# The Structure of the Earth

**The Earth consists of four *concentric* layers: inner core, outer core, *mantle* and *crust*. The crust is made up of *tectonic plates*, which are in constant motion. Earthquakes and volcanoes are most likely to occur at plate boundaries.**

**The structure of the Earth**

The Earth is made up of four distinct layers:

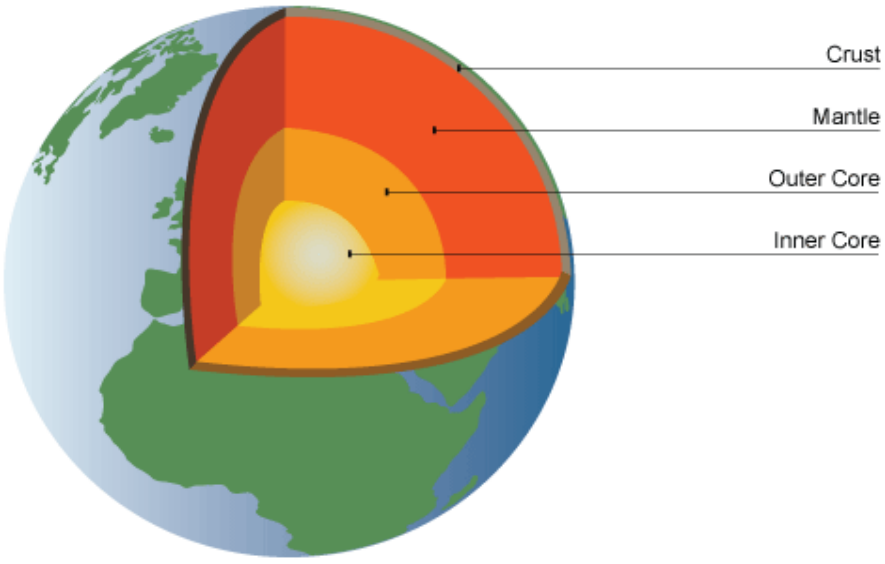
- ✓ **The inner core** is in the centre and is the hottest part of the Earth. It is solid and made up of iron and nickel with temperatures of up to 5500°C. With its immense heat energy, the inner core is like the engine room of the Earth.
- ✓ **The outer core** is the layer surrounding the inner core. It is a liquid layer, also made up of iron and nickel. It is still extremely hot, with temperatures similar to the inner core.
- ✓ **The mantle** is the widest section of the Earth. It has a diameter of approximately 2900km. The mantle is made up of semi-molten rock called magma. In the upper parts of the mantle the rock is hard, but lower down the rock is soft and beginning to melt.
- ✓ **The crust** is the outer layer of the earth. It is a thin layer between 0-60km thick. The crust is the solid rock layer upon which we live.

There are two different types of crust: **continental crust**, which carries land, and **oceanic crust**, which carries water.

**Continental Crust vs Oceanic Crust**

- ✓ Continental crust is older than oceanic crust because oceanic crust is constantly being destroyed
- ✓ Continental crust is lighter (less dense) than oceanic crust
- ✓ Continental crust is thicker (25km-75km) than oceanic crust (7km-10km)

The diagram below shows the structure of the earth. In geography, taking a slice through a structure to see inside is called a **cross section**.




Cross section showing structure of the Earth

**Distribution**

The Earth's crust is broken up into pieces called plates. Heat rising and falling inside the mantle creates **convection currents** generated by radioactive decay in the core. The convection currents move the plates. Where convection currents diverge near the Earth's crust, plates move apart. Where convection currents converge, plates move towards each other. The movement of the plates, and the activity inside the Earth, is called **plate tectonics**.

Plate tectonics cause earthquakes and volcanoes. The point where two plates meet is called a **plate boundary**. Earthquakes and volcanoes are most likely to occur either on or near plate boundaries.

The Earth's plates move in different directions

Plates behave differently at different plate boundaries:

- ✓ At a **tensional**, **constructive** or **divergent boundary** the plates move apart.
- ✓ At a **compressional, destructive** or **convergent** boundary the plates move towards each other.
- ✓ At a **conservative** or **transform** boundary the plates slide past each other.

Different exam boards and textbooks may use different names for each of the boundary types. For example, a **destructive boundary** may also be called a **collision boundary**. Use any term so long as you use it correctly, but it is best to stick to the terms you have been taught.

