

Class 11 Geography Notes Chapter 5 Geomorphic Processes

The earth's crust is dynamic. It is undergoing change continuously. Some powers have led to changes in form of the earth. These powers have been divided into two parts: internal and external.

Internal forces keep giving birth to new land forms. External forces keep changing the forms of existing land forms. In other words, the earth's surface is being continuously subjected to by external forces originating within the earth's atmosphere and by internal forces from within the earth. The external forces are known as exogenic forces and the internal forces are known as endogenic forces.

The endogenic and exogenic forces causing physical stresses and chemical actions on earth materials and bringing about changes in the configuration of the surface of the earth are known as geomorphic processes. Diastrophism and volcanism are endogenic geomorphic processes. Weathering, mass wasting, erosion and deposition are exogenic geomorphic processes.

All processes that move, elevate or build up portions of the earth's crust come under diastrophism. They include:

- orogenic processes
- epirogenic processes
- earthquakes
- plate tectonics.

Temperature and precipitation are the two important climatic elements that control various processes.

There are three major groups of weathering processes :

- chemical
- physical or mechanical
- biological weathering processes

A group of weathering processes viz; solution, carbonation, hydration, oxidation and reduction act on the rocks to decompose, dissolve or reduce them to a fine clastic state through chemical reactions by oxygen, surface and/or soil water and other acids. Water and air (oxygen and carbon dioxide) along with heat must be present to speed up all chemical reactions. Over and above the carbon dioxide present in the air, decomposition of plants and animals increases the quantity of carbon dioxide underground.

Oxidation occurs where there is ready access to the atmosphere and oxygenated waters. The minerals most commonly involved in this process are iron, manganese, sulfur etc. In the process of oxidation rock breakdown occurs due to the disturbance caused by addition of oxygen. Red color of iron upon oxidation turns to brown or yellow.

Hydration is the chemical addition of water. Minerals take up water and expand; this expansion causes an increase in the volume of the material itself or rock. The process causes fatigue in the rocks and may lead to their disintegration,

Carbonation is the reaction of carbonate and bicarbonate with minerals and is a common process helping the breaking down of feldspars and carbonate minerals. Carbon dioxide from the atmosphere and soil air is absorbed by water, to form carbonic acid that acts as a weak acid. Calcium carbonates and magnesium carbonates are dissolved in carbonic acid and are removed in a solution without leaving any residue resulting in cave formation.

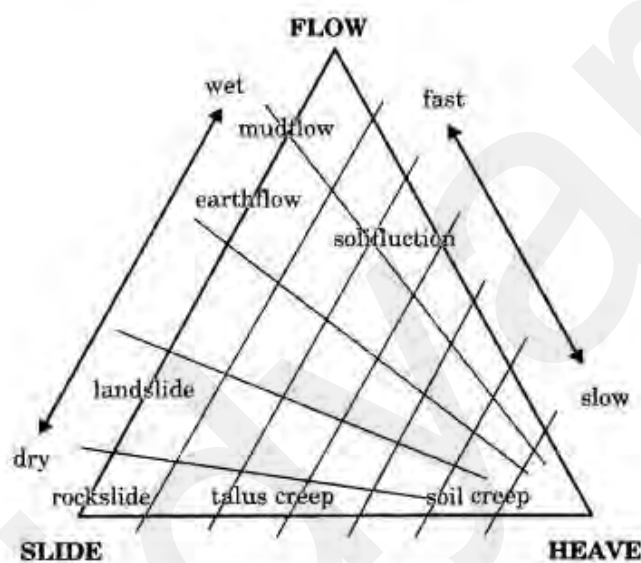


Fig: Relationships among different types of mass movements, their relative rates of movement and moisture limits (after Whitehead, 2001)

When oxidized minerals are placed in an environment where oxygen is absent, reduction takes place. Such conditions exist usually below the water table, in areas of stagnant water and waterlogged ground. Red colour of iron upon reduction turns to greenish or bluish grey.

Debris Avalanches and landslides transfer the mass of rock debris down the slopes under the direct influence of gravity. That means, air, water or ice do not carry debris with them from place to place but on the other hand the debris may carry with it air, water or ice.

In our country, debris avalanches and landslides occur very frequently in the Himalayas. There are many reasons for this. One, the Himalayas are tectonically active. They are mostly made up of sedimentary rocks and unconsolidated and semi-consolidated deposits. The slopes are very steep.

