05 March 2024 20:05

Endogenic - land building forces E.g - volcanism, Diatrophism

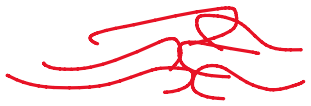
Exogenic - land wearing forces.

↳ Mass wasting, weathering, erosion.

Geomorphic Agent - mobile medium, running water, waves, wind, currents ...

Diatrophism -

1. Orogenic Process (Mountain building).



2. Epeirogenic processes (continent building) - uplifting / warping

3. Earthquakes.

4. Plate tectonics.

Chemical Weathering -

- solution formation — caves.
- oxidation
- reduction
- carbonation
- hydration.

1. Solution — soluble caves

2. Hydrolysis — insoluble precipate

Eg feldspar.

3. Carbonation — H_2O CO_2

— caves.

4. Oxidation. — Oxygen + H_2O + Fe.

Eg rusting of iron.

5. Hydration - (absorption of water).

anhydrite + watere

= gypsum

Biological weathering -

Ex. burrowing, wedging, etc-

vegetation, ploughing, cultivating.

+

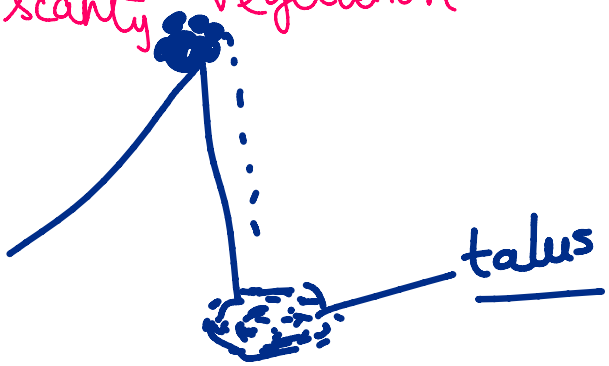
Decomposition.

plant roots

Mass Movements

↳ slowly / suddenly.

+ weathering
+ running water
+ steep slopes.
+ vertical cliffs.
+ scanty vegetation.



Types

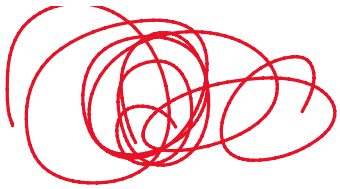
- Rock falls
- Rock Slides — zone of weakness.
- Landslides
- Slump — erosion.
- Debris Slide
- Debris flow — 2 soils + rock fragments
- Creep.

mudflow.
earthflow.
avalanche.

lahar (near a volcanic slope).

deadliest type of debris flow.

air + water + soil + rock debris.



air + water + soil + rock debris.

Creep.

— Slow and gradual movement of soil downhill.

Erosion and **Deposition**

↳ degradational.

Soil Formation (Pedogenesis).

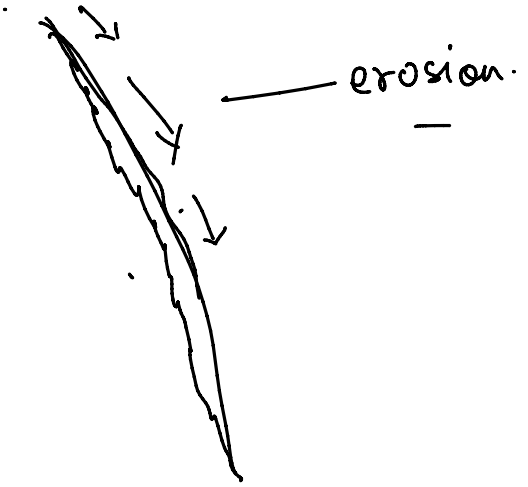
- Parent material
- Topography (relief, altitude and slope).
- Climate — Rainfall, Temp.
- Biological activity
- Time.

higher chemical activities

Biological activity.

Running Water

- stream
- rivers
- overland flow.
  - ↓
  - sheet erosion.



↳ narrow to wide paths.

rills — gullies — valleys.

Youth.

↳ mountain stage.

↳ V shaped valleys / erosion.

↳ Stream divides. — broad — marshes, swamps and lakes.

↳ Waterfalls. hard rocks are exposed.

↳ Stream divides. ——— broad —— marshes, swamps and lakes.

↳ Waterfalls. hard rocks are exposed.

Mature / Middle Stage

Erosion / → widening of the valleys.

volume of river water increases.

no swamps. / no marshes.

Old / Lower Stage

- Swamps, marshes and lakes.

Landscapes are
at or slightly above the sea level.