**Tensional margins**

At a tensional or **constructive boundary** the ***plates*** are moving apart. The plates move apart due to ***convection currents*** inside the Earth.

The Helgafjell volcano on Westman Island, Iceland

As the plates move apart (very slowly), ***magma*** rises from the mantle. The magma erupts to the surface of the Earth. This is also accompanied by earthquakes.

When the magma reaches the surface, it cools and solidifies to form a new crust of **igneous rock**. This process is repeated many times, over a long period of time.

Eventually the new rock builds up to form a volcano. **Constructive boundaries** tend to be found under the sea, eg the Mid-Atlantic Ridge. Here, chains of underwater volcanoes have formed along the ***plate boundary***. One of these volcanoes may become so large that it erupts out of the sea to form a volcanic island, eg Surtsey and the Westman Islands near Iceland.

The diagram below to see how magma pushes up between the two plates, causing a chain of volcanoes along the constructive plate boundary.

**Destructive / Compressional boundary**

At a compressional or **destructive boundary** the plates are moving towards each other. This usually involves a **continental plate** and an **oceanic plate**.

The oceanic plate is **denser** than the continental plate so, as they move together, the oceanic plate is forced underneath the continental plate. The point at which this happens is called the **subduction zone**. As the oceanic plate is forced below the continental plate it melts to form magma and earthquakes are triggered. The magma collects to form a ***magma chamber***. This magma then rises up through cracks in the continental crust. As pressure builds up, a volcanic eruption may occur.

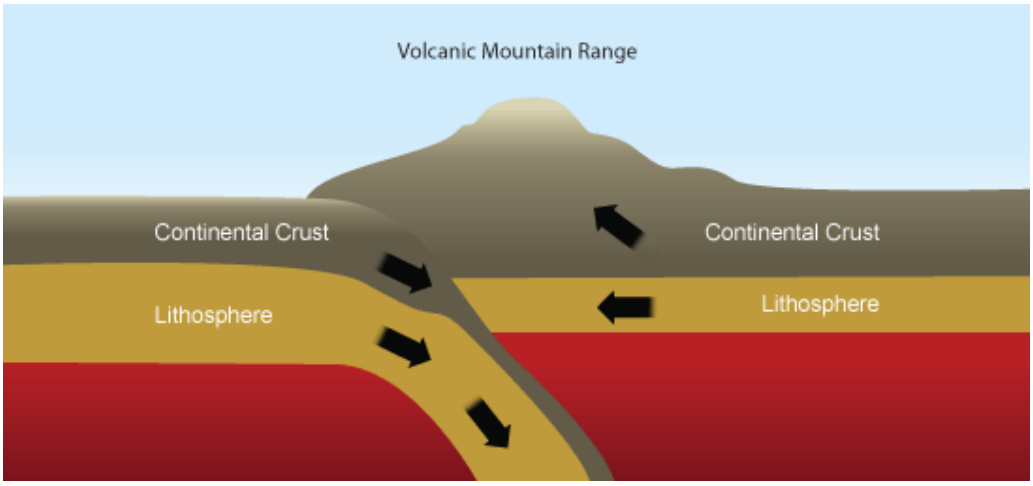

A view of the Himalayas from Gorak Shep

**Collision boundary**

As the plates push together, the continental crust is squashed together and forced upwards. This is called folding. The process of folding creates **fold mountains**. Fold mountains are formed where two continental plates push towards each other. This is how mountain ranges such as the **Himalayas** and the **Alps** were formed.

**Fold mountains occur near convergent or compressional plate boundaries. Examples of fold mountains include the Alps, Rockies, Andes and Himalayas.**

**Formation and characteristics**



The formation of fold mountains

## The formation of fold mountains

- ✓ Where an area of sea separates two plates, sediments settle on the sea floor in depressions called geosynclines. These sediments gradually become compressed into sedimentary rock.
- ✓ When the two plates move towards each other again, the layers of sedimentary rock on the sea floor become crumpled and folded.
- ✓ Eventually the sedimentary rock appears above sea level as a range of fold mountains.

**Conservative boundary**

When plates move along side each other in opposite directions or in the same direction but at different speeds earthquakes are created.

The plate margins are made up of rock that is brittle and jagged so it is difficult for the plates to slide past each other. Sometimes the plates get stuck and pressure builds and builds until eventually they suddenly jerk forwards. This sudden movement and release of pressure is the cause of earthquakes at this type of margin. The most famous conservative plate margin is the San Andreas Fault on the western coast of North America.