VOLCANOES

A volcano is an opening, or rupture, in a planet's surface or crust, which allows hot magma,

volcanic ash and gases to escape from the magma chamber below the surface. Volcanoes are

generally found where tectonic plates are diverging or converging. A mid-oceanic ridge, for

example the Mid-Atlantic Ridge, has examples of volcanoes caused by divergent tectonic plates

pulling apart; the Pacific Ring of Fire has examples of volcanoes caused by convergent tectonic

plates coming together. By contrast, volcanoes are usually not created where two tectonic plates

slide past one another.

Volcanoes can also form where there is stretching and thinning of the Earth's crust in the interiors

of plates, e.g., in the East African Rift, the Wells Gray-Clearwater volcanic field and the Rio

Grande Rift in North America. This type of volcanism falls under the umbrella of "Plate

hypothesis" volcanism. Volcanism away from plate boundaries has also been explained as mantle

plumes. These so- called "hotspots", for example Hawaii, are postulated to arise from upwelling

diapirs with magma from the core–mantle boundary, 3,000 km deep in the Earth.

Erupting volcanoes can pose many hazards, not only in the immediate vicinity of the eruption.

Volcanic ash can be a threat to aircraft, in particular those with jet engines where ash particles

can be melted by the high operating temperature. Large eruptions can affect temperature as ash

and droplets of sulfuric acid obscure the sun and cool the Earth's lower atmosphere or

troposphere; however, they also absorb heat radiated up from the Earth, thereby warming the

stratosphere. Historically, so-called volcanic winters have caused catastrophic famines.

**Characteristics of volcanoes**

* Lava cools and hardens after coming into contact with the air which forms a volcanic mountain-like shape
* A pyroclastic flow is the flow of molten semi-liquid lava away from the volcanic mountain, downhill.
* Molten rocks are called magma which are present just below the vent of the volcano and are the main source of lava
* Lava is the molten rock or magma that comes through a volcanic vent. It generally consists of silicate or silica rocks and it is in liquid or semi-solid form.
* Magma chamber contains molten rocks and gases under high pressure. Conduit is a pipe-like structure through which magma comes out and it opens into the main vent

**Formation of volcano**

Volcanoes are formed by the movement of tectonic plates, which are large slabs of the Earth's crust that move slowly over the Earth's mantle. There are two main types of tectonic plate boundaries that can create volcanoes: convergent boundaries and divergent boundaries.

Convergent boundaries are where two plates collide. When an oceanic plate collides with a continental plate, the denser oceanic plate is forced under the continental plate, a process called subduction. As the oceanic plate sinks into the mantle, it melts and forms magma. This magma rises through the crust and can erupt onto the surface, forming a volcano.

Divergent boundaries are where two plates are moving away from each other. As the plates pull apart, they create cracks in the Earth's crust. Magma from the mantle rises up through these cracks and erupts onto the surface, forming volcanoes.

**Types of volcanoes**

**On the basis of activity:**

* **Active Volcano:**An active volcano erupts continuously in the present time. Example: Barren Island volcano at Andaman Nicobar Islands in India is the only active volcano of India. There are around 700 active volcanoes in the world, many under the sea.
* **Dormant or sleeping volcanoes:** These are the most dangerous volcanoes in the world. Sleeping volcanoes do not have any fixed time of the eruption, they can erupt any time.  Example- Mt. Vesuvius in Italy, Mt. Krakatau in Indonesia and Mt. Kilimanjaro (Tanzania).
* **Extinct Volcano:** An extinct volcano is the one which has not erupted for the last 10,000 years and is a dead volcano according to scientists. An extinct volcano has no lava supply in its magma chamber. Example- Mt. Thielson in Oregon USA is a dead volcano because it had last erupted 2,50,000 years ago.

**On the basis of structure**

* **Shield Volcano:**Shield volcanoes are not so steep therefore lava flows to a great distance. Such volcanoes are wider and resemble warrior shields and hence its name. Shield volcanos are the largest of all types of volcanos.
* **Cinder Volcanos:** Cinder volcanoes are formed when upcoming lava of shield mountains moves in the form of shield mountains and comes out explosively. Cinder volcanoes have a steep slope and also a crater on the top.
* **Composite volcanoes:** Composite volcanoes do not have one but many vents. The lava flows with a mixture of volcanic rocks called cinders. The material accumulates in the form of layers over layers.
* **Caldera:**Caldera is created as a large depression due to a sudden explosion in the volcano, which collapses it.

**Significance of volcanoes**

* Volcanoes provide a window into the Earth's interior, allowing scientists to study the composition and behaviour of molten rock (magma) beneath the Earth's surface.
* Volcanic activity is closely tied to plate tectonics. The movement and interaction of tectonic plates lead to the formation of volcanic features at plate boundaries, providing insights into the Earth's dynamic processes.
* Volcanic eruptions contribute to the creation of various landforms, including mountains, calderas, and volcanic islands. Over time, volcanic activity shapes the Earth's topography.
* Volcanic activity can contribute to the formation of valuable mineral deposits. Minerals such as gold, silver, and various metal ores can be associated with volcanic processes.
* Volcanic ash, when weathered, breaks down into fertile soil. The volcanic soils are often rich in minerals, making them highly productive for agriculture. Regions with past volcanic activity are often agriculturally valuable.
* Volcanic islands often serve as unique ecosystems with diverse flora and fauna. Over time, life colonizes these new landmasses, leading to the development of distinct ecosystems.
* Large volcanic eruptions can release significant amounts of ash and gases into the atmosphere, affecting global climate patterns. Volcanic aerosols can lead to temporary cooling of the Earth's surface.
* Volcanic regions often have geothermal resources. The heat from the Earth's interior can be harnessed for geothermal energy, providing a sustainable and renewable energy source.
* Many cultures have myths, legends, and religious beliefs associated with volcanoes. Volcanoes are sometimes considered sacred or mythical, playing a central role in the cultural narratives of certain societies.
* Volcanic landscapes attract tourists and outdoor enthusiasts. People visit volcanic regions to witness the unique geological features, hot springs, and other natural attractions.
* In some regions with active volcanoes, local traditions and practices are shaped by the presence of these geological features. People may have ceremonies, festivals, or rituals related to volcanic activity.
* Volcanoes provide valuable opportunities for scientific research. Studying volcanic processes enhances our understanding of Earth's geology, magma dynamics, and eruption mechanisms.
* Volcanoes are used as educational tools to teach students about geology, earth sciences, and natural hazards. Outreach efforts often focus on raising awareness about volcanic risks and preparedness.

**References**

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