1. Valleys
   ↳ v valleys, gorges, canyons.
2. Potholes.

} Erosional Processes.

2. Potholes.

3. Plunge Pool

4. Meanders.

5. River Terraces.

Processes.

1. Alluvial fans

2. Deltas.

3. Floodplain

4. Natural levees and Point bars.

5. Meanders.

Depositional Processes.

Notes

Geomorphologic processes refer to the natural forces and actions that shape the Earth's surface over time, leading to the formation and modification of landforms. These processes are fundamental to understanding the dynamic nature of landscapes. Geomorphic processes can be classified into several categories:

1. **Weathering:**
   - **Physical Weathering:** Mechanical breakdown of rocks into smaller particles due to processes like freeze-thaw cycles, abrasion, and exfoliation.
   - **Chemical Weathering:** Chemical alteration of rocks through processes such as dissolution, oxidation, and hydrolysis.

2. **Erosion:**
   - **Water Erosion:** The wearing away of land by the action of water, including processes like river erosion, coastal erosion, and glacial erosion.
   - **Wind Erosion:** The removal of soil and rock particles by wind, leading to the formation of

features like sand dunes.

3. **Transportation:**
   - **Fluvial Transportation:** The movement of sediments by rivers.
   - **Aeolian Transportation:** The transportation of particles by wind.
   - **Glacial Transportation:** The movement of rocks and debris by glaciers.

4. **Deposition:**
   - **Sedimentation:** The settling of transported particles, leading to the formation of various landforms such as river deltas, alluvial plains, and sedimentary rock layers.

5. **Mass Wasting:**
   - The downhill movement of rock and soil under the influence of gravity, including processes like landslides, rockfalls, and mudflows.

6. **Tectonic Processes:**
   - **Plate Tectonics:** The movement and interaction of Earth's lithospheric plates, leading to the creation of features like mountains, valleys, and earthquakes.

7. **Volcanic Processes:**
   - **Volcanism:** The eruption of molten rock, ash, and gases from the Earth's interior, contributing to the formation of volcanic landforms.

8. **Human-induced Processes:**
   - Activities such as mining, urbanization, deforestation, and construction can significantly alter the natural geomorphic processes, leading to accelerated erosion and landform changes.

Geomorphologic agents are the various natural forces or elements that contribute to shaping the Earth's surface. These agents play a key role in the processes that lead to the formation and modification of landforms. The main geomorphic agents include:

1. **Water:**
   - **Running Water:** Rivers and streams erode, transport, and deposit sediments, shaping landscapes through processes like erosion, transportation, and deposition.
   - **Ocean Waves:** Coastal areas are shaped by the erosive and depositional actions of waves.

2. **Wind:**
   - Wind is an agent of erosion and transportation, particularly in arid and semi-arid regions where it can lead to the formation of features such as sand dunes.

3. **Glaciers:**
   - Glaciers are massive ice bodies that move under their own weight, eroding and shaping landscapes through processes like glacial erosion, transportation, and deposition.

4. **Gravity:**
   - **Mass Wasting:** The downhill movement of rock and soil under the influence of gravity includes processes like landslides, rockfalls, and mudflows.

5. **Tectonic Activity:**
   - **Plate Tectonics:** The movement and interaction of Earth's lithospheric plates contribute to the creation of various landforms, including mountains, valleys, and earthquakes.

6. **Volcanic Activity:**
   - **Volcanic Eruptions:** The eruption of molten rock, ash, and gases from the Earth's interior leads to the formation of volcanic landforms.

7. **Biological Activity:**
   - Plant roots, animals, and microorganisms contribute to weathering processes, and vegetation can influence erosion and sedimentation.

8. **Human Activities:**
   - Human actions such as mining, deforestation, urbanization, and construction can significantly alter geomorphic processes and contribute to landscape changes.

Each of these agents interacts with the Earth's surface in unique ways, and their collective influence shapes the diverse landforms found on the planet. The study of these geomorphic agents is essential for understanding landscape dynamics and the interconnectedness of Earth's physical processes.

1. **Diastrophism:**
   - Diastrophism refers to the processes involving the deformation of the Earth's crust. This includes both tectonic and volcanic activities that lead to the formation of landforms such as mountains, valleys, and plateaus. It encompasses the large-scale movements and changes in the Earth's crust, often associated with plate tectonics.

2. **Neotectonics:**
   - Neotectonics is the study of recent and ongoing crustal movements and deformations. It focuses on understanding the current tectonic processes shaping the Earth's surface, including earthquakes, faulting, and other geological activities.

