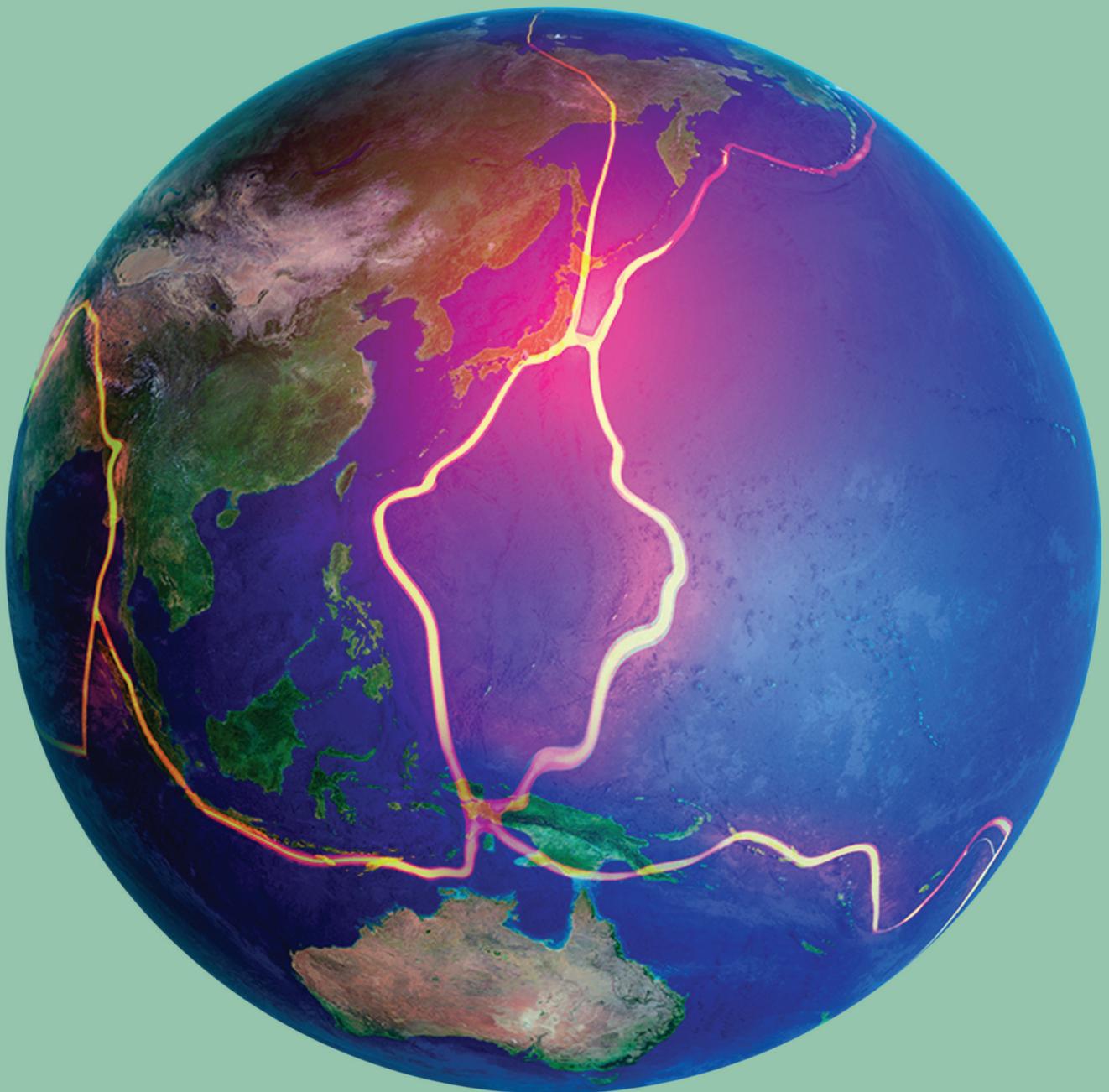


QUICK REVISION MODULE  
(UPSC PRELIMS 2024) GEOGRAPHY

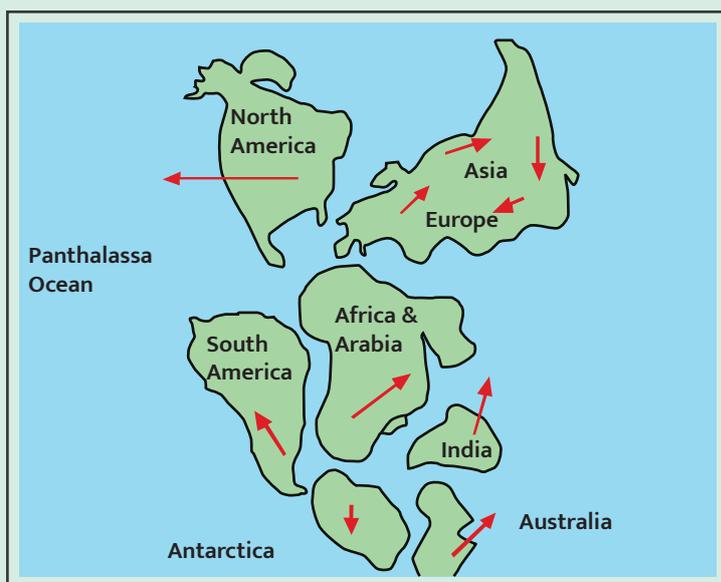
# CONTINENTAL DRIFT AND PLATE TECTONICS



# CONTINENTAL DRIFT AND PLATE TECTONICS

## SUPERCONTINENT

A supercontinent is the assembly of most or all the Earth's continental blocks to form a single large landmass. A supercontinent cycle is the breakup of one supercontinent and the development of another. Pangaea, last supercontinent.



## CONTINENTAL DRIFT THEORY (ALFRED WEGNER IN 1912)

All the continents formed a single continental mass (Pangaea), a mega ocean (Panthalassa) surrounded by the same. Around 200 million years ago, the Pangaea began to split. The initial two blocks – Gondwanaland and Laurasia – started drifting away and in between a shallow sea emerged by filling up the water from Panthalassa. It was known as Tethys Sea.

# EVIDENCE



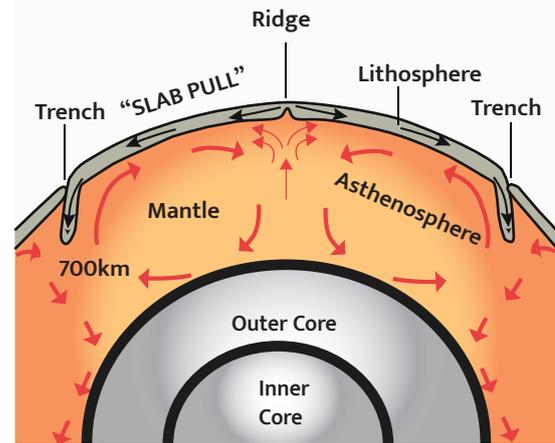
- **Jig-Saw fit** - The shorelines of Africa and South America facing each other have a remarkable and unmistakable match.
- **Rock of same age across ocean** - The belt of ancient rocks of 2,000 million years from Brazil coast matches with those from western Africa.
- **Placer deposit** - The occurrence of rich placer deposits of gold in the Ghana coast and the gold bearing veins are in Brazil.
- **Tillite** - Tillite indicating extensive and prolonged glaciation.
- **Distribution of fossils** - The observations that Lemurs occur in India, Madagascar and Africa led some to consider a contiguous landmass “Lemuria” linking these three landmasses.

## FORCES FOR DRIFTING –

- The polar-fleeing force relates to the rotation of the earth. This was, according to Wegener, the cause for movement of continents towards equatorward.
- Tidal force – due to the attraction of the Moon and the Sun was the main reason given by Wegener for the westward movement of the Americas.

