

Volcanoes

Volcanoes form when magma reaches the Earth's surface, causing eruptions of lava and ash. They occur at destructive and constructive plate boundaries, and can be of three main types - cone, shield and composite - which have different profiles and types of eruption.

The immediate effects of volcanic eruptions can be devastating, but they may be beneficial in the long term. The eruptions on the Caribbean island of Montserrat in 1995 - 98 are a good case study.

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Causes of Volcanic Eruptions

Key things you should know about volcanoes:

1. A volcano is a cone-shaped mountain or hill, formed by eruptions of lava and ash.
2. When **magma** reaches the Earth's surface it is called lava. When the lava cools, it forms rock.
3. Volcanic eruptions can happen at destructive and constructive boundaries, but not at conservative boundaries.
4. Some volcanoes happen underwater, along the sea bed or ocean floor.



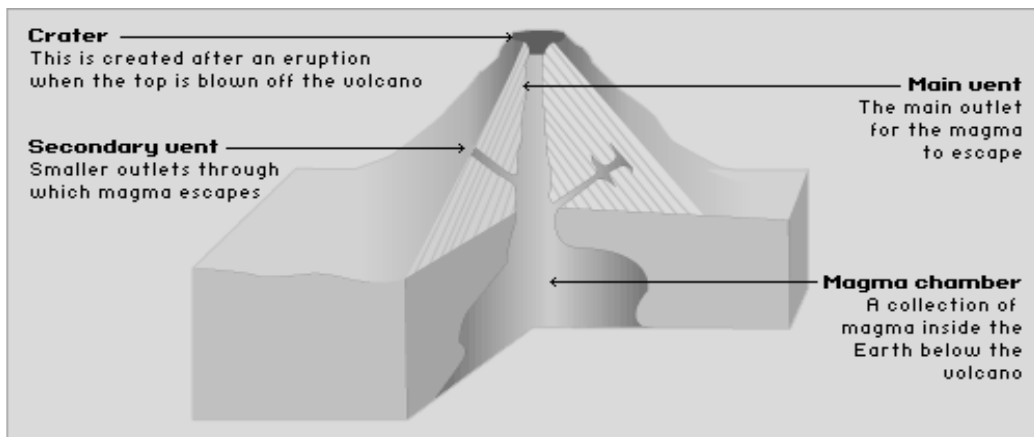
How volcanoes form

1. Magma rises through cracks or weaknesses in the Earth's crust.
2. Pressure builds up inside the Earth.
3. When this pressure is released, magma explodes to the surface causing a volcanic eruption.
4. The lava from the eruption cools to form new crust.
5. Over time, after several eruptions, the rock builds up and a volcano forms.

What happens inside a Volcano

A volcano has several important features:

- The **magma chamber** is a collection of magma inside the Earth, below the volcano.
- The **main vent** is the main outlet for the magma to escape.
- **Secondary vents** are smaller outlets through which magma escapes.
- The **crater** is created after an eruption blows the top off the volcano.



Cross section of a volcano.

An eruption occurs when pressure in the magma chamber forces magma up the main vent, towards the crater at the top of the volcano. Some magma will also be forced out of the secondary vent at the side of the volcano.

Different Types of Volcano

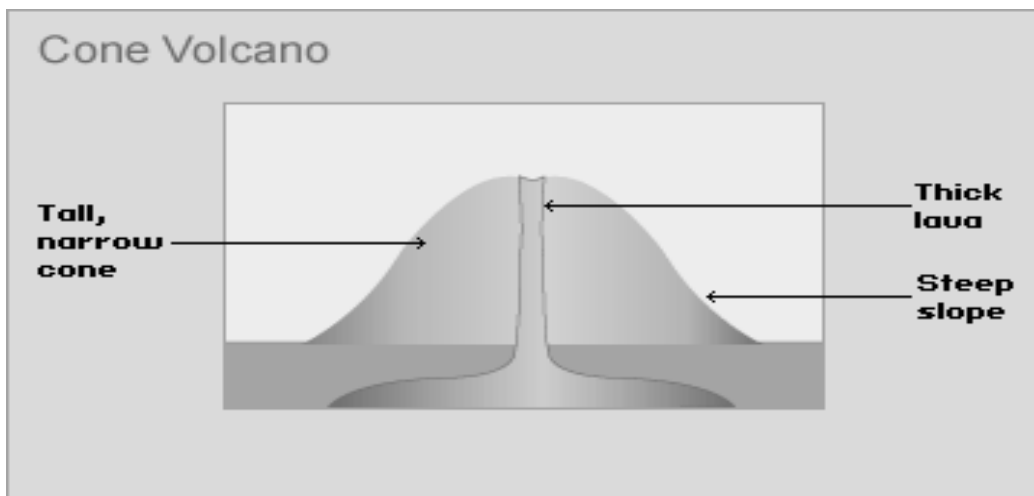
One way to describe volcanoes is in terms of activity:

- Some volcanoes are still **active** and erupt frequently.
- Some volcanoes are **dormant** (sleeping).
- Some volcanoes are **extinct** (never likely to erupt again).

The other way of describing volcanoes is by their shape or type. There are cone volcanoes, shield volcanoes and composite volcanoes.

