Volcanoes, earthquakes and floods

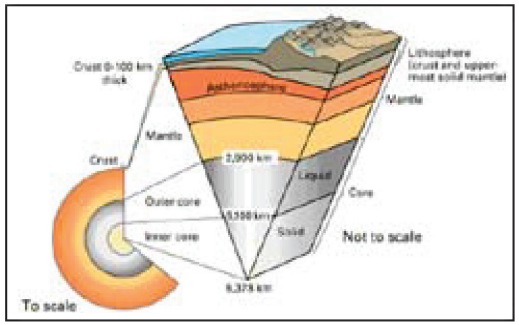
The structure of the Earth

The Earth comprises of a crust – a hard outer layer like the skin of an apple, a mantle – a layer of very hot and dense rock that flows and moves and a core – the hot centre of Earth that is believed to be made entirely from metal.

A hard layer called the crust covers the Earth. This layer is the outermost layer of rock that covers the Earth and is like the skin of an apple. The crust is thinner in some places than in others. Mountains are areas where the crust is thick. This crust is not one large solid piece; it consists of many smaller pieces that are called 'tectonic plates' which are thousands of kilometres in size. These tectonic plates float on the underlying layer of magma and exert pressure as they move.

The mantle comprises of layers of hot slow-moving magma, which causes the tectonic plates to move. This movement causes earthquakes and volcanic eruptions.

The core is the hottest layer of the Earth, comprising of an outer and inner core. Scientists believe that the outer core is made up of nickel and iron, whilst the inner core is largely iron. The outer core is more liquid than that of the inner core. The temperatures within the core range from 5000 – 7000 degrees Celsius. The pressure for the rest of the Earth causes the inner core to be mostly solid, even though the temperature of the core is hot enough to melt the iron.



The internal structure of the Earth

Activity 1

a) Name the three main layers of the Earth. (1)

b) Describe a tectonic plate. (2)

c) How does magma contribute to earthquakes? (1)

d) Describe the structure of the core. (5)

Total: (9)

http://www.nhm.ac.uk/nature-online/Earth/plate-tectonics/index.html

http://science.nationalgeographic.com/science/Earth/the-dynamic-Earth/plate-tectonics-article/

http://science.howstuffworks.com/nature/29595-100-greatest-discoveries-plate-tectonics-video.htm

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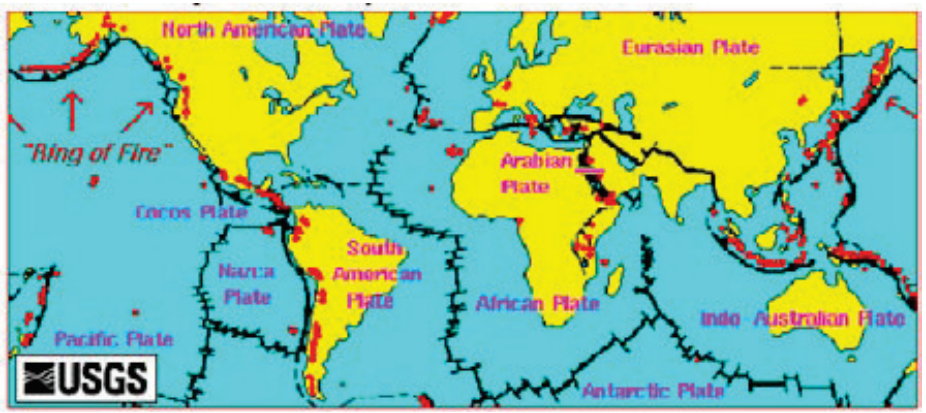
How the crust moves

The crust is not one large solid piece of rock. It consists of many smaller pieces that are called 'tectonic plates' which are thousands of kilometres in size. These tectonic plates float on the underlying layer of magma and exert pressure as they move. The edges of the tectonic plates are called 'plate boundaries'. The tectonic plates move on the layer of hot slow-moving magma that lies underneath the crust. When the plates move, they push and pull against each other causing pressure or sudden shifts.

There are seven large plates and many smaller plates that move very slowly each year. The plates that lie beneath the continents are called continental plates and the plates that lie beneath the oceans are called oceanic plates.