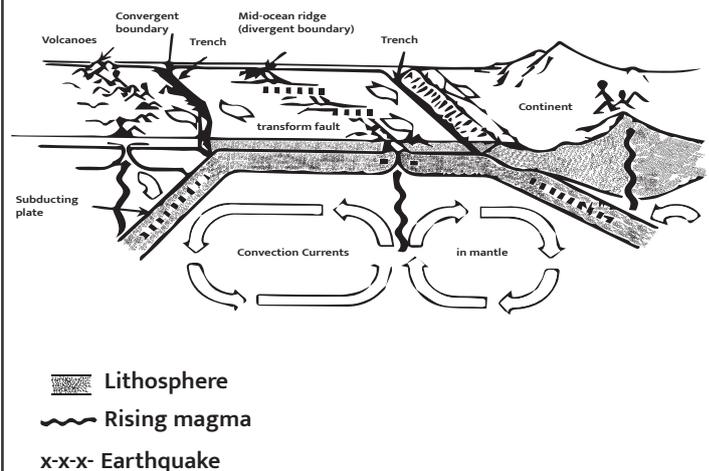
# CONVECTION CURRENT THEORY

Arthur Holmes put forward his theory of convection current in 1928-29. Cause of the origin of these currents is the presence of radioactive elements which causes thermal differences in the mantle portion.



# SEA FLOOR SPREADING THEORY –

- The ocean crust rocks are much younger than the continental rocks.
- The sediments on the ocean floor are unexpectedly very thin.
- Mid-oceanic ridge was not found only in Atlantic Ocean, but ridges were present in all the oceans.
- The rocks equidistant on either sides of the crest of mid-oceanic ridges show remarkable similarities in terms of period of formation, chemical compositions and magnetic properties