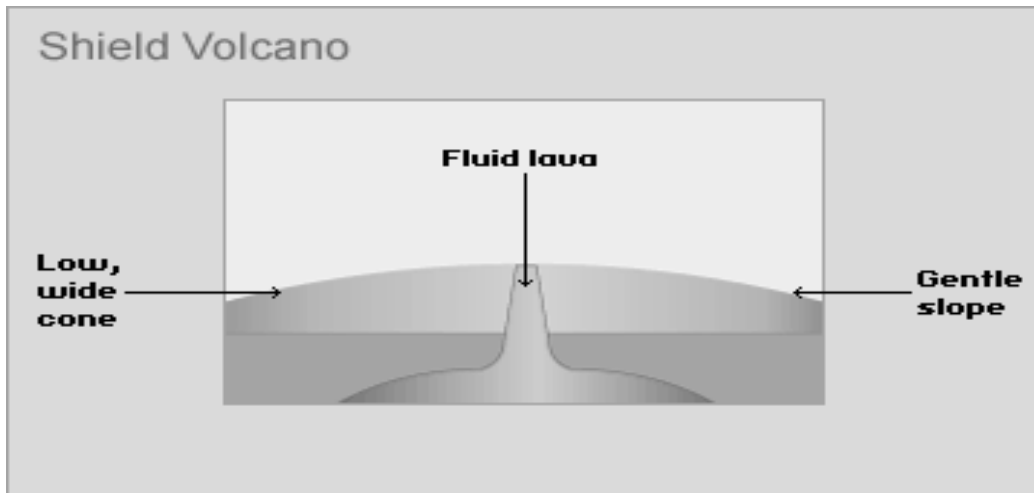
Cone volcanoes:

- These are usually found at **destructive boundaries**.
- Cone volcanoes are tall and steep-sided.
- Cone volcanoes are formed by eruptions of thick, viscous (sticky) **lava**.
- The thick lava moves relatively slowly and hardens quickly to form new rock - this explains the formation of a cone shape.
- Eruptions tend to be violent.



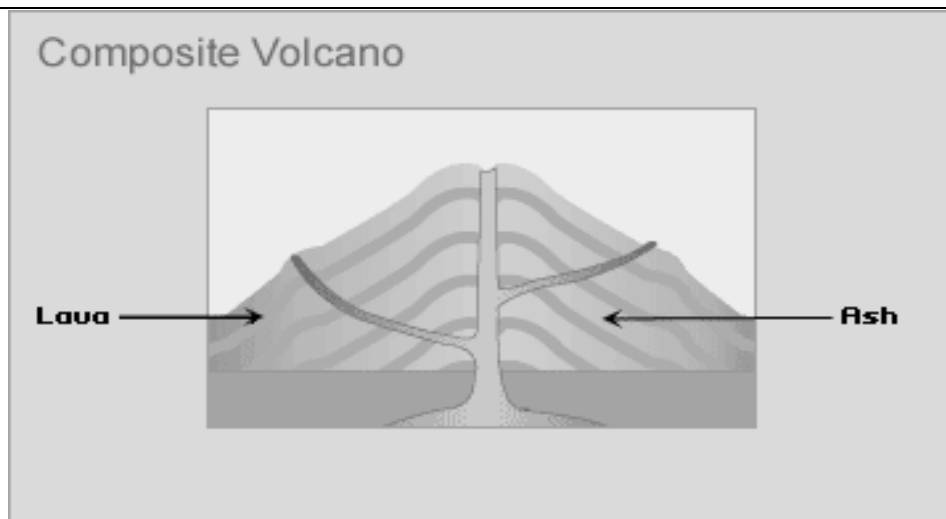
Shield volcanoes:

- These are usually found at **constructive boundaries**.
- They are low, with gently sloping sides.
- Shield volcanoes are formed by eruptions of thin, runny lava.
- Eruptions here tend to be frequent but relatively gentle.



Composite volcanoes:

- These volcanoes are composed (made up) of alternating layers of lava and ash (other volcanoes just consist of lava).
- The eruptions from these volcanoes may be a **pyroclastic** flow rather than a lava flow. A pyroclastic flow is a mixture of hot steam, ash, rock and dust.
- A pyroclastic flow can roll down the sides of a volcano at very high speeds and with temperatures of over 400° C.



Effects of Volcanic Eruptions



Eruption of the island volcano of Helgafjell, Iceland, 1973

Volcanic eruptions can have a devastating effect on people and the environment. However, unlike earthquakes, volcanoes can also have a positive impact on an area. These positive impacts can help to explain why people choose to live near volcanoes.

Positive	Negative
The dramatic scenery created by volcanic eruptions attracts tourists. This brings income to an area.	Many lives can be lost as a result of a volcanic eruption.
The lava and ash deposited during a volcanic eruption breaks down to provide valuable nutrients for the soil. This creates very fertile soil, which is good for agriculture.	If the ash and mud from a volcanic eruption mix with rain water or water from melting snow, fast moving mudflows are created. These flows are called lahars.
The high level of heat and activity inside Earth, close to a volcano, can provide opportunities for generating energy. This is called geothermal energy.	Lava flows and lahars can destroy settlements and clear areas of woodland or agriculture.
	Human and natural landscapes can be destroyed and changed forever.

Case Study: Chances Peak, Montserrat, 1995-97



Volcanic ash covers the town of Plymouth, Montserrat

Montserrat is a small island in the Caribbean. There is a volcanic area located in the south of the island, called Soufriere Hills.

The volcanic peak in this area is called Chances Peak, which had been **dormant** for over 300 years. Then in 1995, the volcano began to give off **warning signs** of an eruption (small earthquakes and eruptions of dust and ash). Once Chances Peak had **woken up** it then remained active for a period of 5 years. The most intense eruptions occurred in 1997.

During this time, Montserrat was devastated by **pyroclastic** flows. The small population of the island (11,000 people) was **evacuated** in 1995 to neighbouring islands. The evacuees became **refugees**.

Despite the evacuations, 19 people were killed by the eruptions. This is because a small group of people chose to stay behind on the island and watch over their crops.

Volcanic eruptions and **lahars** have destroyed large areas of Montserrat. The capital, Plymouth, has been covered in layers of ash and mud. Homes and buildings have been destroyed.

The graphic shows the progress of the eruption and its impact on the island.

