Geography Notes Part 3 & 4

3] The Earth we live in

A continuous stretch of mountains is called a **mountain range.** The highest mountain range in the world is the Himalayas.

Flat upland with steep slope is called a **plateau.** The plateau of Tibet is the highest plateau in the world.

A relatively flat and low lying land surface a plain. The area where the River Ganges flows is one of the most important plains in the world.

Chennai, Madurai, Tirunelveli, Trichy, Ooty, Kodaikanal and Theni are parts of Tamil Nadu. **Tamil Nadu is a part of India.**

India is a part of the continent of Asia. Countries like India, China, Russia and Pakistan are situated in Asia. Countries like England, France and Germany are situated in the continent of Europe.

There are seven continents like Asia, Europe, North America, South America, Africa, Australia and Antarctica. **Large land masses** are called continents.

The seven continents:

1. Asia:

It is the largest continent. It is situated in the northern hemisphere. Our Country, **India is situated in Asia.**

The cold **Gobi desert** and the **Himalayan mountains** are located in this continent.

2. Africa:

It is the second largest continent in the world. This continent is situated in both, the northern and southern hemisphere. The **equator divides the continent into two equal halves.**

River Nile, (6,695 kms) the longest river in the world and the **Sahara**, the largest desert in the world, are found in this continent. This continent is rich in **mineral resources** and has **dense forests.**

3. North America:

This continent is surrounded by the Arctic ocean, Atlantic ocean and Pacific Ocean. The **Rocky mountains** situated along the west coast is a very long chain of mountains.

4. South America:

This continent lies almost entirely in the southern hemisphere. The **Andes,** the world's longest mountain range and **River Amazon,** (6,586 kms) the world's largest river, is situated in this continent.

5. Europe:

This continent lies to the west of Asia. The **Alps** mountain range is situated in this continent.

6. Australia:

Australia is referred to as **'Island continent',** because it is surrounded by oceans all the sides. It consists of many islands like New Zealand and Fiji. Fiji islands, Papua and New Guinea are called oceanic islands. The Great Barrier Reef, the world's largest coral reef is situated off the east coast of Australia.

7. Antarctica:

Antarctica is situated around the South Pole and is **entirely covered with snow.** It is a very cold place. **Penguins, Seals** and other living creatures live here.

Our Country has set up the **Dakshin Gangotri**(Not in function) and **Maitri** scientific research stations. Throughout the year Indian scientists conduct many experiments in this continent. Bharathi, the new scientific research station, has recently been established.

Island:

A piece of land surrounded by **water on all sides** is called an island. Sri Lanka is an island. A group of islands is called an archipelago.

Oceans:

71% (two third) of the earth's surface is covered by water. A large stretch of water covering a huge area is called an **Ocean.** Just like the mountains, plains and plateaus are part of the Earth. Oceans are also a part of the earth.

There are **five oceans** on the Earth. They are the Pacific ocean, the Atlantic ocean, the Indian ocean, the Arctic ocean and the Southern ocean.

For our convenience oceans are divided into **seas.** The sea to the east of Tamil Nadu is called the **Bay of Bengal** and the sea to the west of Kerala is called **Arabian sea.**

1. Pacific Ocean:

It is the deepest ocean in the world. The volcanic mountains surrounding the Pacific Ocean are called the **Pacific Ring of Fire.**

The deepest **Mariana Trench** is located in the Pacific Ocean. This trench is so deep that even Mt. Everest is not enough to fill it.

2. Atlantic Ocean:

It is the second largest ocean in the world. **Hurricanes** are very common in this ocean.

3. Indian Ocean:

It is the third largest ocean in the world. India receives rainfall from the **monsoons** which originate in this ocean.

4. Antarctic(Southern) Ocean:

The ocean surrounding the continent of Antarctica is called the Southern ocean or Antarctic Ocean.

