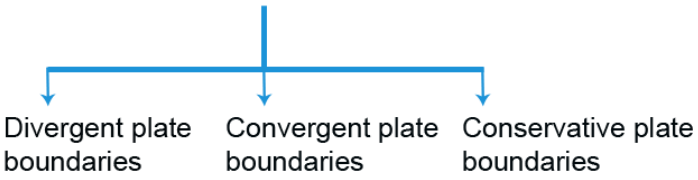
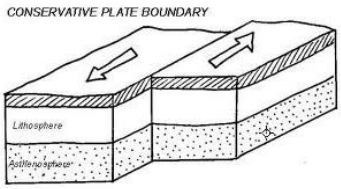
TECTONIC PLATES

Plate Tectonic Theory

- Earthquakes are caused along

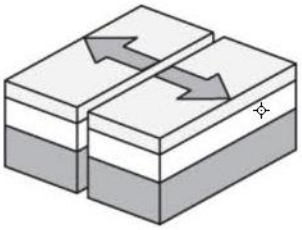


Conservative Plate Boundaries

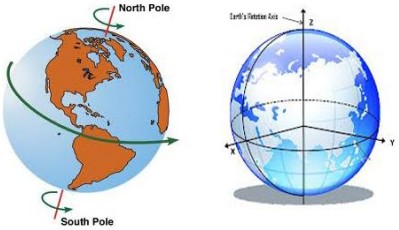


- Boundaries where the two plates slide past each other
- A plate is neither created nor destroyed in this case.
- A large amount of stress is released as the plates move against each other.
- Release of stress leads to shallow-focus intense earthquake.
- Example: San Andreas Fault in California

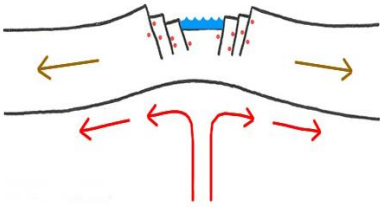
Divergent Plate Boundaries



- Boundaries where the two plates move away from each other.
- This is prominent along the oceanic ridges.
- All the plates move along the pole of rotation.
- Rate of movement of the plates is more at the equator and less at the poles.



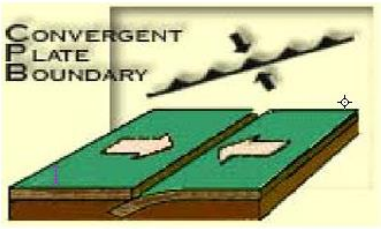
- Thus rate of divergence of the plates is more at the equator.
- Rate of divergence of the plates is relatively less at the poles.
- These two different rates of movement divide a single plate into many plates.
- Each part of the divided plates will have a relative motion of its own.



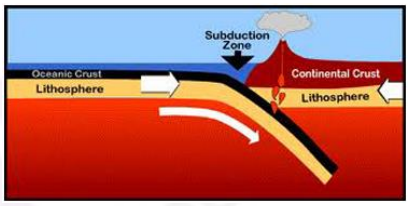
- The parts of the plates will have a mutual relative motion.
- This relative motion will be along the conservative plate boundaries.
- Shallow-focus intense earthquakes are caused.

- Conservative plate boundaries come into existence due to plate divergence.

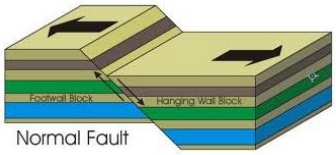
Convergent Plate Boundaries



- Boundaries where the two plates move towards each other.
- Convergence leads to the sinking of the heavier tectonic plate under the lighter one.
- Benioff zone refers to a dipping planar zone of the earthquake that is produced by the interaction of a down-going oceanic crustal plate with a continental plate.
- At the point of subduction the rocks get broken due to compression.



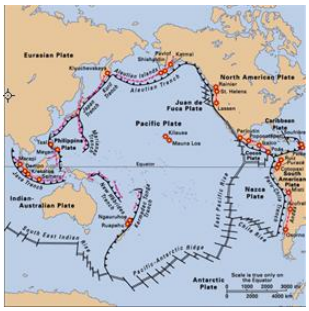
- Reverse Fault refers to the breaking of the rocks due to compression under subduction.
- Shallow-focus earthquakes are caused due to reverse fault.
- The plates slide inside under its own weight due to subduction.
- Normal Fault refers to the fault in which the hanging wall has moved downward relative to the footwall.
- Normal fault results in Intermediate-focus earthquake.



