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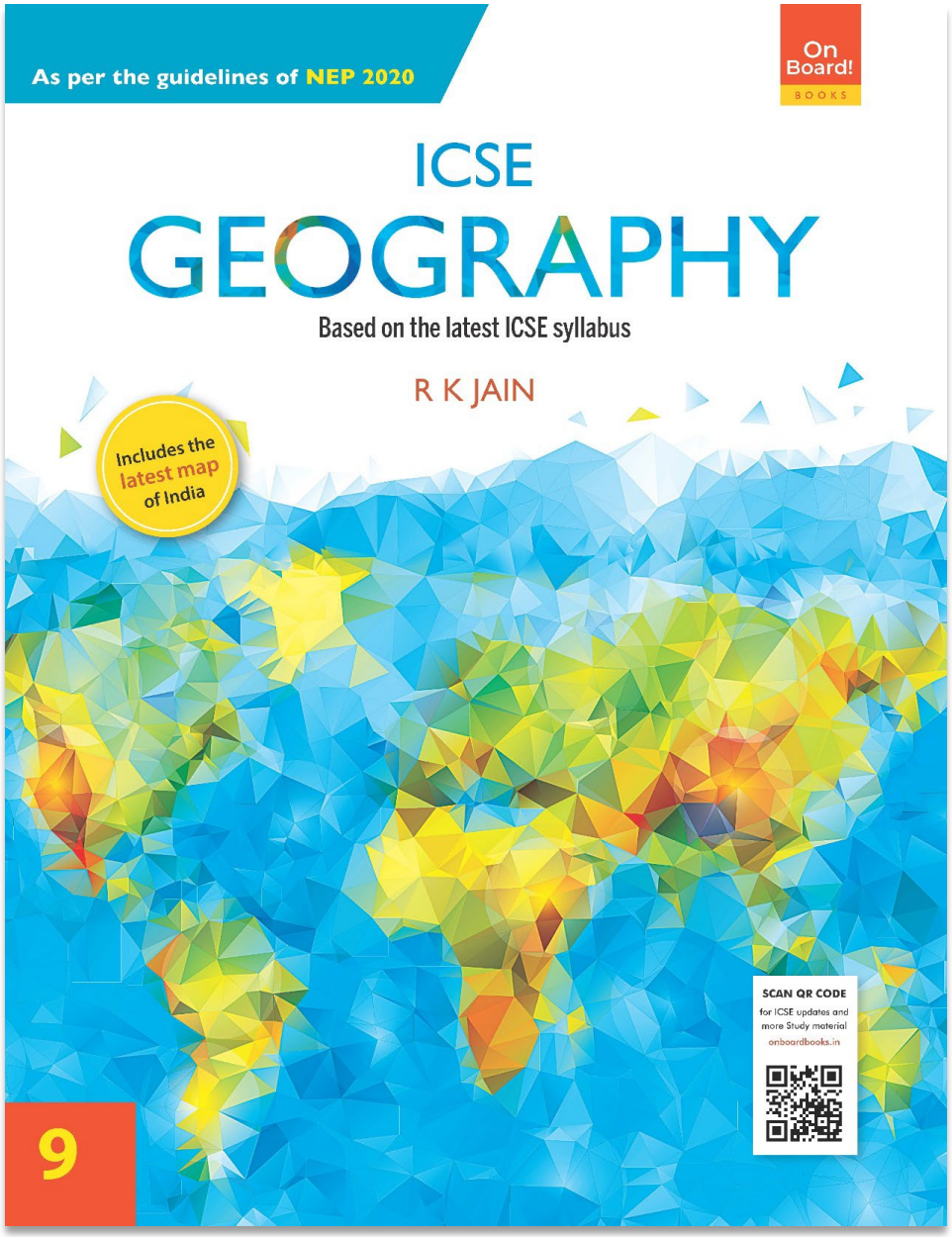
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Class 9

Chapter 7: Volcanoes

A volcano is not a mountain. It is a **vent** or an opening, usually circular or nearly circular in form, through which heated materials consisting of water, gases, liquid lava and rock fragments are erupted from the highly heated interior to the surface of the Earth.
Volcanology is the term given to the study of volcanoes, and the scientists who study them are called the **volcanologists**.