Oceanic plates

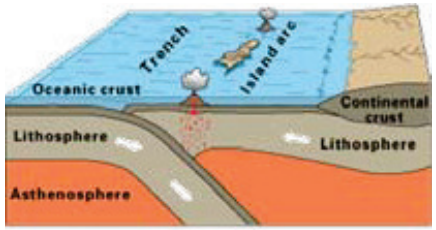
The Tectonic plates

The edges of the tectonic plates are called 'plate boundaries'. New crust is formed and old crust is returned to the core at these boundaries. The process of the Earth's crust being formed and returned to the core can take about 100 million years.

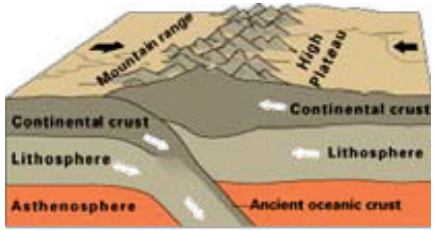
These plates meet in different ways:

Convergent boundaries:

These occur when two tectonic plates push against each other and one plate is forced upwards. This movement causes the formation of mountains or volcanoes. The other plate sinks back into the core and melts. Earthquakes can occur along this type of boundary.



Oceanic-oceanic convergence



Continental-continental convergence

Divergent boundaries:

These occur when the tectonic plates pull away from each other. The crust breaks apart. The space that remains is called a rift. Magma seeps up to fill the rift and so new crust is made.

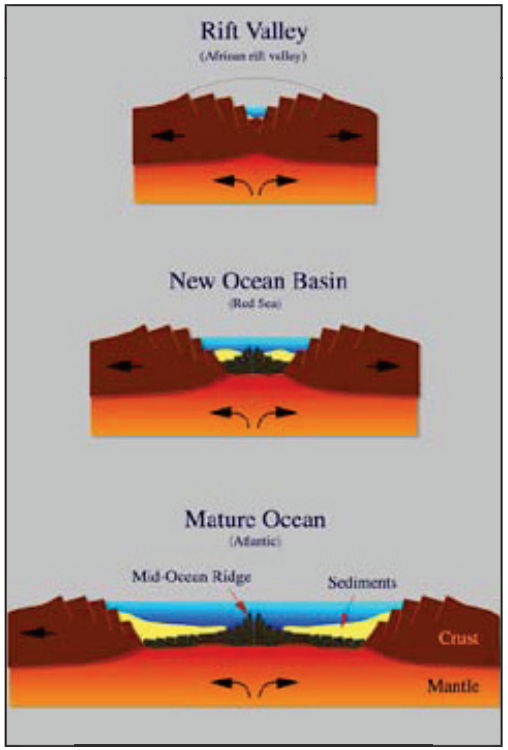
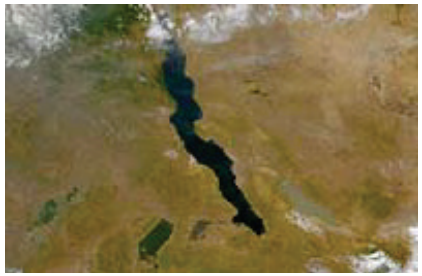


Diagram of the African plate, showing the East African Rift zone.



Lakes of the Great Rift Valley as seen from space.

Transform boundaries:

This type of boundary is where two plates meet and move against each other horizontally, in different directions. As they move, neither plate is displaced up or down. This movement causes a build up of energy, which may be released in a sudden movement which can cause an earthquake.

Activity 2

a) Define a plate boundary. (1)
b) How do the tectonic plates move? (1)
c) Name and describe three areas where tectonic plates meet. (6)
d) List the names of three tectonic plates. (3)
e) Describe the difference between continental and oceanic tectonic plates. (2)
f) Explain why the Great Rift Valley in Africa is a good example of divergent convergence. (3)

Total: 16

Volcanoes

Locations around the world

A volcano allows molten rock form the mantle to flow out on to the Earth's surface through the Earths crust, in the form of lava. Currently, there are approximately 1500 active volcanoes around the world. A small portion of these volcanoes are located beneath the oceans.

http://science.howstuffworks.com/nature/231-how-volcanoes-work-video.htm
http://www.nhm.ac.uk/nature-online/Earth/volcanoes-earthquakes/volcano/volcano-types/index.htm

