

Exogenetic forces

● Weathering

Weathering is the action of elements of **weather** and **climate** over earth material. It can be defined as mechanical disintegration and chemical decomposition of rocks through the actions of various elements of weather and climate. When rocks undergo weathering, some minerals are removed through chemical/ physical leaching by groundwater and thereby the concentration of remaining (valuable) minerals increase.

Weathering can be classified as – physical, chemical and biological:

(1) Physical / Mechanical weathering

- Physical or mechanical weathering processes depend on some applied forces.
- The applied forces could be (i) gravitational forces such as overburden pressure, load, and shearing stress; (ii) expansion force due to temperature changes, crystal growth or animal activity; (iii) water pressure controlled by wetting and drying cycles.
- **Causes:** Most of the physical weathering are caused by thermal expansion and pressure.

(2) Chemical weathering

Chemical weathering can be due to solution, carbonation, hydration or oxidation/reduction.

(3) Biological weathering

- This kind of weathering is caused by several biological activities like the growth or movements of organisms.
- They also bring conditions for physical or chemical weathering.
- Grazing of animals, ploughing by human beings etc are examples of biological weathering.

● Mass Movements

These movements transfer the mass of rock debris down the slope under the **direct influence of gravity**. Mass movements are very active over weathered slopes rather than over unweathered slopes. Usual geographic agents like running water, glaciers, wind, waves etc do not have much role to play in mass movements, and it is gravity, which is the main driving force. Mass movements are classified into slow movements and rapid movements.

(1) Slow movements:

A) CREEP:

It occurs on moderately steep, soil-covered slopes (doesn't need to be lubricated with water as in solifluction). The movement is extremely slow and imperceptible except through extended observation. We might notice that some of the electric posts in our region which are posted in sloppy areas deviated from their horizontal linearity. This is an effect of creep.

B) SOLIFLUCTION:

It is the process of slow downslope flowing of soil mass or fine-grained rock debris saturated or **lubricated with water**. It can be said as a type of creep with lubricated water influences the movement. It mainly occurs in permafrost regions as the layers of groundwater are occupied in between permanently frozen soil and rocks.

(2) Rapid movements

A) EARTHFLOW:

The movement of water-saturated clayey or silty earth materials down low angle terraces or hillsides is called earthflow.

B) MUDFLOW:

In the absence of vegetation and cover and with heavy rainfall, thick layers of weathered materials get saturated with water and either slow or rapidly flow down along definite channels is called as a mudflow.

C) DEBRIS AVALANCHE:

It is more in humid regions with or without vegetation. It occurs in narrow tracks on steep slopes and is similar to snow avalanche.

D) LANDSLIDES:

In landslides, the materials involved are relatively dry irrespective of the above said rapid mass movements. Landslides can be classified into a slump, debris slide, rockslide etc.

- **Slump:** It is a type of landslide in which the slipping of several units of rock debris occurs with a backward rotation with respect to the slope over which the movement takes place.
- **Debris slide:** In this type of landslide, there is no backward rotation. The fall is almost vertical.
- **Rockslide:** It is nothing but the slide of individual rock masses.

- **Erosion and Deposition**

Erosion is the acquisition and transportation of rock debris by geomorphic agents like running water, the wind, waves etc. Though weathering aids erosion, it is not a pre-condition for erosion to take place. (i.e., erosion can take place in unweathered conditions also). The deposition is a consequence of erosion. The erosional agents lose their velocity and energy on gentle slopes and materials carried by them start to settle themselves.

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