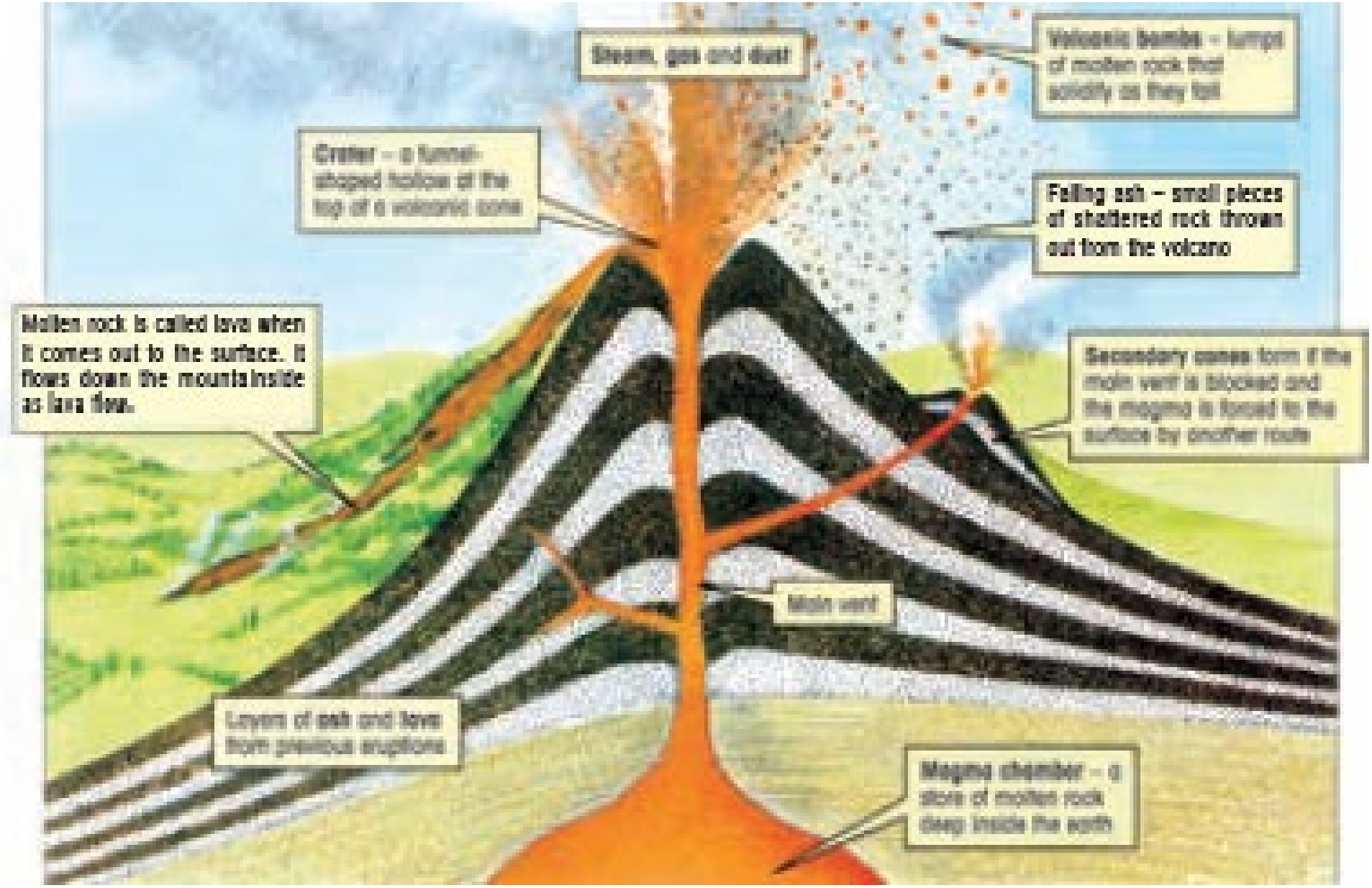
Volcanism has two components, one of them operates below the Earth's crust and the other above the crust, i.e. the endogenetic mechanism and the exogenetic mechanism.

