

VOLCANOES

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2017
YEAR OF RISK

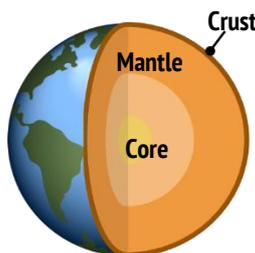
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From left to right: Erta Ale lava lake, Ethiopia; Grand Prismatic Spring, Yellowstone, USA; Sarychev Peak Volcano, Russia; Lava flows from Kilauea, Hawaii

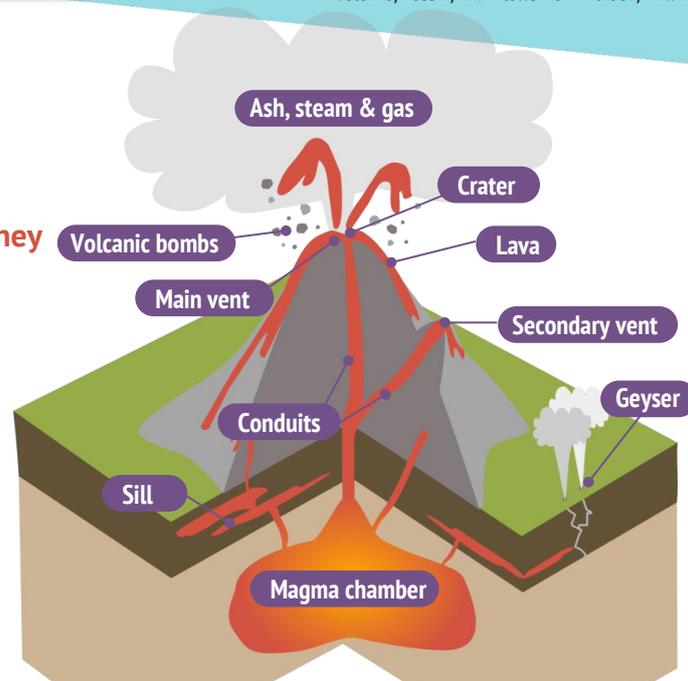
Throughout Earth's history volcanoes have erupted enormous amounts of molten rock onto the Earth's surface. Today there are about 500 currently active volcanoes on Earth, but what are volcanoes, how do they form and where does all this molten rock come from?



WHAT IS A VOLCANO?

Volcanoes are openings in the Earth's rocky **crust** which allow hot **molten** (melted) **rock**, **ash** and **gas** to escape from below the surface.

Volcanoes form when parts of the Earth's solid **mantle melts** to form pockets of hot liquid rock called **magma**. This magma collects in large pools deep underground known as **magma chambers**. As more and more magma is added to the magma chamber, the **pressure** increases and causes the rock around the magma chamber to crack. The hot liquid magma, which is lighter than the surrounding rock, is forced upwards through cracks in the crust and **erupts** on land through a **volcanic vent**. Magma that reaches the Earth's surface can erupt as **lava** (hot liquid rock), **obsidian** (volcanic glass), **pumice** (a type of frothy volcanic glass) **volcanic ash** and **gas** depending on the type of eruption.



Magma chamber: pool of magma below the volcano

Vent: main opening in the ground surface

Conduit: channel which magma travels through

Lava: erupted magma

Crater: created when an eruption blows the top off a volcano

Volcanic bombs: large lumps of rock and molten blobs of magma thrown out from the volcano

Ash, steam & gas: material erupted from the volcano

Geyser: vent that shoots steam and boiling water into the air

Sill: flat sheet of igneous rock formed underground

Volcanoes are grouped into three types depending on how often they erupt:

 **Active volcanoes** are volcanoes that have erupted within the last 10,000 years e.g. **Mount Etna**, Italy

 **Dormant volcanoes** are volcanoes that have not erupted in the past 10,000 years, but could erupt again e.g. **Yellowstone Caldera**, USA

 **Extinct volcanoes** are volcanoes that have not erupted in the past 10,000 years and will not erupt again e.g. **Arthur's Seat**, Edinburgh

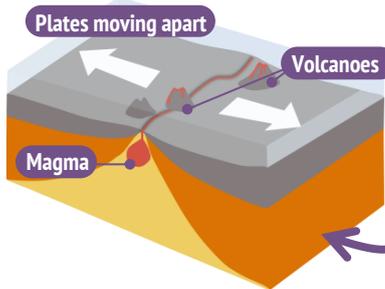


DID YOU KNOW?

The Earth is not the only place in the solar system to have volcanoes. The biggest volcano in the solar system is actually **Olympus Mons** on **Mars**. At 25km high, it's 3 times the height of Mount Everest and covers an area of 600,000km² - that's almost the same size as France!