5. Arctic Ocean:

This is the smallest ocean in the world. It surrounds the North Pole. This ocean has many **icebergs.**

Land, Water, Air:

Apart from the seas, the rivers, lakes, ponds and tanks are the other water bodies. The peaks of the Himalayas, Arctic circle and Antarctic circle are **covered with snow** and not with water.

The atmosphere is filled with **water vapour,** cloud and moisture. The water on earth is found in **three forms namely solid, liquid and gas.** Apart from land and water, air is present in the earth.

Though we are always surrounded by **air,** we feel its **presence,** only when there is **wind and cyclones.**

The solid portion of the earth on which we live is called the **Lithosphere.** Water covers a large area of the earth's surface and this area is called **Hydrosphere.** The gaseous layer that surrounds the earth is called **Atmosphere.**

Apart from water, land and air, the life that exists here is unique to this planet. Plants, animals and millions of micro organisms are found on the land surface.

The zone in which living organisms exists is called as **Biosphere.** Lithosphere, Hydrosphere and Atmosphere together forms Biosphere. Hence if any one of these is **polluted, the living organisms are affected.**

Trees, plants, creepers, worms, insects, birds, animal, micro organisms and other millions of living forms exist in the biosphere. The living organisms extend upto many kilometres in the atmosphere.

Apart from many kinds of fish, plankton which serves as food for the fish are also found in the ocean.

Living organisms are found at great depths were geysers are present. Worms and micro organisms are present deep in the soil. **Many species of plants and animals are present on land.**

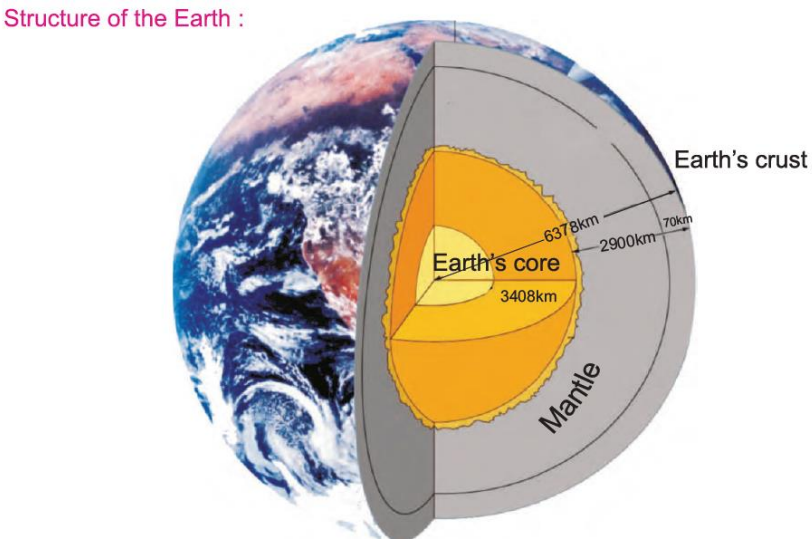
India Peninsula is a piece of land that is surrounded by water on three sides. India is a peninsula.	A gulf is a hollow carved out in the sea coast which lets the water reach deep inland. A bay is an inlet of the sea with a wider opening than a gulf. Examples of these are the Bay of Bengal and the Persian gulf.
A strait is a narrow stretch of water that separates two large land masses. For example the Palk strait between India and Sri Lanka	An isthmus is a narrow strip of land separating two large water bodies. The Isthmus of Panama connects North America with South America.

Lithosphere, hydrosphere and atmosphere do not exist separately. They are interdependent and interact with each other. For example sea water evaporates and forms water vapour. This mixes with the atmosphere. The surface of the Earth is heated by the sun's rays, as a result of this air on the land surface gets heated.

This hot air rises upward towards the cooler atmosphere. Therefore changes take place in the atmosphere. As a result of this, air moves and causes winds and breeze.

Land, water and air together help the plants to grow.