Chemical weathering is a process that involves the alteration or breakdown of rocks and minerals through chemical reactions with various agents. Unlike physical weathering, which involves mechanical processes breaking down rocks into smaller particles, chemical weathering leads to changes in the mineral composition of rocks. Here are the main types of chemical weathering:

1. **Hydration:**
   - In hydration, minerals absorb water and undergo a chemical change. This is common in minerals like anhydrite, which, when hydrated, transforms into gypsum.

2. **Hydrolysis:**
   - Hydrolysis involves the reaction of minerals with water, leading to the formation of new minerals and soluble ions. For example, feldspar can undergo hydrolysis to form clay minerals and dissolved ions.

3. **Oxidation:**
   - Oxidation occurs when minerals react with oxygen. Iron-bearing minerals are particularly susceptible to oxidation, resulting in the formation of iron oxides or rust. The reddish-brown color often seen in weathered rocks is a sign of oxidation.

4. **Carbonation:**
   - Carbonation involves the reaction of minerals with carbon dioxide to form carbonate minerals. This process is common in rocks containing calcium and magnesium minerals. For instance, limestone can be weathered into calcite through carbonation.

5. **Solution:**
   - Solution refers to the dissolution of minerals in water. Water, especially if slightly acidic, can dissolve minerals like halite (rock salt) or gypsum, leading to their removal from the rock.

6. **Biological Weathering:**
   - This type of chemical weathering involves the actions of living organisms. For example, certain plants and microorganisms produce organic acids that can accelerate the breakdown of minerals in rocks.

Mass movements, also known as mass wasting or mass wasting events, refer to the downslope movement of Earth materials under the influence of gravity. These movements can occur on slopes and can range from slow, gradual processes to rapid, catastrophic events. Here are some common types of mass movements:

1. **Landslides:**
   - **Rockslides:** Large blocks of rock slide down a slope.
   - **Debris Flows:** Rapid movements of water-saturated rock, soil, and debris resembling a fluid.
   - **Mudslides:** Similar to debris flows but with a higher proportion of fine-grained material.

2. **Rockfalls:**
   - Individual rocks or blocks of rocks fall freely through the air before reaching the base of a slope.

3. **Slumps:**
   - A rotational movement where a mass of material moves along a curved surface, creating a characteristic spoon-shaped landform.

4. **Creep:**
   - Slow, imperceptible movement of soil down a slope over a long period, often facilitated by freeze-thaw cycles or wetting and drying.

5. **Solifluction:**
   - Common in periglacial regions, solifluction involves the slow movement of water-saturated soil over a frozen substrate.

6. **Earthflows:**
   - A type of mass wasting where water-saturated soil and rock move downhill as a viscous fluid.

7. **Avalanches:**
   - Rapid downslope movement of snow, ice, and debris. They can be triggered by factors such as heavy snowfall, temperature changes, or human activities.

8. **Subsidence:**
   - Gradual sinking or settling of the Earth's surface, often associated with the extraction of groundwater, oil, or gas.

9. **Turbidity Currents:**
   - Underwater mass movements of sediment, usually triggered by disturbances like earthquakes or underwater landslides.

10. **Underwater Landslides:**
    - Similar to landslides on land, but occurring beneath the ocean's surface.

Erosion and deposition are geological processes that involve the movement and redistribution of Earth's materials, primarily through the actions of natural agents like water, wind, ice, and gravity. These processes play a fundamental role in shaping the Earth's surface and forming various landforms. Let's explore each process:

1. **Erosion:**
   - **Definition:** Erosion is the process by which weathered rock and soil are removed from one location and transported to another by natural forces.

- **Agents of Erosion:**
  - **Water Erosion:** Rivers, streams, rainfall, and ocean waves contribute to the erosion of landscapes.
  - **Wind Erosion:** Wind can transport and erode loose soil particles, leading to the formation of features like sand dunes.
  - **Glacial Erosion:** Glaciers can erode and transport large amounts of rock and sediment as they move.

- **Erosional Landforms:**
  - River valleys, canyons, gorges, and waterfalls are examples of landforms created by water erosion.
  - Wind can create features such as sand dunes, yardangs, and ventifacts.
  - Glacial erosion forms features like cirques, arêtes, and U-shaped valleys.

2. **Deposition:**
- **Definition:** Deposition is the process by which transported sediments settle and accumulate in a new location, forming sedimentary layers.
- **Agents of Deposition:**
  - **Water Deposition:** When the velocity of water decreases, sediments carried by rivers, streams, and ocean currents settle out and accumulate.
  - **Wind Deposition:** Wind can deposit sediment when its carrying capacity decreases, leading to the formation of features like sand dunes.
  - **Glacial Deposition:** As glaciers melt, they deposit the sediments they transported, forming features like moraines and glacial outwash plains.