Class 11 Geography Notes Chapter 5 Important Terms:

- **Landslides:** These are relatively rapid and perceptible movements. The materials involved are relatively dry. The size and shape of the detached mass depends on the nature of discontinuities in the rock, the degree of weathering and the steepness of the slope.
- **Gradation:** The phenomenon of wearing down of relief variations of the surface of the earth through erosion is known as gradation.
- **Geomorphic processes:** The endogenic and exogenic forces causing physical stresses and chemical actions on earth materials and bringing about changes in the configuration of the surface of the earth are known as geomorphic processes.
- **Exogenic forces:** The external forces are known as exogenic forces. These forces derive their energy from atmosphere determined by the ultimate energy from the sun and also the gradients created by tectonic factors.
- **Endogenic forces:** The internal forces are known as endogenic forces.
- **Geomorphic agents:** An agent is a mobile medium (like running water, moving ice masses, wind, waves and currents etc.) which removes, transports and deposits earth materials. Running water, groundwater, glaciers, wind, waves and currents, etc., can be called geomorphic agents.
- **Diastrophism:** All processes that move, elevate or build up portions of the earth's crust come under diastrophism.
- **Orogepy:** It is a mountain building process
- **Epeirogeny:** It is continental building process.
- **Volcanism:** Volcanism includes the movement of molten rock called magma onto or toward the earth's surface and also formation of many intrusive and extrusive volcanic forms.
- **Stress:** Gravitational force acts upon all earth materials having a sloping surface and tend to produce movement of matter in down slope direction. Force applied per unit area is called stress.
- **Weathering:** Weathering is defined as mechanical disintegration and chemical decomposition of rocks through the actions of various elements of weather and climate.
- **Denudation:** The term 'denude' means to strip off or to uncover. Weathering, mass wasting/ movements, erosion and transportation are included in denudation.
- **Solution:** When something is dissolved in water or acids, the water or acid with dissolved contents is called solution.
- **Carbonation:** Carbonation is the reaction of carbonate and bicarbonate with minerals and is a common process helping the breaking down of feldspars and carbonate minerals.
- **Hydration:** Hydration is the chemical addition of water.
- **Structure:** The term structure includes such aspects of rocks as folds, faults, orientation and inclination of beds, presence or absence of joints, bedding planes, hardness or softness of constituent minerals, chemical susceptibility of mineral constituents; the permeability or impermeability etc. ,

- **Enrichment:** When rocks undergo weathering, some materials are removed through chemical or physical leaching by groundwater and thereby the concentration of valuable materials increases. It makes the concentration of the same valuable material sufficient and economically viable to be exploited, processed and refined. This is called enrichment.
- **Debris Slide:** Rapid rolling or sliding of earth debris without backward rotation of mass is known as debris slide.
- **Erosion:** The erosion can be defined as “application of the kinetic energy associated with the agent to the surface of the land along which it moves”.
- **Soil:** A pedologist who studies soils defines soil as a collection of natural bodies on the earth’s surface containing living and/or dead matter and supporting or capable of supporting plants. Soil is a dynamic medium in which many chemical, physical and biological activities go on constantly.
- **Deposition:** The erosional agents lose their velocity and hence energy on gentler slopes and the materials carried by them start to settle themselves. Therefore, deposition is not actually the work of any agent. The coarser materials get deposited first and finer ones later. By deposition depressions get filled up.
- **Slump:** Slump is slipping of one or several units of rock debris with a backward rotation with respect to the slope over which the movement takes place.
- **Pedology:** It is soil science.
- **Pedologist:** A pedologist is a soil-scientist.
- **Parent Material:** Parent material is a passive control factor in soil formation.
- **Earth Flow:** Movement of water-saturated clayey or silty earth materials down low-angle terraces or hillsides is known as earth flow.
- **Nitrogen Fixation:** Humus accumulates in cold climates as bacterial growth is slow. With undecomposed organic matter because of low bacterial activity, layers of peat develop in sub-arctic and tundra climates. In humid tropical and equatorial climates, bacterial growth and action is intense and dead vegetation is rapidly oxidised leaving very low humus content in the soil. Further, bacteria and other soil organisms take gaseous nitrogen from the air and convert it into a chemical form that can be used by plants. This process is known as nitrogen fixation.
- **Desilication:** Removal of silica from the soil is known as desilication.
- **Exfoliation:** It is a result but not a process. Flaking off of more or less curved sheets of shells from over rocks or bedrock results in smooth and rounded surfaces is called exfoliation.
- **Exfoliation domes:** Large, smooth rounded domes are called exfoliation domes.
- **Tors:** In rocks like granites, smooth surfaced and rounded small to big boulders form due to such exfoliation. It is called tors.