Structure of the Earth:



The core is in the semi solid. Nickel and iron is found in abundance in this layer. This is called as the inner core. Minerals are found in the molten stage around the core. Here the temperature is very high. It is approximately 6,000^{0}C .

The core is surrounded by the Mantle. 85% of the Earth's minerals are found here. The entire layer consists of rocks in the solid and semi solid state. Like the skin of the apple, the Earth's outer crust is a thin layer.

The continents and oceans are found in this layer. The thickness of the Earth's crust below the oceans is 5-10 km. the thickness of the crust varies from 30-50 kms on the continents.

4] The Earth – Its Structure and Tectonic movements

The earth is a unique planet that sustains life on it. There are many theories explaining the formation of the earth. The most accepted one is the Big Bang theory.

The Egyptians visualized that earth was a floating sphere on the sea.

Many experts had brought out theories on the formation of Earth and other planets. Among them, "Big Bang" theory is the most accepted one. It proposes that the universe was once extremely compact, dense and hot. Around 10 billion to 20 billion years ago there was a cosmic explosion called "**Big Bang"**. From that explosion, the Universe including our Earth was formed. An American astronomer Edwin Hubble explained that the existing Universe is still expanding. As time passes, galaxies move further and further apart. On the 30th May 2010, the scientists made a Large Hadron Collider (LHC) machine to test the Big Bang theory. It may help us to understand some of the mysteries of the formation of the Earth.

Formation of Continents and Oceans

The land and water bodies were not always distributed on the surface of the earth as they are today. A few million years ago, all the present continents were clustered together around the South Pole. This **Super continent** was called **Pangaea.** In Greek, it means "**all earth".** The Pangea was surrounded by a Mega Ocean called the **Panthalassa** or the **Super Ocean.** In Greek, it means **"all water".**

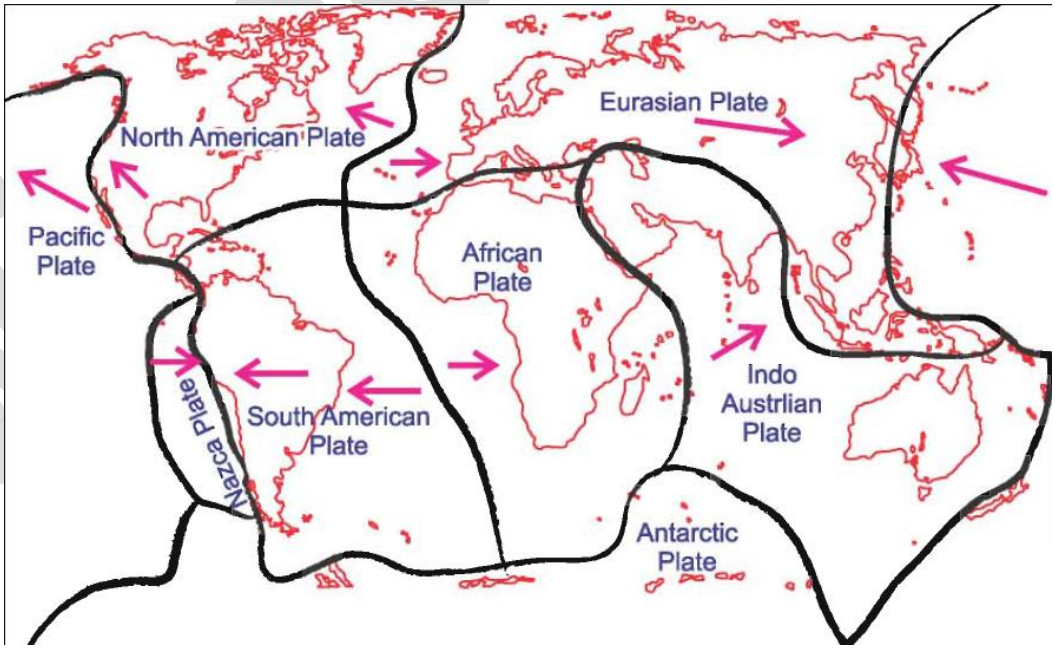
The Pangea was broken into a number of plates known as the lithosphere Plates. These Plates move around very slowly, from a few Millimetres to a centimetre a year.