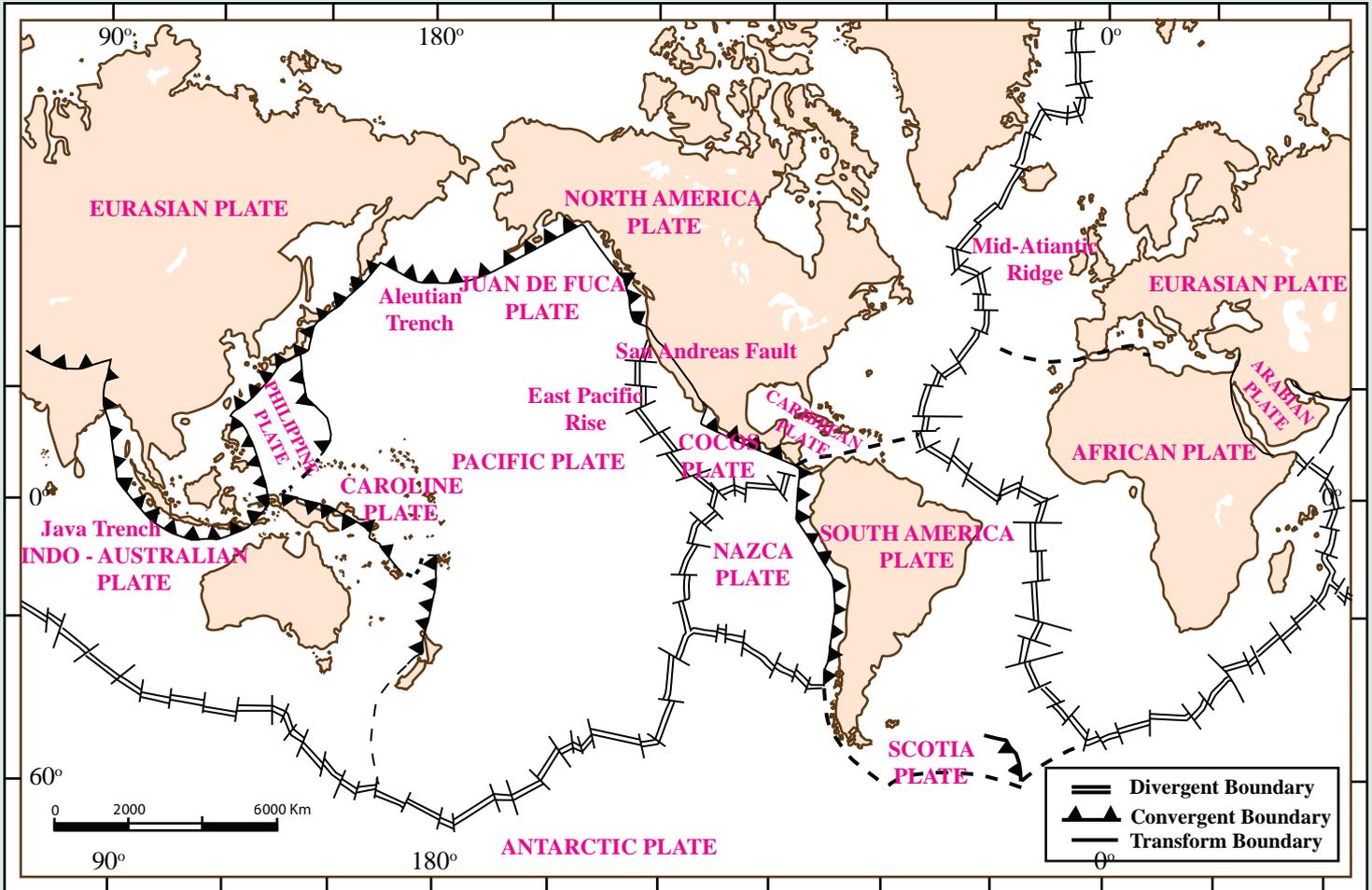


# PLATE TECTONICS –

- Term plate was first used by Tuzo Wilson. Hypothesis of plate tectonics was first outlined by W.J. Morgan in 1967.
- There is spreading of sea floor and new oceanic crust is being continually created at the active mid-oceanic ridges and destroyed at trenches.

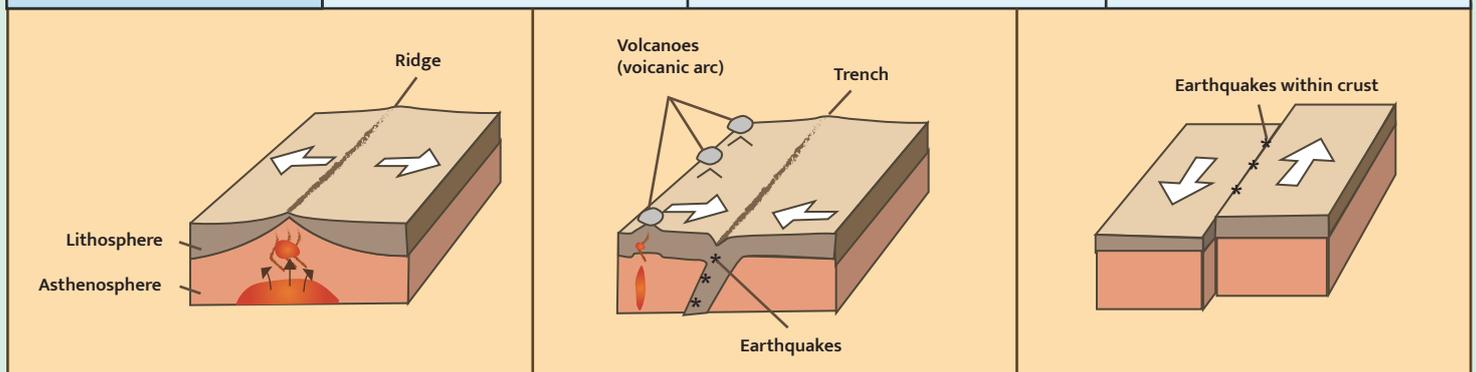
- The amount of crust consumed almost equals the amount of new crust created.