The **endogenetic mechanism** includes the creation of hot and liquid magma and gases in the mantle and the crust, their expansion and upward ascent, their intrusion and cooling and solidification in various forms below the crustal surface. They form batholiths, laccoliths, sills, dykes, phacoliths, etc.

The **exogenetic mechanism** includes the process of appearance of magma as lava, volcanic dust and ashes, fragmental materials, mud, smoke, etc. in different forms such as fissure flows or violent volcanic eruptions, hot springs, geysers, fumaroles, etc.

COMPONENTS OF A VOLCANO

- The volcano of explosive type has a **volcanic cone**, which is formed when the erupted material accumulates around the **vent**.
- The vent is an opening of circular or nearly circular shape at the centre of the cone.
- The vent is connected to the interior of the Earth by a narrow **pipe**. The volcanic materials erupt through this pipe.
- A funnel-shaped hollow at the top of the cone is called the **crater**.



Components of a volcano

TYPES OF VOLCANOES

There is a wide variation in the mode of volcanic eruptions and their periodicity. Accordingly, the volcanoes can be classified into three types. These are:

1. Active Volcanoes erupt frequently and constantly eject volcanic lava, gases, ashes and fragmental materials. There are more than 500 active volcanoes in the world. **Etna** and **Stromboli** are examples.

An erupting volcano

2. Dormant Volcanoes have become quiet after eruption. They do not show any indication of future eruption. These are also called the **sleeping volcanoes**. **Mt Vesuvius** is the example.

3. Extinct Volcanoes have not erupted for thousands of years. It may be pointed out that no volcano can be declared permanently dead, as we do not know what is exactly happening below the ground surface.

CAUSES OF VOLCANISM

The mechanism of volcanism and the volcanic activity are associated with several processes, such as:

- A gradual increase of temperature with increasing depth at the rate of 1 °C for every 32 metres.
- Magma is formed due to the lowering of melting point, which in turn is caused by the reduction in pressure of the overlying material.
- Gases and vapour are formed due to heating of water, which reaches underground through percolation.
- The ascent of magma forced by vast volume of gases and water vapour.

VOLCANIC LANDFORMS

Various landforms are created due to the cooling and solidification of **magma** (below the Earth's surface) and **lava** (on the Earth's surface). Some relief features are also formed due to the accumulation of volcanic materials. The volcanic landforms are grouped into two broad categories. These are as under:

1. Extrusive features like cinder or ash cones, composite cones, basic-lava cones, acid-lava cones, lava domes, lava plugs, craters, calderas, etc.

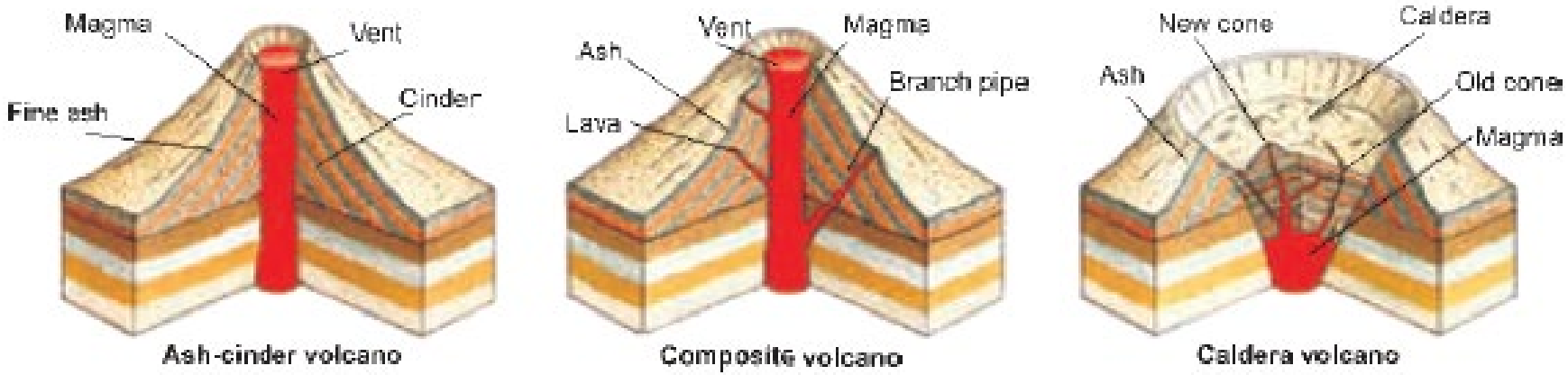
2. Intrusive features like batholiths, laccoliths, phacoliths, lopoliths, sills, dykes, etc.