The Pacific plate is the largest plate and it covers about 1/5th of entire Earth's surface.

The Himalayas is rising by about 5mm per year, due to the movement of Indo-Australian plate, and the plate is still moving at the rate of 67 mm/year. The scientists expect that, in another 10 million years, the plate would have travelled about 1,500 km into Asia.

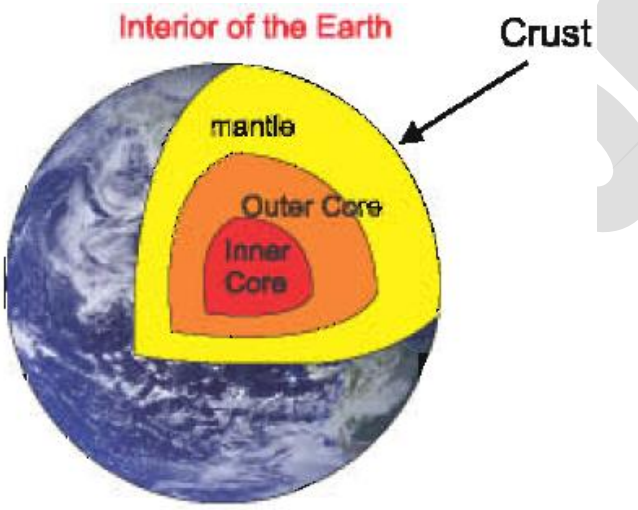
The Pangea split into seven major plates and smaller plates. The major plates were the Eurasia, Antarctica, North America, South America, Pacific, Africa and Indo-Australian plates. The smaller plates include the Arabian, Caribbean, Philippine, Cocos, Nazca and so on. These plates are continuously in motion with respect to each other.

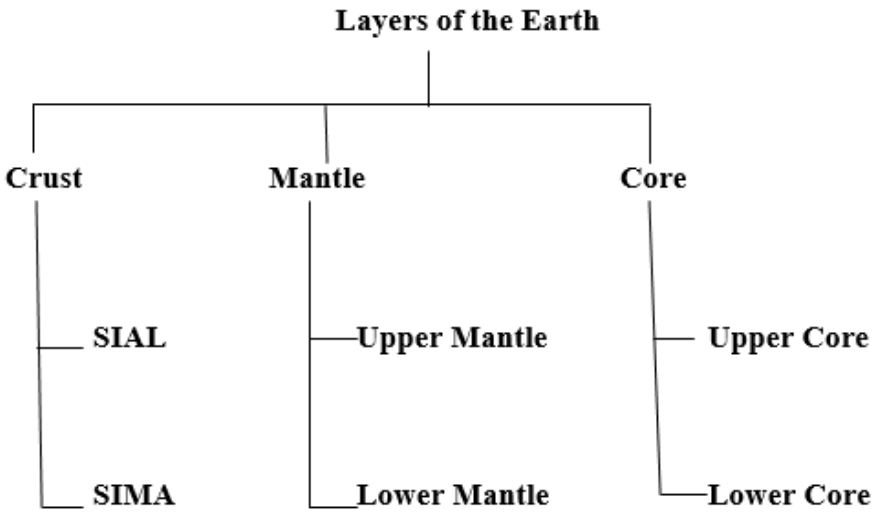
Plate boundaries of the Earth



Interior of the Earth

By analyzing the seismograms recorded from many earthquakes, scientists have discovered that three main layers or shells exist within the Earth. Isaac Newton was one of the first scientists to theorize about the structure of the earth. Since then many scientists presented theories on the structure of the earth. **The part of the earth we live on is a very thin layer** compared to the interior of the earth. The interior of the earth can be divided into three major layers based on chemical composition and characteristics. They are the **crust, mantle** and the **core.**





Suess, an Austrian Geologist named the crust, mantle and core as sial, sima and nife respectively.