## MAJOR AND MINOR PLATES –



## TYPES OF BOUNDARIES –

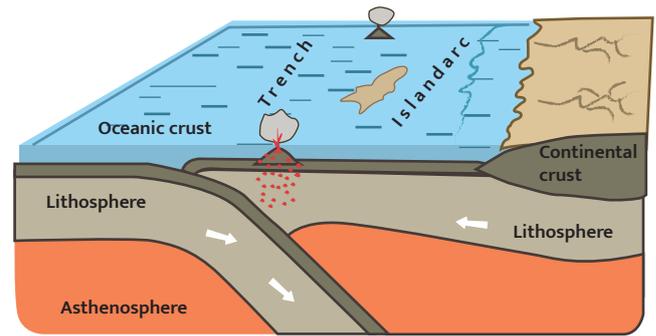
Type of Margin	Divergent	Convergent	Transform
Motion	Spreading	Subduction	lateral Sliding
Effect	Constructive (oceanic lithosphere created)	Destructive (oceanic lithosphere destroyed)	Conservative (lithosphere neither created or destroyed)
Topography	Ridge/Rift	Trench	No major effect
Volcanic activity?	Yes	Yes	No



# TYPES OF CONVERGENT BOUNDARIES –

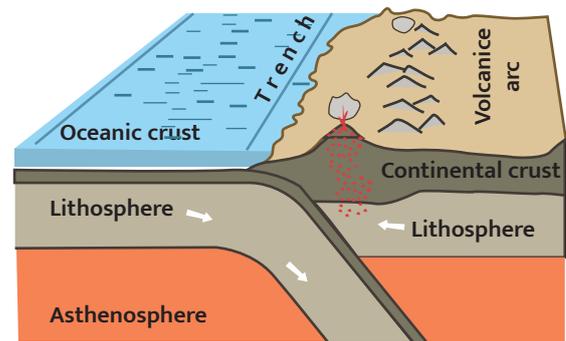
## Oceanic-Oceanic convergence

- Cooler, denser oceanic lithosphere sinks beneath the warmer, less dense oceanic lithosphere.
- water reduces the melting point of rocks in the asthenosphere and causes partial melting
- Formation of volcanic Arcs.



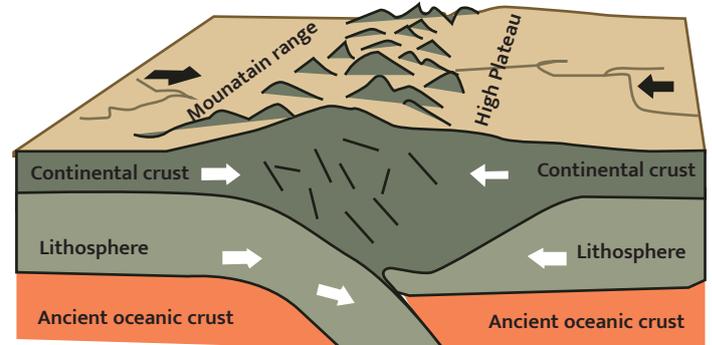
## Oceanic-Continent convergence

- Dense oceanic lithosphere subducts beneath the less dense continental lithosphere.
- Volcanic arcs form on continental lithosphere.
- Accretionary wedge forms on the continental crust