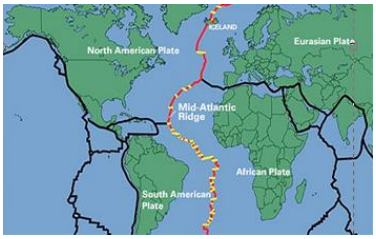
- Upon further subduction compression caused due to the pushing of the plate by the magma results in the breaking of the rocks i.e. Reverse Fault.
- Deep-focus earthquake take place in this case.
- Thus all three types of earthquakes occur along the convergent plate boundaries.

- Plate tectonic theory also explains the distribution of the earthquakes since most of the earthquakes occur along the plate boundaries.
- Example:

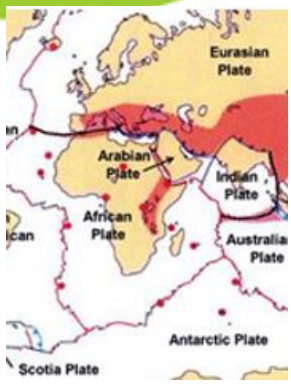
  a) Earthquake occurring along the circum-pacific belt is due to subduction.



  b) Earthquake occurring along the mid-Atlantic ridge is due to plate divergence

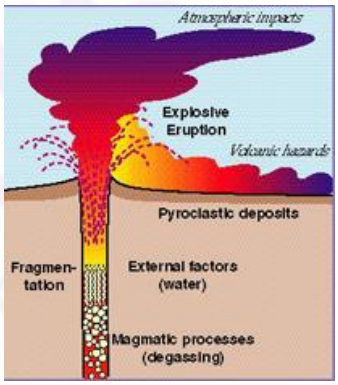


c) Earthquake occurring along the mid-continental belt is again due to divergence



Volcanicity

- Refers to the process through which the gases and the molten rocks are either extruded on the earth's surface or intruded into the earth's crust.
- At times the magma solidifies beneath the earth's surface before emerging on to the surface.
- Based on the solidification of magma, it can be of two types:
  a) one that solidifies on the earth's surface
  b) one that solidifies beneath the earth's surface

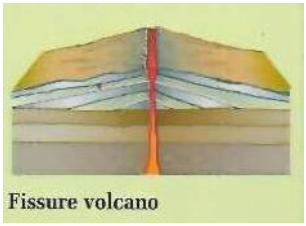


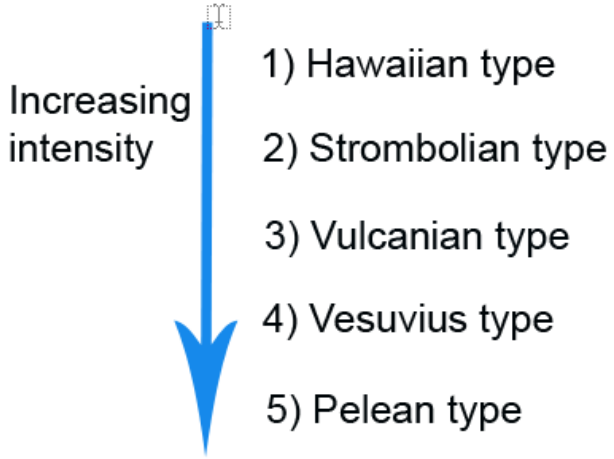
- Due to the two types of solidifcation of the magma two types of solidifcation are produced
  - extrusive topography (magma solidifying on the earth's surface)
  - intrusive topography (magma solidifying beneath the earth's surface)

Extrusive Topography

- Can be of two types:
  a) Magma may emerge in the form of a fissure flow.
  b) Magma may emerge from a volcanic pipe.
- Magma emerging in the form of fissure flow mostly occurs along the divergent plate boundaries.
- In this case magma gets derived from the mantle which in turn is made up of the peridotite rocks.
- Peridotite rocks contain relatively less amount of silica and hence the magma containing these rocks are less viscous.