EXTRUSIVE FEATURES

- **Cinder** or **ash cones** are formed due to the accumulation of loose particles around the vent.
- **Composite cones** are the highest and are formed by the accumulation of various layers of volcanic material.
- **Basic-lava cones** are formed of light and less viscous lava. Thus, a long cone with low height is formed. These are also called the shield cones.
- **Acid-lava cones** are formed from highly viscous lava. High cones of steep slopes are formed and are also known as the Strombolian type.
- **Lava domes** are more extensive than the shield cones. These are formed due to the accumulation of lava around the volcanic vent.

- **Craters** are depressions formed at the mouth of the volcanic vent, which is usually funnel-shaped. It differs from caldera with regard to size and mode of formation.

- **Caldera** is an enlarged form of a crater. It is surrounded by steep walls and is formed usually due to the subsidence of the crater.

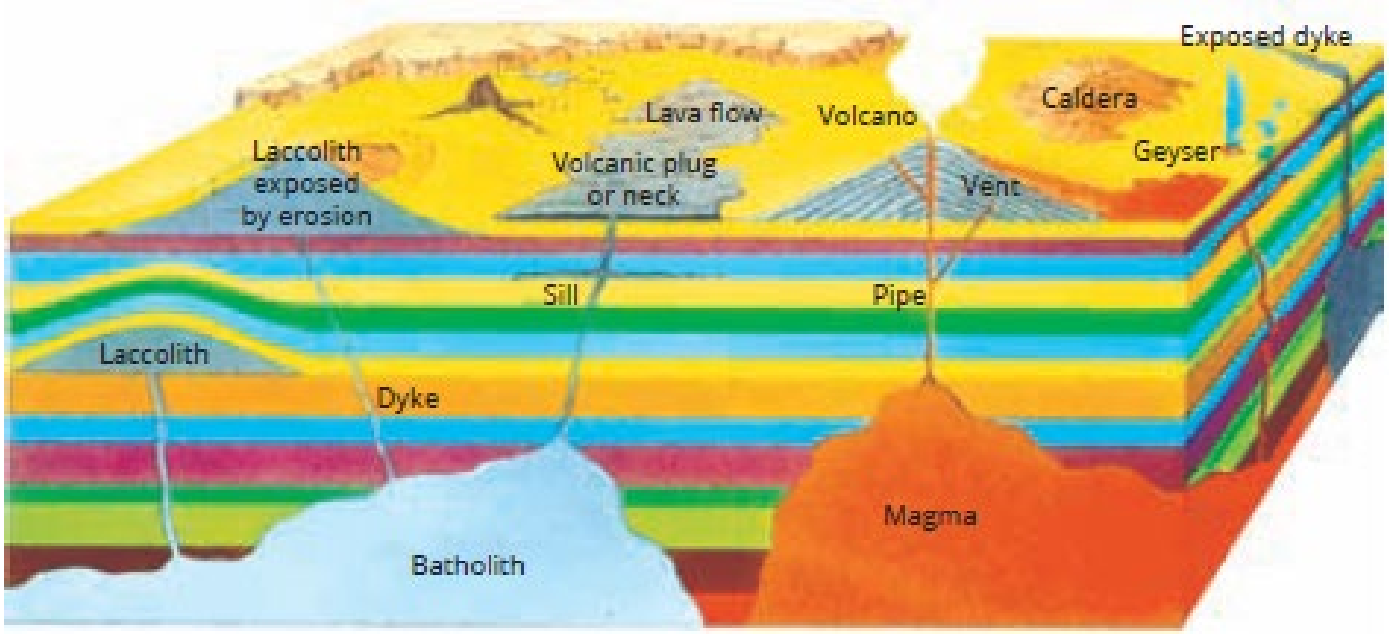


Extrusive features of volcanic landforms

INTRUSIVE FEATURES

- **Batholiths** are long, irregular, undulating and dome-shaped features. Their side walls are very steep, almost vertical. They are buried deep within the Earth. When exposed, they are subjected to weathering and erosion. Such domes can be seen in the Chotanagpur Plateau of India.

- **Laccoliths** are formed due to the intrusion of magma along the bedding planes of horizontal sedimentary rocks. They are usually mushroom or dome shaped.



The volcanic landforms – extrusive and intrusive

- **Phacoliths** are formed due to the intrusion of acidic magma along the anticlines and synclines in the region of fold mountains.

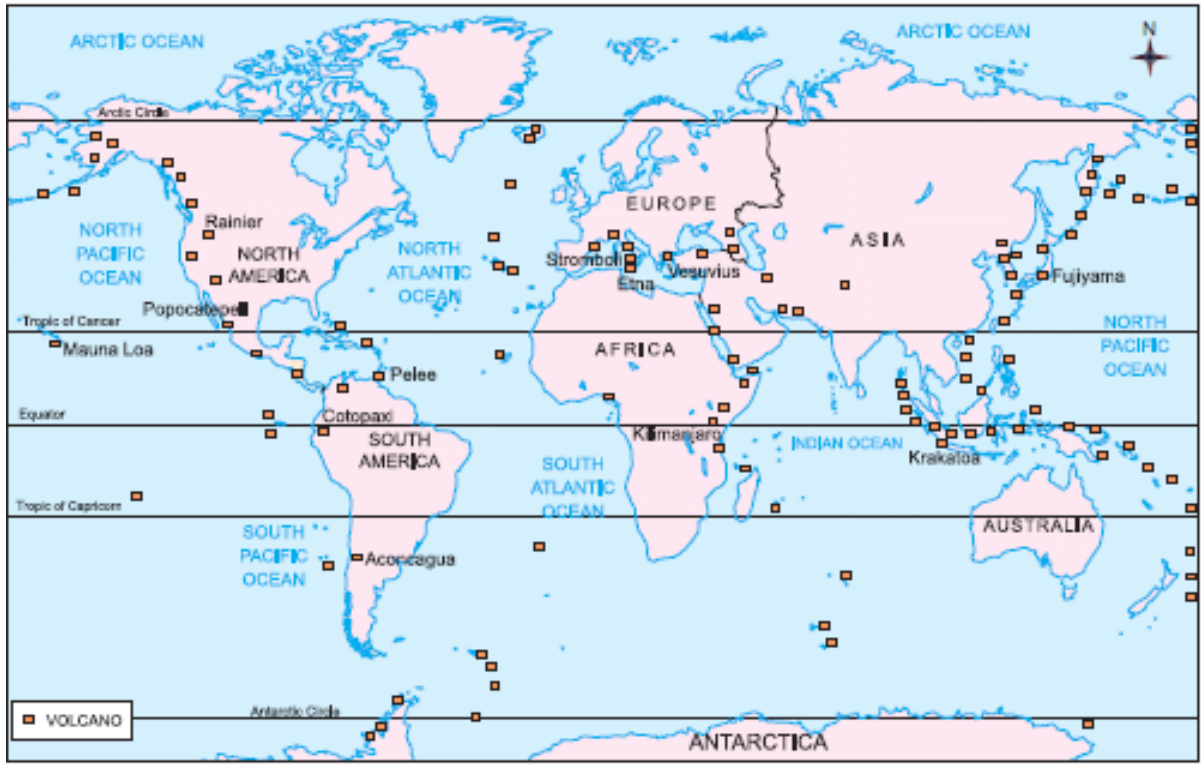
- **Lopoliths** are formed when magma solidifies in shallow basins. The rocks are coarse-grained due to very slow process of cooling.