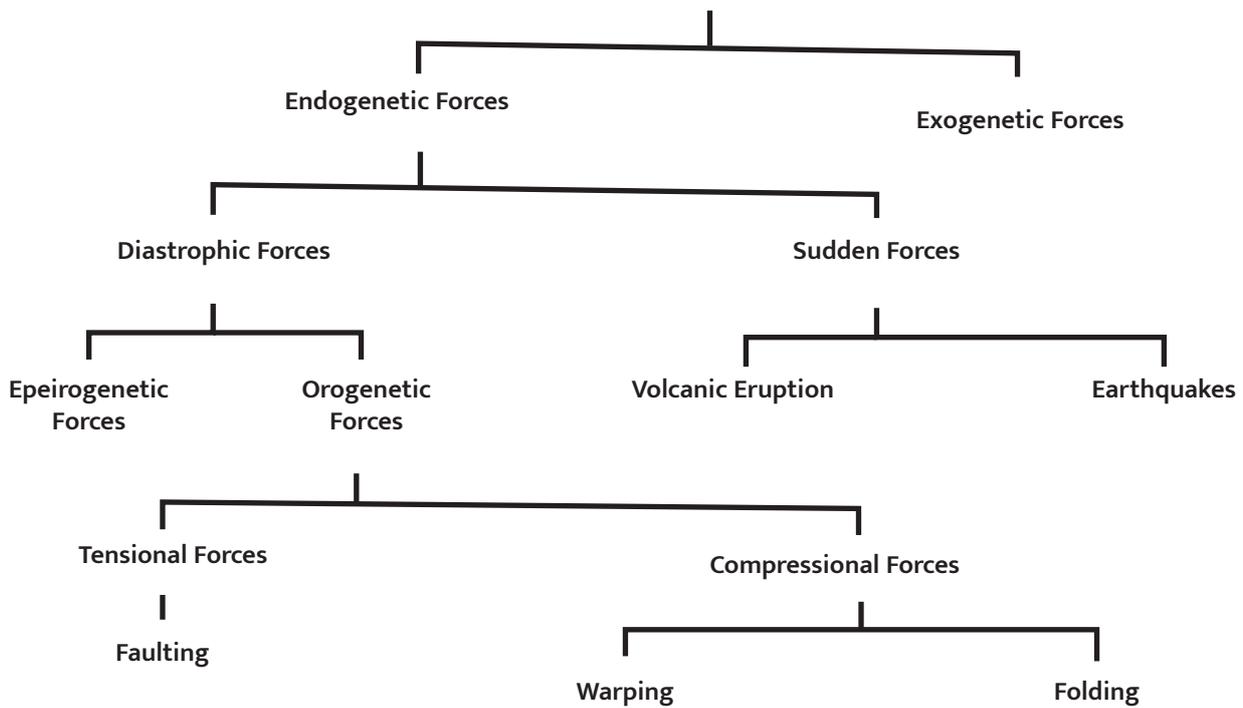
## Continent-Continent convergence

- Both of them have a density that is much lower than the mantle, which prevents subduction
- The intense compression can also cause extensive folding and faulting of rocks within the two colliding plates



**Exogenic forces** – external forces caused by events occurring outside the earth  
**Endogenic forces** – internal forces caused by events occurring inside the earth.

