Earth's Internal Energy

Key words

Lithosphere	lithospheric plates	conduction	convection	convection currents
Magma	lava	lapillus	crater	vent
Epicentre	focus	seismic waves		

Earth's internal heat circulates making the materials that form the mantle move. These movements are passed on to the lithosphere.

The lithosphere is fragmented into plates which form the ocean floors and the continents. The lithospheric plates move very slowly, crushing into each other or moving apart. Earthquakes and volcanoes are two of the consequences of the movements of the lithospheric plates.

The structures that we see in the landscape, such as faults, mountain ranges, etc are also a result of the forces that act upon due to the internal energy of the planet.

The internal energy of the planet is also responsible for the formation of two types of rocks: magmatic and metamorphic rocks.

Geothermal gradient: it is the rate of increase in temperature per unit depth in the Earth. The temperature rises 3 ºC every 100 m. Nowadays it is believed that this is only up to a certain depth, and after such depth the increase of temperature slightly decreases. The estimated temperature of the core is 6 000 ºC.

Manifestations of the Earth's Internal Energy

The interior of the Earth has a great amount of energy. Such energy comes from:

1. The energy left over from the enormous amount of energy existing in the planet when it was first formed.
2. The energy released due to the decaying of radioactive elements found in its interior.

Thanks to this existing energy convection currents are produced (as materials warm up they become less dense and rise, as they rise they cool down becoming denser and descend)

The Earth's internal heat can be observed on the Earth's surface in different ways: volcanism, earthquakes and the continental drift.

1. Volcanism begins when magma created by the melting of pre-existing rock in the Earth's interior reaches the surface of the Earth.
2. Earthquakes are brusque and brief shakes of the lithosphere.
3. Continental drift: the lithosphere is not a continuous layer. It is divided or fragmented into **lithospheric plates** which drift slowly over a less rigid **asthenosphere**.

Earth's internal heat melts rocks

Another important outcome (consequence) of the Earth's internal heat is the melting of rocky material. Underneath the lithosphere there are areas of extreme heat, where rocks melt becoming **magma.**

Magma is the molten rock that sometimes comes up to the surface (for example through volcanoes)

Volcanoes

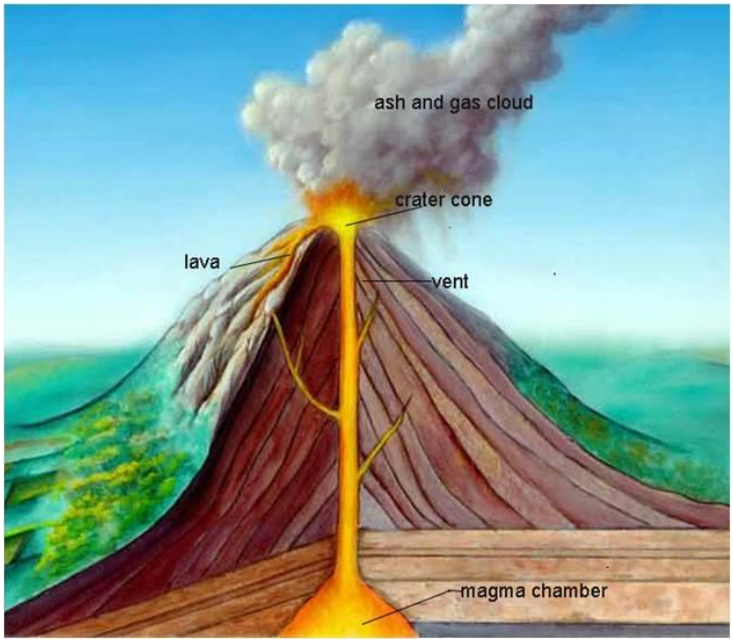
A volcano is an opening in the earth's crust through which magma from the interior of the earth comes up to the surface.
The most typical volcanoes form a mountain or hill of lava through which hot matter is extruded. We can distinguish three parts in this type of volcanoes: the cone, the vent and the crater.

- The volcano's **cone-shaped** structure is built by the more-or-less symmetrical accumulation of lava.
- The **crater** is the opening at the top of a volcano.
- The **vent** is the passage connecting the crater and the pool of magma, found in the magma chamber (the main storage area for the eruptive material)

The hot matter extruded by a volcano can be gaseous, liquid or solid.

- **Gaseous**: some are inflammable (combustible) which produce flames as they come in contact with the atmosphere (hydrogen and hydrocarbides) and others are not (nitrogen, carbon monoxide, carbon dioxide and water vapour)
- **Liquids**: the liquid material extruded by a volcano is **lava**. As lava solidifies it becomes volcanic rock.

- **Solids**: they are of different sizes and are called pyroclastic material. The very fine particles are called **volcanic ashes**. Fragments of the size of gravel are called **lapilli (singular: lapillus** – 'little stones' in Latin**)**. The large fragments, which can be up to several tonnes, are called **volcanic bombs**. All these solid materials are the result of the brusque cooling of lava, which could plug the crater and come out very violently (producing explosions)



Seismic Method

Seismic activity is caused by the interaction between the lithospheric plates. As the plates try to move against or away from each other, forces build up in the form of energy. Eventually the tension is released, causing the ground to shake violently: **earthquakes or seismic movements**. The energy released travels through the Earth as a series of shock waves called seismic waves.

The **focus or hypocentre** of an earthquake is the point inside the Earth's crust where an earthquake originates. The**epicentre** is the point on the Earth's surface directly above the focus of an earthquake.

Seismic waves are registered in seismic stations by seismographs.
A **seismograph** is an instrument that records how the ground shakes. The graph that records the movements in which the different types of seismic waves can be observed is called a seismogram.

The intensity of an earthquake is measured using the **Richter scale** (a logarithmic scale of 1 to 10) The formula that the scale uses takes into account the energy released by the earthquake, as well as the magnitude of the earthquake.

Two types of rocks form as a result of internal dynamics:

A) Igneous rocks

Igneous rocks are formed when molten rock called magma cools and solidifies.

Igneous rocks are also classified into:

Intrusive or plutonic if they form below ground, at great depth. Their cooling is a slow process, allowing large crystals to form. For example granite.

Extrusive or volcanic if they are formed on the surface or near the surface due to the rapid cooling of magma as it comes out of a volcano, therefore not allowing large crystals to form. For example basalt.

B) Metamorphic rocks

Metamorphic rocks are formed due to changes that have happened to other rocks caused by an increase in temperature and/or pressure. These changes the rock undergoes are called **metamorphisms**. The rock does not melt in the process. Some examples are marble, schist and slate.