A volcano erupting beneath the ocean

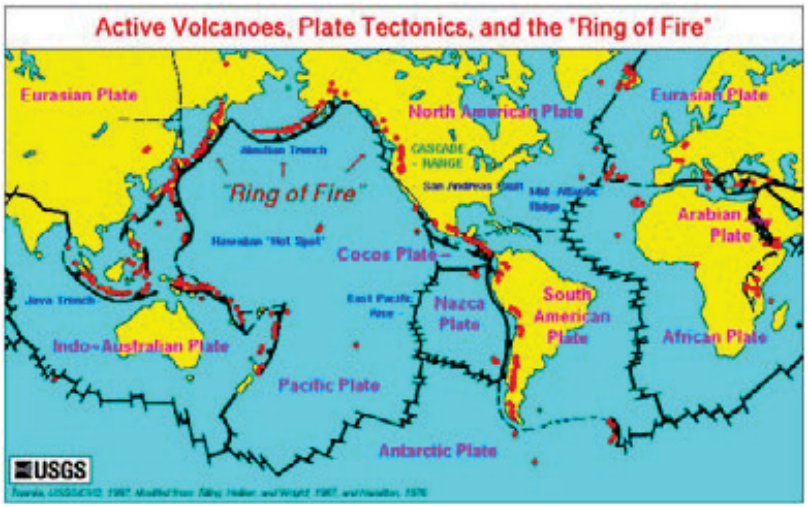
http://video.nationalgeographic.com/video/news/west-mata-submarine-volcano-vin?source=searchvideo

Info file: There are 1500 active volcanoes world wide

Volcanoes are often found near the edges of the tectonic plates that cover the surface of the Earth. The image below illustrates the occurrence of volcanoes around the world and the position of the tectonic plates.

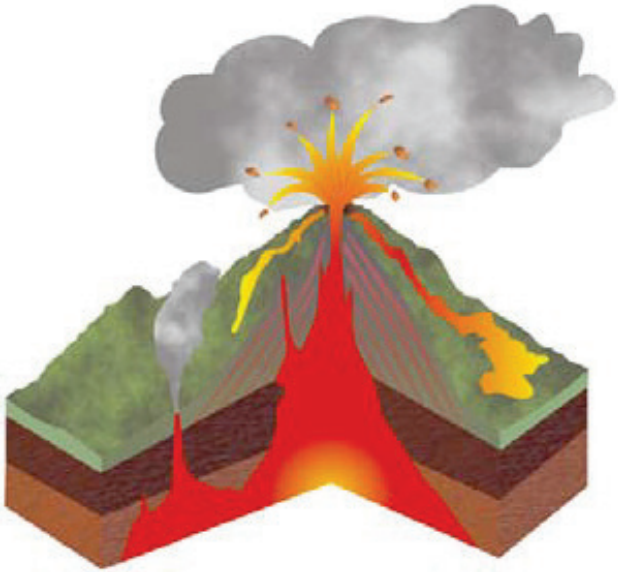
A volcanic eruption

The Ring of Fire is a ring of volcanoes that is found in Pacific Ocean. There are approximately 450 volcanoes in this area. There are frequent earthquakes and volcanic eruptions in this area.



Why volcanoes occur

The pressure caused by the movement of magma beneath the Earth's crust can force magma up through faults in the Earth's surface. This movement of magma causes a volcano. When the magma reaches the Earth's surface, it is called lava. As the lava pours onto the surface, the lava emits poisonous gases. The heat of the lava causes clouds of steam in the atmosphere. The force of the pressure of a volcano can cause rocks, ash and volcanic dust to be blasted into the air. http://video.nationalgeographic.com/video/volcano-lava



Volcanoes can erupt through the same fault or vent over a long period of time. A crater forms at the top of the volcano. After each eruption, lava coats the edge of the crater and builds a cone as the lava cools.

Diagram of a volcano

A famous volcanic eruption was that of Mount St Helens in the United States of America. The eruption occurred on 18 May 1980. The eruption destroyed approximately 250 homes and killed 57 people. The eruption removed almost 400m of the volcano leaving a horseshoe shaped crater in the volcano.
http://www.discovery.com/video-topics/other/other-topics-volcano-videos.htm

From top left clockwise, Mount St Helens before, during and after eruption.