- **Depositional Landforms:**
  - River deltas, floodplains, and alluvial fans are examples of landforms created by water deposition.
  - Wind deposition forms features such as sand dunes and loess deposits.
  - Glacial deposition creates moraines, drumlins, and eskers.

The balance between erosion and deposition shapes the Earth's surface over time, contributing to the development of diverse landscapes. Human activities, such as construction, agriculture, and deforestation, can also influence these processes and impact the natural balance of erosion and deposition in different regions. Understanding these processes is crucial for managing and mitigating the potential hazards associated with erosion, as well as for preserving the health of ecosystems.

Soil formation, also known as pedogenesis, is a complex and continuous process that occurs over geological time as a result of interactions between climate, parent material, organisms, topography, and time. The formation of soil involves various physical, chemical, and biological processes. Here are the key factors and processes contributing to soil formation:

1. **Parent Material:**
- Parent material refers to the unconsolidated mineral or organic material from which soil is formed. It can be derived from the weathering of rocks, volcanic ash, or organic matter. The composition of the parent material influences the characteristics of the resulting soil.

2. **Climate:**
- Climate plays a significant role in soil formation. Temperature and precipitation affect the rates of weathering, organic matter decomposition, and the leaching or accumulation of minerals in the soil. Soils in arid regions may differ significantly from those in humid areas.

3. **Organisms:**
- The presence and activity of organisms, including plants, animals, bacteria, fungi, and other microorganisms, contribute to soil development. Plants contribute organic matter through litter and root decay, and soil organisms break down this material into humus, enhancing soil fertility.

4. **Topography:**
- The shape and slope of the land influence soil formation. Sloped areas may experience erosion,

leading to the removal of topsoil, while flat or concave areas may accumulate sediments. Soil properties can vary on different slopes and aspects (e.g., north-facing vs. south-facing slopes).

5. **Time:**
   - Soil formation is a gradual process that takes place over extended periods. The longer the time of soil development, the more mature and well-developed the soil profile becomes. Time allows for the accumulation of organic matter and the development of distinct soil horizons.

6. **Horizons:**
   - Soil profiles generally consist of horizons, or layers, each with distinct characteristics. These horizons include:
     - **O horizon:** Organic horizon, composed of decomposed plant material (humus).
     - **A horizon:** Topsoil, rich in minerals and organic matter.
     - **B horizon:** Subsoil, where minerals leached from above may accumulate.
     - **C horizon:** Weathered parent material.

7. **Processes:**
   - **Weathering:** The breakdown of rocks into smaller particles through physical (e.g., frost action) and chemical (e.g., dissolution, hydrolysis) processes.
   - **Decomposition:** The breakdown of organic matter by microorganisms, releasing nutrients into the soil.
   - **Leaching:** The removal of minerals and nutrients from the soil by water moving through it.

Soil formation, or pedogenesis, is influenced by a combination of factors that interact over time to shape the characteristics of the soil. These factors, known as soil-forming factors or soil-forming processes, collectively contribute to the development of distinct soil profiles. The main soil-forming factors are often remembered using the acronym "CLORPT," which stands for:

1. **Climate (C):**
   - Climate, including temperature and precipitation, is a crucial factor in soil formation. The amount and intensity of rainfall, temperature fluctuations, and the overall climatic conditions influence processes such as weathering, leaching, and the rate of organic matter decomposition. Different climates lead to the development of different types of soils.

2. **Organisms (O):**
   - Organisms, including plants, animals, microorganisms, and humans, contribute to soil formation. Plant roots help break up rocks, and vegetation adds organic matter to the soil through litter and root decay. Soil organisms, such as bacteria and fungi, play essential roles in decomposing organic material and cycling nutrients.

3. **Relief (Topography) (R):**
   - The topography or relief of an area affects soil formation. Slope, aspect, and elevation influence factors like water drainage, erosion, and soil accumulation. For example, soils on steep slopes may experience erosion, while flat or concave areas may accumulate sediments and develop different soil characteristics.

4. **Parent Material (P):**
   - Parent material refers to the unconsolidated material from which soils develop. It can include weathered rock, sediment, or organic material. The mineral composition and texture of the parent material influence the properties of the resulting soil. Different types of rocks weather into different types of soils.

5. **Time (T):**
   - Time is a critical factor in soil formation. Soils evolve over extended periods as a result of the interactions among the other soil-forming factors. The duration of weathering, organic matter accumulation, and the development of soil horizons all depend on time.