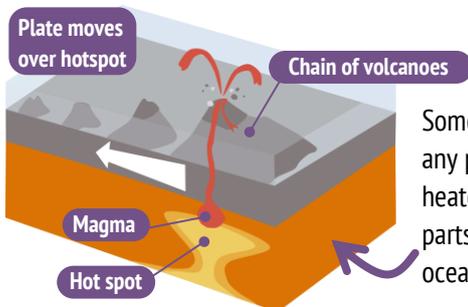
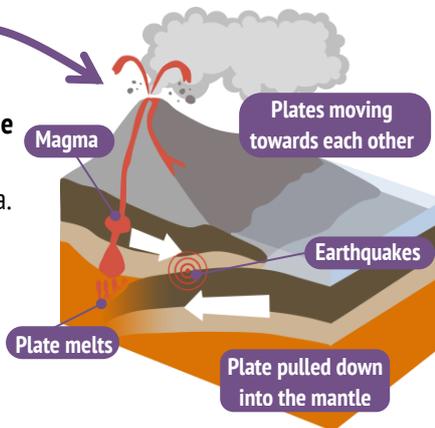
WHERE DO VOLCANOES FORM?

The Earth's surface is made from **tectonic plates** - huge slabs of the Earth's **crust** and uppermost **mantle** that fit together like a jigsaw puzzle and move around over millions of years. Volcanoes are usually located where these tectonic plates meet. This is especially true for the **Pacific Ring of Fire**, an area around the Pacific Ocean where over 75% of the volcanoes on Earth are found.



A **constructive plate boundary** is formed when two tectonic plates are moving away from each other. As they move apart, hot magma rises up between the two plates from the mantle below and erupts on the surface as lava. Over time, continued eruptions of lava forms volcanoes on the surface of the crust like at the **Mid Atlantic Ridge**.

Volcanoes can form when two tectonic plates are moving towards each other at a **destructive plate boundary**. Here a **subduction zone** forms which is where one plate is pulled down into the Earth's mantle. The high **heat** and **pressure** melts the plate to form magma. This magma then rises and erupts explosively on land as lava and forms volcanoes. The **Andes** mountain chain in South America is a chain of volcanoes above a subduction zone.

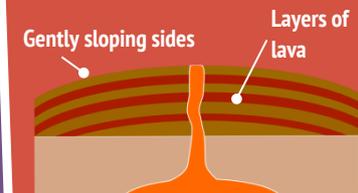


Sometimes volcanoes can form in the middle of plates far away from any plate boundaries. These volcanoes form above areas of super-heated rocks in the Earth's mantle called '**hotspots**'. Hotspots melt parts of the mantle and cause magma to rise and erupt as lava on the ocean floor, creating volcanoes like those on the **Hawaiian Islands**.

VOLCANO TYPES

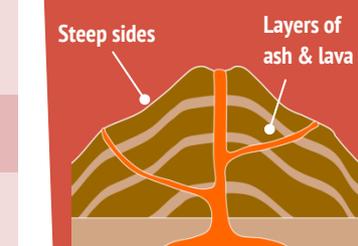
There are 2 main types of volcano - shield volcanoes and composite volcanoes.

Shield volcanoes form from gentle (**effusive**) eruptions of runny lava called **basalt**. Because it's so runny, this lava can travel a long way before it **solidifies** into rock and creates wide, sloping volcanoes in the shape of a shield.



Composite volcanoes are formed from layers of alternating lava and ash, usually at destructive plate boundaries. The lava that erupts to form composite volcanoes is much **thicker** and flows more slowly than basalt lava. This means that it cannot spread out very far before it solidifies so forms **cone-shaped** volcanoes with steep sides.

Because of the thicker lava, composite volcanoes tend to erupt explosively and can cause **pyroclastic flows**, clouds of super-heated rock ash and gas that blast down the side of a volcano during large eruptions.



EFFECTS OF VOLCANIC ERUPTIONS

POSITIVE

Volcanic ash and lava are rich in **minerals** so break down to provide valuable **nutrients** for the soil. This creates very **fertile** soil which is good for growing fruit and vegetables.

Volcanoes are important **tourist attractions** which generate jobs and bring in money.

Volcanic areas are sources of **geothermal energy** (heat from the Earth), a type of **renewable energy** which can be used to heat buildings or be converted into electricity.

Volcanic rocks such as **basalt** can be used for building materials.

NEGATIVE

Many lives can be lost as the result of volcanic eruptions. If the ash and from a volcanic eruption mixes with rainwater or snow this can trigger fast flowing mudflows called **lahars** which can destroy farmland, woodland and man-made structures including roads and bridges.

Pyroclastic flows (avalanches of hot rock and gas) cannot be outrun and can kill people instantly. This is what happened in the Italian towns of Pompeii and Herculaneum when **Mount Vesuvius** erupted in AD79.

Volcanic ash can cause disruption to weather and air travel e.g. the Icelandic **Eyjafjallajökull** eruption in 2010.

Some **volcanic gases** can poison rivers and lakes and cause animals (including humans) to suffocate.