Crust

The uppermost layer of the earth's surface is called the "crust or lithosphere". The continental crust is composed of a layer called the **"SIAL"** which is made up of Silica and Aluminium. The oceanic crust is composed of basaltic layer called the **"SIMA"** which is made up of Silica and Magnesium. Crust is ticker on the continents and thinner on the ocean floors. The sial layer is floating on the sima layer. The average depth of sial is about 20 km and the average depth of sima is about 25 km. the average density of the crust is about 3 g/cm^3.

Mantle

Mantle lies between the crust and core. It comprises about 83% of the Earth's volume. It is made up of plates that move and create continental drift. Beyond 900 km, this layer is completely homogenous. Upper mantle is known as **"Asthenosphere".** It extends up to a depth of 700 km. lower mantle is semisolid and is plastic in nature. The average density of the mantle is about 8 g/cm^3.

The layers of the Earth can be compared with a mango or boiled egg or cricket ball for better understanding.

Core

The inner most layer of the earth is called the **"Core** or **Barysphere".** It is otherwise known as **NIFE,** because of the presence of Nickel and Ferrous(iron). This layer produces earth's magnetic field. It has two main divisions; they are the outer core and the inner core. The particles present here resemble liquid. It may be in a solid state due to excessive pressure of the surrounding layers. The density of the core is about 12g/cm^3.

Temperature at Interior of the Earth

The experience of volcanic eruption, hot springs and mines indicate that heat increases as we move downwards into the earth. The temperature is estimated at the centre of the Earth to be as high as 5000^0C. the normal temperature change is 1^0C for every 32 metres of descent.

The Tethys sea was a shallow sea between the Angara and Gondwana land.

