Plates, Types of Wave, Scale, Seismic Zone of Earth

Earthquake

When the Lithospheric plates move, the surface of the earth vibrates. The vibrations can travel all round the earth. These vibrations are called earthquakes The place in the crust where the movement starts is called the focus. The place on the surface above the focus is called the epicentre.Vibrations travel outwards from the epicentre as waves.Greatest damage is usually closest to the epicentre and the strength of the earthquake decreases away from the centre. Earthquakes occur when the ground is subjected to so much force that it fractures or breaks. Earthquakes occur all the time all over the world, both along plate edges and along faults. Most earthquakes occur along the edge of the oceanic and continental plates. The earth's crust (the outer layer of the planet) is made up of several pieces, called plates. Earthquakes usually occur where two plates are running into each other or sliding past each other.

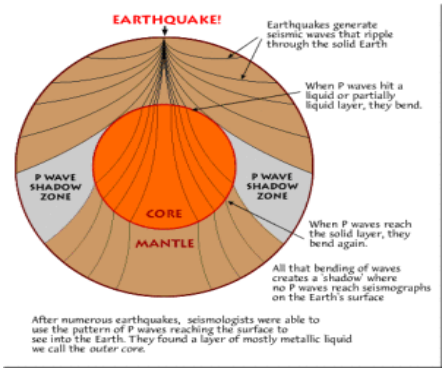
Distribution of Earthquakes:

The Pacific Ring of Fire accounts for about 68 per cent of all earthquakes and these are closely linked with the phenomenon of plate tectonics. Chile, California, Alaska, Japan, Philippines, New Zealand and the mid-ocean areas have had many minor and major earthquakes in this belt. Mountains here run along the border of continents and nearly parallel to the depressions in oceans. The sharpest break in relief in this belt is the cause of earthquake.

The mid-world mountain belt extends parallel to the equator from Mexico across the Atlantic Ocean, the Mediterranean Sea from Alpine- Caucasus ranges' to the Caspian, Himalayan mountains and the adjoining lands. This zone has folded mountains, large depressions and active volcanoes.

The remaining 11 per cent of the shocks are recorded outside these two belts. Only a few occur along the fracture in African lakes, Red Sea and the Dead Sea zone. For geographical distribution of earthquakes. For an account of earthquakes in the Indian sub-continent, Physical Aspects in Indian Geography section.)

Earthquake or Seismic waves



- Body waves are generated by the energy released at the focus /hypocenter. They move in all directions through the body of Earth. They interact with the surface rocks and generate Surface waves, which move along the surface. Body waves are further divided in two types: P – waves and S – waves.
- Surface waves move along the surface.The velocity of these waves vary with the material through which they travel, the more denser the material, the higher the velocity of these waves. They change their direction as they reflect and refract after coming across materials of different densities.
- Let us look into the characteristics of each of these waves in brief. The following are points from standard textbook so they are reliable source for study and revision:

1. P- waves:

- These waves are known as Primary waves as they are first one to arrive at the surface.
- Their characteristics are similar to Sound waves, as they travel through all three mediums- solid, liquid and gases.
- P-waves have a tendency to vibrate parallel to the direction of wave propagation. this causes density differences in the material through which they travel.
- These waves are responsible for stretching and squeezing of material.
- Shadow zone: these are specific areas where waves are not reported on the seismograph. P-waves appears as around the Earth at 105-145 degrees away from the epicenter.

2. S- waves:

- These waves arrive after some time delay, hence they are called secondary waves.
- An important characteristic of these s-waves is that they travel only through solid medium. This is important because this information helped in understanding the structure of interior of Earth.
- The direction of vibration of these S – wave is perpendicular to the direction of wave propagation, thereby creating crests and troughs in material of their transmission.
- Shadow zone: Beyond 105 degrees from the epicenter no S-waves are reported.

Tectonic Plates

- A tectonic plate (also called lithospheric plate) is a massive, irregularly-shaped slab of solid rock, generally composed of both continental and oceanic lithosphere.