- **Sills** are usually parallel to the bedding planes of sedimentary rocks. The thickness of sills ranges from a few centimetres to several metres.

- **Dykes** are wall-like formation of solidified magma. These are vertical to the bed of sedimentary rocks. The thickness ranges from a few centimetres to several hundred metres, but the length can be several kilometres.

DISTRIBUTION OF VOLCANOES

- The volcanoes are mostly associated with the weaker zones of the Earth's crust which are also zones of seismic activities like the earthquakes.
- The weaker zones are mostly found in the areas of fold mountains (with the exception of the Alps and the Himalayas).
- They are also associated with the meeting zones of oceans and continents, or with the mountain building activity.
- Most of the world's active volcanoes are associated with the plate boundaries. About 15 per cent of the volcanoes are associated with the **divergent plate** boundaries and about 80 per cent with the **convergent plate** boundaries.
- Some volcanoes are also found in the intra-plate regions.



World – Distribution of volcanoes.

MAIN VOLCANIC BELTS

Circum-Pacific Belt

- The Circum-Pacific Belt includes the volcanoes of the eastern and western coastal areas of the Pacific Ocean. This belt is also known as the **Ring of Fire** of the Pacific Ocean.
- Cotopaxi in Andes (5896 m) is the highest volcanic mountain in the world. The other famous volcanoes are **Mt Fujiyama** (Japan), **Mt Shasta**, **Mt Rainier** and **Mt St Helena** (USA).

Mid-Continental Belt

- The Mid-Continental Belt includes the volcanoes of the Alpine mountains and the Mediterranean Sea.
- Some of the famous volcanoes of the Mediterranean Sea such as the **Stromboli**, **Vesuvius**, **Etna**, etc. are in this belt.

Mid-Atlantic Belt

- The Mid-Atlantic Belt includes the volcanoes along the Atlantic ridge which is the divergent plate zone.
- They are mainly of the fissure eruption type.
- **Iceland**, which is a part of the Mid-Atlantic ridge, is the most active volcanic area.
- The fractures in the crust are created by the divergent plates.

EFFECTS OF VOLCANIC ERUPTIONS

Volcanic eruptions can cause constructive as well as destructive effects. Some of them are as under:

Constructive Effects

- Lava can give rise to fertile soils. Most of the precious stones are formed due to volcanic activity.
- Geysers and springs are tourist attractions and are also important from the medical point of view due to the chemicals dissolved in them.
- Some crater lakes are source of rivers and often offer scenic attraction for tourists.
- Most of the volcanic rocks when exposed on the surface are a storehouse of metals and minerals.

Destructive Effects

- The hot lava ejected from the volcano moves at a fast speed. This can bury man-made infrastructure, kill human beings and animals, destroy agricultural farms and pastures, plug rivers and lakes, burn and destroy forests.
- The fall out of large quantities of fragmented materials, dust, ash, smoke, etc. creates health hazards due to poisonous gases emitted during eruption. It also causes **acid rain**.
- Heavy rains mixed with volcanic dust and ash cause mud-flow on the steep slopes of the cones.
- Earthquakes caused due to explosive eruptions can generate destructive **tsunamis**, seismic waves, etc. These can cause loss of life and property in the affected coastal regions.
- The volcanic eruptions can change the heat balance of the Earth and the atmosphere, causing **global warming**.

THANK YOU