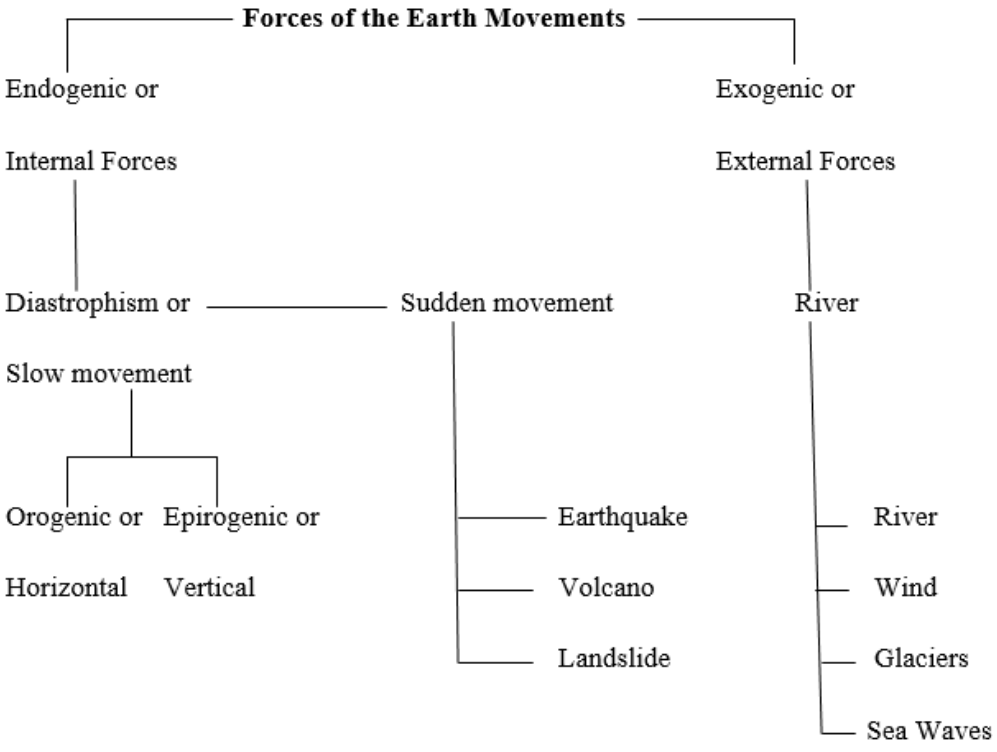
Forces of Earth Movements

The crust of the earth is not stable. Several areas of the present land masses were once beneath the sea. Continuous changes are taking place on the surface of the earth. In ancient geological part of the place where the Himalayas lies was occupied by the shallow **Tethys** sea. A few of the changes are gradual and slow, some of them are sudden. These changes are brought on by two different forces. They are, Endogenic and Exogenic forces.

The Endogenic or Internal Forces

It originates and acts from within the earth's crust. It gives rise to deformation and irregularities on the crust of the earth.

The earth movements which bring about vast changes within the crust of the earth are called the Endogenic or Tectonic movements. These movements are of two types:



Slow movements or Diastrophism

It is the general term applied to slow bending, folding, warping and fracturing. Such movements may be further divided as follows;

Epirogenic or continental movement

The vertical movement leads to either uplift or subsidence of the earth's crust, along lines of weaknesses which are called **"FAULTS".** Displacement of the earth's crust takes place along the fault line. When displacement takes place along two adjoining fault lines, a portion between them may get uplifted to form a block mountain or plateau or subside to form a basin or Rift valley. Large scale vertical movements of the earth's crust are also called Epirogenic movements.

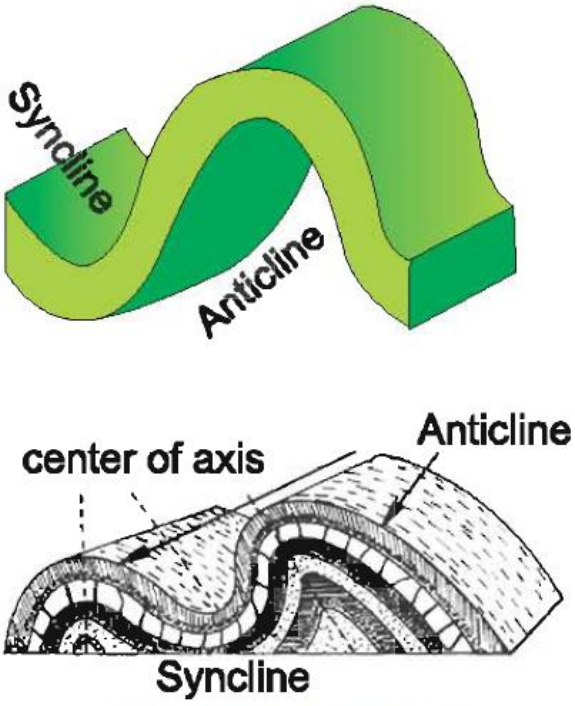
The Great Rift Valley of East Africa and the Narmadha valley in India are the best examples of such basins bounded by faults.

Orogenic or Mountain Building Movements

Horizontal movements of the earth's crust are responsible for folding and displacement of the layers of rocks. Simple folding consists of alternating upfolds called **"Anticlines"** and down folds called **"Synclines".** Such simple folds rarely occur. Most often folds get compressed to such an extent that the layers of rocks get displaced over long distances resulting in complex structure. Large scale horizontal movements are called Orogenic movements. They are responsible for the formation of fold mountains of the world – like the Himalayas.

The Exogenic or External Forces

It originates and acts on the surface. It removes the irregularities to make a Levelled Land.