- The lithosphere includes the crust and top mantle with its thickness range varying between 5-100 km in oceanic parts and about 200 km in the continental areas.
- The concept of Tectonic Plates was first introduced in 1967.
- A tectonic plate may be a continental plate or an oceanic plate, depending on which of the two occupies the larger portion of the plate.
- The Pacific plate is largely an oceanic plate whereas the Eurasian plate is a continental plate.

The Major and Minor Plates

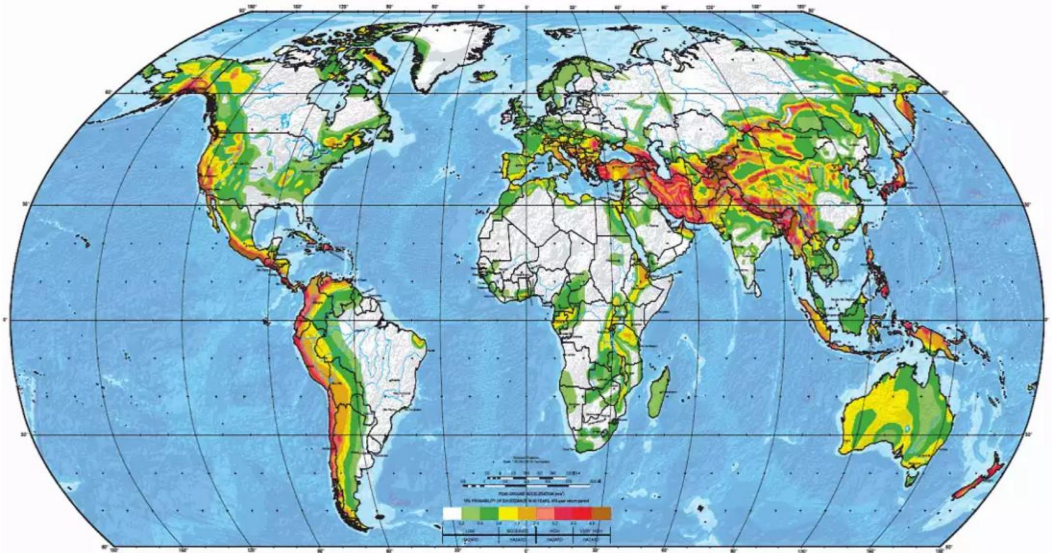
- The Earth's lithosphere is divided into seven major and some minor plates.
- Young Fold Mountain ridges, oceanic trenches, and/or transform faults surround the major plates. These include:
- The Antarctic (and the surrounding oceanic) plate
- The North American plate (with western Atlantic floor separated from the South American plate along the Caribbean islands)
- The South American plate (with western Atlantic floor separated from the North American plate along the Caribbean islands)
- The Pacific plate
- The India-Australia-New Zealand plate
- The Africa with the eastern Atlantic floor plate
- Eurasia and the adjacent oceanic plate

Some important minor plates include:

- Cocos plate: Between Central America and Pacific plate
- Nazca plate: Between South America and Pacific plate
- Arabian plate: Mostly the Saudi Arabian landmass
- Philippine plate: Between the Asiatic and Pacific plate
- Caroline plate: Between the Philippine and Indian plate (North of New Guinea)
- Fuji plate: North-east of Australia
- Juan De Fuca plate: South-East of North American Plate

Seismic Zones

A seismic zone is a region in which the rate of seismic activity remains fairly consistent. This may mean that seismic activity is incredibly rare, or that it is extremely common. Some people often use the term "seismic zone" to talk about an area with an increased risk of seismic activity, while others prefer to talk about "seismic hazard zones" when discussing areas where seismic activity is more frequent.



List of Earthquake (Seismic) Zones in India

Based on the past seismic history, Bureau of Indian Standards grouped the country into four seismic zones namely Zone-II, Zone-III, Zone-IV and Zone-V. Of all these four zones, Zone-V is the most seismic active region whereas Zone-II is the least.

Seismic Zone	Intensity on M.M Scale
Zone-II (Low-Intensity Zone)	6 (or less)
Zone-III (Moderate Intensity Zone)	7
Zone-IV (Severe Intensity Zone)	8
Zone-V (Very Severe Intensity Zone)	9 (and above)