- When the fissure flow occurs along the divergent plate boundaries oceanic ridges and plateaus are formed. Example: Columbia Plateau
- Again if the amount of silica present in the fissure flow is too less it leads to the formation of the planes.
- Magma emerging from a volcanic pipe and forming a volcanic cone is typically found in the case where the plates get subducted.
- Plates are made up of basaltic rocks which are rich in silica.
- Magma which rises after melting these plates are viscous because of the rich amount of silica present
- This magma solidifies and forms a conical shape upon reaching the earth's surface
- Central cone type volcanoes get formed when the magma rises from the subducted plates and form volcanic arc
- Volcanic arcs can be classified based upon:
  a) Intensity of eruption
  b) Activity
  c) Composition
    - Classification based on the intensity refers to how violent the explosion is.
    - Intensity of eruption depends upon the amount of silica present.
    - Classification based on the activity refers to the frequency of eruption
- Based on the activity, the volcanoes can be classified into:
  a) Active volcanoes
  b) Dormant volcanoes
  c) Extinct volcanoes
    - **Active Volcanoes** refer to the volcanoes that keep erupting after a period of time. Example: Etna, Strombolian
    - **Dormant Volcanoes** refer to the volcanoes that erupt after a relatively lengthier period of time. Example: Krakatoa, Fujiyama
    - Extinct Volcanoes refer to the volcanoes that show no sign of eruption in future. Example: Koh-i-Sultan
- Based on the composition:
  a) Cinder and Ash cone: Cone made up of pyroclastic rocks, dust and ash and devoid of lava.


Fissure volcano



- These cones have a small height. Hence also called Ant's Mount
- They are thoroughly permeable

b) Basic Lava cone: Cones made up of the magma that contains very less amount of silica.

- Due to less amount of silica the lava flows and forms plateau.
- These cones are of smaller height and have gentle slope.
- These cones are also known as shield cones.
- Example: Hawaiian Volcano

c) Acid Lava cone: Cones formed from the magma having a relatively higher amount of silica.

- Because of a higher amount of silica the magma solidifies and form cones with steep slope.

d) Composite cones: Cones having alternate layers of lava and pyroclastic material.

- These cones have the highest height.
- They are also called Strato cones.

e) Parasitic cones: Refers to the one-shaped accumulation of volcanic material that is not part of the central vent of a volcano.

- It gets formed by the eruptions from fractures on the flank of the volcano.

Intrusive Topography

- Refers to the magma solidifying beneath the earth's surface
- The shape of the solidified magma will be the same as the shape of the void in which the magma gets solidified.
- Intrusive topography may be of two type:
  a) Plutonic
  b) Hypabyssal

  - Plutonic topography is one in which the magma gets solidified at a greater depth beneath the earth's surface.
  - Hypabyssal topography is one which the magma gets solidified just beneath the earth's surface.

- Hypabyssal topography are more significant since they are exposed on to the surface once the surface material gets weathered away.

- Based on the shape of hypabassal topography:

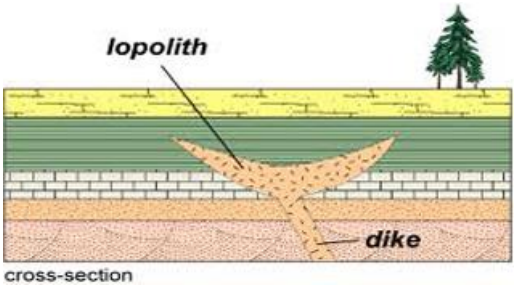
  a) Sills: Deposition of the Magma is in the form of flat table.

  Example: Siberian Plateau

  b) Laccolith: Deposition of Magma is in the form of Mushroom.

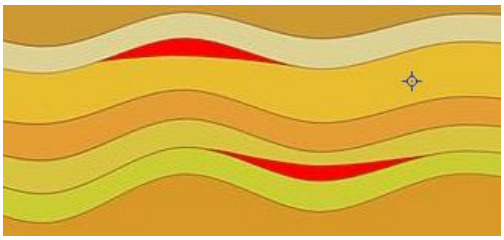
  Example: Bushveld of South Africa

  c) Lopolith: Refers to the solidification of the magma in the form of a bowl shaped cavity.



cross-section

  d) Phacolith: Deposition of Magma in the form of anticlines and synclines.



e) Batholith: Deposition of Magma in huge dome shaped style.

f) Dikes: Deposition of the Magma in the form of a wall.