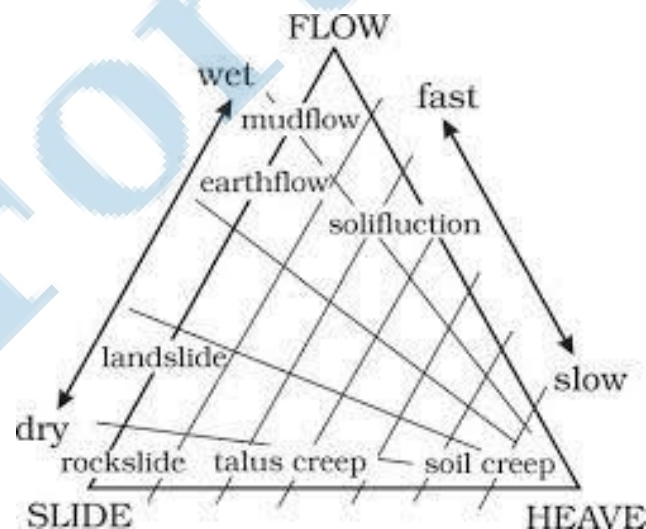


Mass Movements

- Shift of materials from one place to another place under the influence of gravity is called Mass Movement. Often lubricated by rainfall or agitated by seismic activity, these events may occur very rapidly and move as a flow.
- Gravity exerts its force on all matter – bedrock as well as weathered materials
- Weathering is not a pre-requisite for mass movements though it aids mass movements.
- Mass movements are aided by gravity and no geomorphic agents – so, mass movements do not come under erosion.
- When will mass movement occur – disturbing forces >>> shearing resistance of the material.
- **Forms of Mass Movements**
 - Heave
 - A slow form of mass movement
 - Expanding and pushing the ground upwards
 - Frost heave - The upward dislocation of soil and rocks by the freezing and expansion of soil water. Frost push occurs when cold penetrates into the ground. Large stones become chilled more rapidly than the soil. Water below such stones freezes and expands, pushing up the stones.
 - Flow
 - Downslope movement of fragmented rocks and soil along sliding plane with enough water is called flow.
 - Slides
 - Downslope displacement of weathered rock materials and soils with moderate lubrication by water.



Flow >> Slides >> Heave

- Mass movement can be grouped under two groups:
 - Slow Movements
 - Rapid movements

Slow Movements

- **Creep**
 - Moderately steep and soil covered slopes.
 - Movement of material is very slow and imperceptible.
 - Types
 - Soil creep – fine weathered rock debris as well as soil
 - Talus creep
 - Talus - a slope formed especially by an accumulation of rock debris
 - Talus creep involves the very slow downslope movement of the layers of the talus, which typically occupies the foot of the escarpment,
 - Rock creep – un-weathered joint blocks
- **Solifluction**
 - Slow downslope of debris saturated or lubricated with water
 - Areas of occurrence – moist temperate areas where deep grounds are frozen.
 - Upper portions become saturated and lower portions are impervious.
 - Peri-glacial regions (Permafrost below an active layer) – It is called Congelifluction

Rapid Movements

- Mostly prevalent in humid climatic regions.
- Occur to over gentle to steep slopes.
- **Earthflow**
 - Movement of water saturated clayey or silty earth materials
 - Materials slump making steep terraces and leaving arcuate scarps at the heads and bulge at the toe
 - Humid climatic regions
 - Does not look like a stream
 - When slopes are steeper – even the bedrocks especially of sedimentary rocks can slide down the slope
- **Mudflow**
 - Absence of vegetation cover and heavy rainfall
 - Looks like a stream of mud
 - Materials do not slump
 - Humid climatic regions
 - Occur frequently on the slopes of erupting or recently erupted volcanoes
- **Debris Avalanche**
 - Humid climatic regions
 - With or without vegetation
 - Occur over narrow tracks on steep slopes
 - Similar to snow avalanche
 - Much faster than mudflow

Debris avalanche >> Mudflow >> Earthflow

Landslides

- Relatively rapid and perceptible movements
- Materials involved are relatively dry
- It depends upon
 - Nature of discontinuities in the rocks
 - Degree of weathering
 - Steepness of the slope
- Depending upon movement of materials involved, it is categorized under following categories:
 - Slump
 - Rapid rolling with backward rotation
 - It is promoted by undercutting of slope base by streams, sea waves and human activities.
 - Debris Slide
 - Rapid rolling without rotation
 - Large scale than slump
 - Little amount of water
 - Debris Fall
 - Free fall of earth debris from a vertical or overhanging face
 - Rock Slide
 - No free falling
 - Slides along the slopes
 - Rock Fall
 - Free fall of rocks
 - It keeps away from the slope

Reasons for Mass Movements

- Undercutting of steep slopes by rivers
- The removal of vegetation
- Earthquakes
- Heavy prolonged rainfall.
- Mining
- Volcanic eruption

Differences in the cause of landslides in Himalayas and Western Ghats

Himalayas	Western Ghats
Tectonically Unstable	Tectonically Stable
Mostly made up of sedimentary rocks and unconsolidated and semi-consolidated deposits	Made up of hard rocks
Slopes are steep	Relatively less steep

Still Western Ghats witnesses landslides, Why?

- Natural factors
 - Some slopes are steeper with almost vertical cliffs and escarpments
 - Mechanical weathering due to temperature changes and rainfall
 - High intensity of rainfall in short duration
- Man-made factors
 - Deforestation
 - Mining
 - Industrialization and Urbanization

Deposition

- It is a consequence of erosion
- The same erosional agents act as aggradational or depositional agents too.
- The coarser material gets deposited first and fines ones later.