

Tectonic Plate Theory

[UPSC Notes]

What is Tectonic Plate Theory?

Tectonic Plate Theory which is also known as the Plate Tectonic Theory is a scientific theory that deals with the dynamics of the outer shell of Earth's Surface i.e Lithosphere.

- According to this theory, the Earth is made up of a rigid layer known as the Lithosphere that is about 60 miles thick.
- The Lithosphere is broken down into large size plates, regional size plates, and several small ones known as 'platelets'.
- The tectonic plates are composed of thick continental lithosphere and oceanic lithosphere that is topped by different kinds of crust.
- These tectonic plates can move because they have greater mechanical strength than the base of the lithosphere i.e asthenosphere.
- The theory of Plate Tectonics was first introduced in 1967.

Principles of Tectonic Plate Theory

The Plate Tectonic Theory is Elegantly simple.

- The surface layer of Earth is 50 to 100 km thick, which is equivalent to 30 to 60 miles. These plates come together to form a layer known as the lithosphere.
- The term 'Lithosphere' originated from Greek words meaning rocks.
- The Lithosphere slides over a partially molten layer known as the 'Asthenosphere'.
- The Greek meaning of asthenos is 'weak'. The movement of tectonic plates is possible as the boundary of the lithosphere-asthenosphere acts as a layer of detachment.

- As the tectonic plates in the lithosphere move across the Earth's surface, they interact, collide, diverge and converge with the other tectonic plates.
- These plates are driven by forces whose concept is not understood yet. It may be driven by the convection of the Earth's Surface or due to the pull of heavy metal pieces in the crust.
- The collision of plate tectonics results in the formation of various hazards. Some of them are earthquakes, volcanic eruptions, and so on.

Movements of Tectonic Plates

The tectonic plates are never fixed. They always move across the surface of the asthenosphere horizontally.

- When these tectonic plates slide over each other or collide or move apart, it leads to earthquakes, volcanic eruptions, and other natural disasters.
- The rate of movement of the tectonic plates varies considerably. For example, the arctic ridge has the slowest rate i.e 2.5 cm per year or less.
- On the other hand, the east pacific rise in the West of Chile has the fastest rate i.e 15 cm per year or more.
- The rock below the rigid plates is believed to be moving in a circular motion. The rocks beneath the plates are highly mobile.
- The material which is heated rises to the surface and starts to cool down and then sinks back into more depths. This results in the movement of the mantle.
- Hence, the back-and-forth movements of the softened mantle are the force that drives the movements of tectonic plates.

Some Examples of Tectonic Plates

The tectonic plates are classified into various types. They are major plates, minor plates, and regional plates. Some examples of these plates are mentioned below.

- **Major Plates:** The Earth's surface is divided into seven major tectonic plates. They are, Eurasia and adjacent oceanic plate, Africa with the eastern Atlantic floor plate, India-Australia-New Zealand plate, Pacific plate, South American plate, North American plate, and Antarctic (and the surrounding oceanic) plate.
- **Minor Plates:** Some important minor plates are as follows: Juan De Fuca plate found in the South-East of North American Plate, Fuji plate in the North-east of Australia, Cocos plate between Central America and Pacific plate, Nazca plate between South America and Pacific plate, Philippine plate that is found between the Asiatic and Pacific plate, Caroline plate between the Philippine and Indian plate and so on.
- **Indian Plates:** The Indian Plate includes the Australian continental portion and Peninsular India. The Kirthar Mountain in Pakistan follows the West, and the Rakim Yoma Mountains of Myanmar follow the east.

What are the Different Types of Tectonic Boundaries?

The movement of different types of tectonic plates causes the formation of tectonic boundaries. The tectonic boundaries are further classified into three types. They are:

- **Convergent Boundary:** A convergent boundary is a type of tectonic boundary that crashes into one another. They are often termed as 'destructive boundaries' as they cause a lot of destruction.
- **Divergent Boundary:** A divergent boundary is a type of tectonic boundary that is formed when the tectonic plates are pulled apart from each other. They are often termed as 'constructive boundaries'.

Transform Boundary: When the tectonic plates move horizontally sliding each other, a boundary is formed known as a transform boundary.