## FORCES WHICH AFFECT THE EARTH'S CRUST

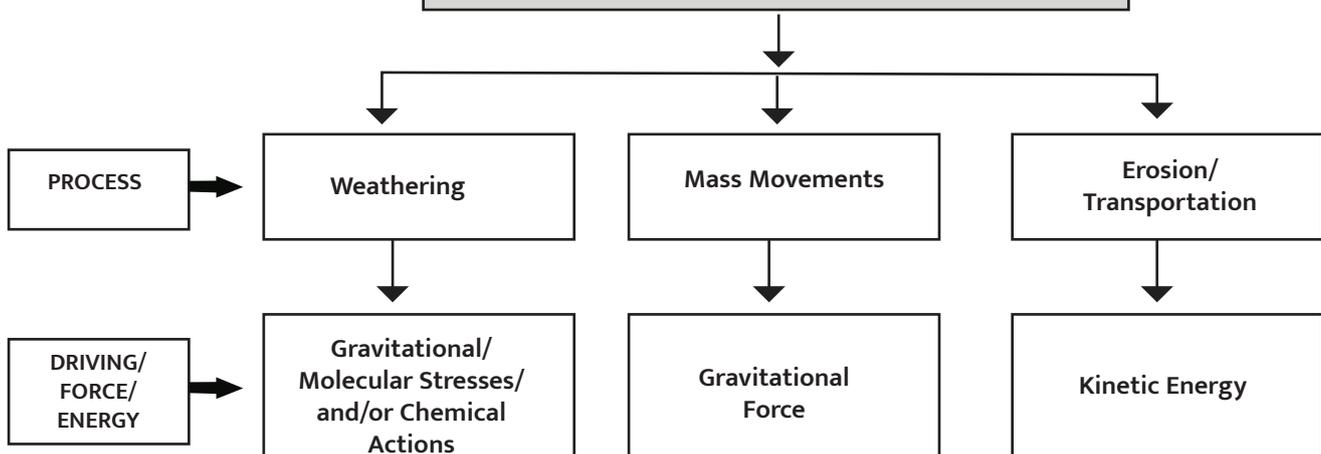


**Diastrophic forces** - Diastrophism refers to deformation of the Earth's crust. Diastrophic movements are gradual and might stretch for thousands of years.

**Epeirogenic or continent forming movements** are radial movements . They can cause upliftment or subsidence of continents.

**Orogenic or the mountain-forming movements** act tangentially to the earth surface. Folds are a result of ductile deformation of rocks in response to external forces. Faulting is a process under which rocks are forcefully broken with accompanying displacement.

## DENUDATATIONAL PROCESSES



**Weathering – mechanical disintegration or chemical decomposition of rocks in situ by different geomorphic agents.**

<b>Chemical Weathering</b>	<ul style="list-style-type: none"><li>• Hydration - process by which certain types of mineral expand as they take up water and expand, causing additional stresses in the rock due to increase in the volume of mineral itself.</li><li>• Oxidation and reduction - oxidation is the addition of oxygen to form oxides or hydroxides while reduction is the reverse of oxidation.</li><li>• Solution - few minerals such as rock salt are significantly soluble in water. Such rock-forming minerals are easily leached out without leaving any residue in rainy climates and accumulate in dry regions.</li><li>• Carbonation - many minerals are soluble in rainwater, which contains carbon dioxide and acts as a weak carbonic acid.</li></ul>
<b>Physical Weathering</b>	<ul style="list-style-type: none"><li>• Expansion by unloading – pressure release (unloading) mechanism causes disintegration of rock. Process is termed as exfoliation.</li><li>• Thermal expansion of rock – is the cause of rock cracking and disintegration.</li><li>• Salt weathering – On drying and crystallization the salts expand and set up a disruptive effect.</li><li>• Frost action and crystal growth – When water fills the pores, cracks and crevices in rocks and then freezes, it expands and exerts a bursting pressure.</li></ul>
<b>Biological Weathering</b>	<ul style="list-style-type: none"><li>• Burrowing and wedging by organisms.</li><li>• Decaying plant and animal matter help in the production of humic, carbonic and other acids.</li><li>• Tree roots can occasionally be shown to have forced apart adjacent blocks of rock.</li></ul>

**Mass movement** - Mass movement or mass wasting is the term used for the movement of material down a slope under the influence of gravity.

**Factors favouring mass movement are:** (i) weathering; (ii) rock composition; (iii) texture and structure of material; (iv) slope gradient; (v) extent of lubrication.

## **TYPES OF MASS MOVEMENT –**

### **Slow movements –**

- Creep - slow downhill movement of debris and soil on moderate slope.
- Solifluction- slow downslope flowing soil mass or fine grained rock debris saturated or lubricated with water.

### **Rapid movement –**

- Earthflow – movement of water-saturated clayey or silty earth materials down hillsides.
- Mudflow – thick layers of weathered materials get saturated with water and either slowly or rapidly flows down along definite channels. Looks like a stream of mud.
- Avalanche – Can be much faster than Mudflow

**Landslides** - Landslides occur when gravitational and other types of shear stresses within a slope exceed the shear strength (resistance to shearing) of the materials that form the slope.

## **EROSION AND DEPOSITION –**

Erosion is a term referring to those processes of Denudation which wear away the land surface by the mechanical action of the debris which is being acquired and transported by various agents of erosion. Deposition is a consequence of erosion. The erosional agents loose their velocity and hence energy on gentler slopes and the materials carried by them start to settle themselves.

