, Scotland.
Massive, straight, well-formed columnar jointing in the Tertiary subterranean volcanic lava flow.
The Giant's Causeway, in Northern Ireland, showing columnar jointing.

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1 Largo Law, Fife, Scotland. A denuded volcanic neck dating from Carboniferous times.

2 Volcanic rocks of the Bradgate Formation, Leicestershire, United Kingdom. When tectonic plates converge, if one of the plates is lighter than the other (e.g. made up of thick continental crust), then the denser plate (the oceanic crust) is forced to depths of hundreds of kilometres in the Earth (subduction), where high temperature and pressure conditions prevail.

The rocks on and above the subducted plate melt, producing magma. The magma rises buoyantly to the surface and erupts as lava to form a volcano. If plates slide past each other sideways, then magma is not usually formed, although there is potential for large earthquakes (e.g. along the San Andreas fault in California). Occasionally, volcanoes occur in the middle of plates above hotspots in the Earth's mantle, e.g. Hawaii.

Britain is neither on the edge of a plate nor near a hotspot. The nearest plate boundary to the British Isles runs down the centre of the Atlantic, and Iceland (with its many volcanoes) lies on top of the boundary.

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