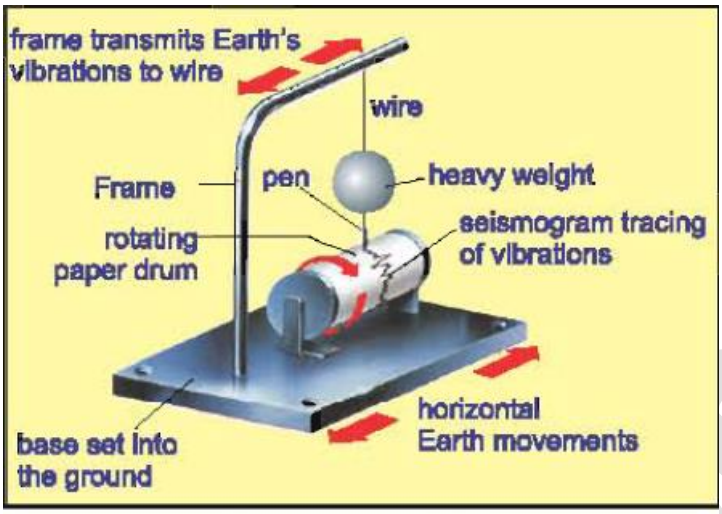
Sudden movements

These movements bring sudden changes on and below the crust. These movements are destructive in nature. Major destructions have occurred due to sudden movement like Earthquakes and Volcanic activities.

Earthquakes

An earthquake is a sudden shake or tremble of a part of the earth's crust which results in tremors or vibrations. They are classified as **volcanic earthquakes** and the **tectonic earthquakes.** The volcanic earthquakes occur along with eruption. The Tectonic earthquakes are caused by crumbling or displacement of rocks.

The point of origin of the earthquake is called the **"Focus".** The point directly above the focus on the surface earth is called the **"Epicentre".** There are 8000 – 10000 earthquakes occurring in the world annually. An earthquake occurs for every one hour. There are many more undetected, because of their low intensity.



Seismograph

The earthquake waves are recorded by the instrument known as the Seismograph. The Richter scale is used to measure the intensity of an earthquake. Its scale ranges from 0 to 9.

Types of Earthquake Waves

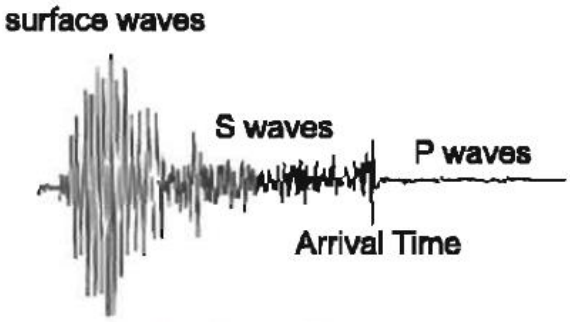
Basically it is divided into **body waves** and **surface waves.**

Body waves are produced by the release of energy at the focus and move in all directions through the body of the earth. There are two types of body waves.

Primary waves or P-waves move faster and are the first to be recorded by the seismograph. It is similar to the sound waves and travel through gaseous, liquid and solid materials. The primary waves travel by the compression of earth materials forward and backward in its direction. It travels at a speed of 8 Km/sec.

Secondary waves or S-waves are slower than the P-waves. It can travel through solid materials. During the occurrence of secondary waves, particles oscillate in the direction of wave travel. It is similar to the movement of a rope shaken from side to side. It travels at a speed of 5 Km/sec.

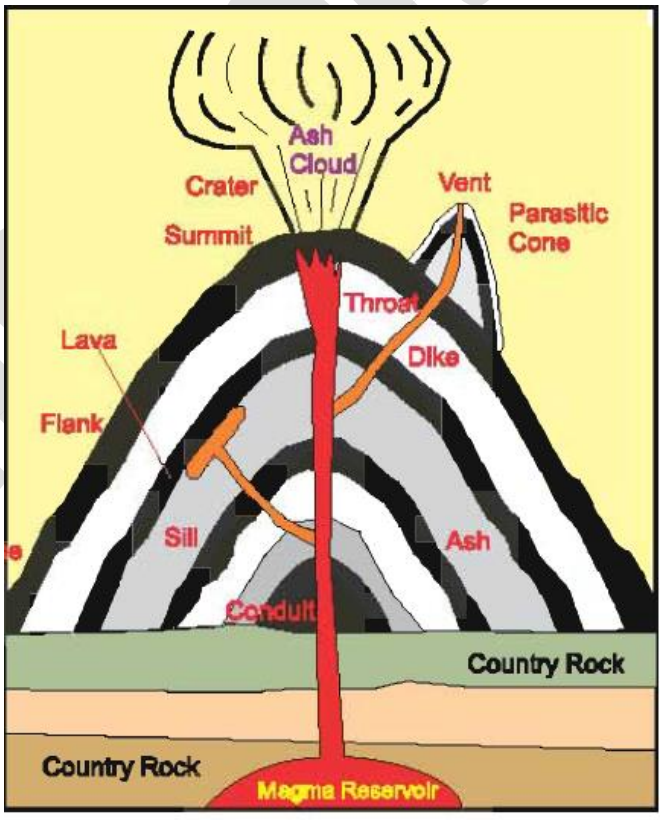
Surface waves are the last to be recorded on the seismograph. These waves cause most of the damages on the surface. They are also known as L-waves. They travel at a speed of 4 Km/sec.



Earthquake waves

Volcanoes

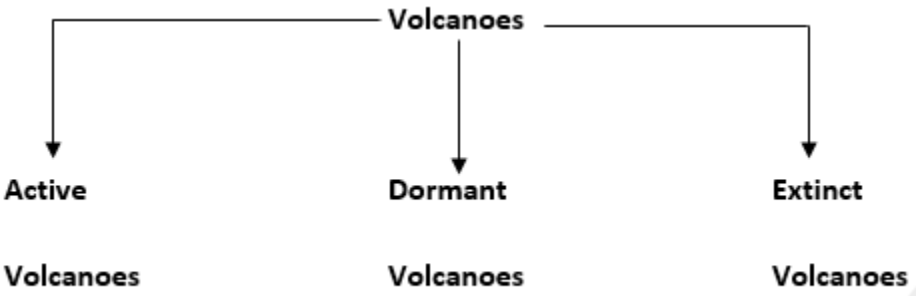
A volcano is a vent or an opening on the earth's crust, through which hot molten materials erupt from the interior. When the magma erupts out of the earth on to the surface, it is called **"Lava".** The eruption of materials from the interior of the earth's crust may occur with huge explosions or silently through tissues of rocks.



Cross section of a Volcano

Types of Volcanoes

Volcanoes can be classified into three types based on the frequency of eruption. They are:



Active Volcano

Eruptions occur at frequent intervals. Most of the active volcanoes are found along the mid-Atlantic oceanic ridges. Mauna loa in Hawaii Island is the largest active volcano in the world. The Barren Island is the only active volcano in India.

North-western part of the Deccan plateau of India has been made up of volcanic lava.

Dormant Volcanoes

They are also called **sleeping volcanoes.** These volcanoes have been active in the past, stopped ejecting lava now, but it may erupt in the future. The Vesuvius of Italy and Mauna Loa in Hawaii are the best examples.

Extinct Volcanoes

Extinct volcanoes are also called dead volcanoes. They would have eruptedin the past but have stopped erupting now. Mt. Kilimanjaro in Africa and Narcondam Island near the north-east of North Andaman Island of Indian territory are some examples of extinct volcanoes. The famous Tiruvannamalai hills of Tamil Nadu and Panaka hills of Andhra Pradesh are also considered as extinct volcanoes.

The crater of a volcano filled with water is known as Crater Lake.

Volcanic Regions of the World