



11092CH06

GEOMORPHIC PROCESSES

CHAPTER

5

50 Important Topics - 2024	
Scheduled Date	Subject
01/04/24	Economy
02/04/24	Science & Technology
03/04/24	Environment & D.M.
04/04/24	Science & Technology
05/04/24	Environment & D.M.
06/04/24	-----
07/04/24	-----
08/04/24	Economy
09/04/24	Science & Technology
10/04/24	Economy
11/04/24	English
12/04/24	International Relations
13/04/24	-----
14/04/24	-----
15/04/24	Geography
16/04/24	Polity & Governance
17/04/24	Polity & Governance
18/04/24	Geography
19/04/24	Polity & Governance
20/04/24	Maths
21/04/24	-----
22/04/24	Reasoning
23/04/24	Environment & D.M.
24/04/24	Social Schemes





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RAPID REVISION

MOST IMPORTANT TOPICS FOR PRELIMS 2024



HOURS

1500 TOPICS

11th April 2024 – 29th April 2024

Special Inclusions

- 6 FLTs (3 GS+ 3 CSAT)
- Value Additions Material
- Subject Specific MCQS

CSAT ₹1,500

GS ₹3,500

CSAT + General Studies ₹4,000



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GEOMORPHIC PROCESSES

BASICS

Introduction

- 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 actions of exogenic forces result in wearing down (degradation) of relief/elevations and filling up (aggradation) of basins/ depressions, on the earth's surface.
- The phenomenon of wearing down of relief variations of the surface of the earth through erosion is known as gradation.
- The endogenic forces continuously elevate or build up parts of the earth's surface and hence the exogenic processes fail to even out the relief variations of the surface of the earth.



ENDOGENIC PROCESSES

- The energy emanating from within the earth is the main force behind endogenic geomorphic processes.
- This energy is mostly generated by radioactivity, rotational and tidal friction and primordial heat from the origin of the earth.
- This energy due to geothermal gradients and heat flow from

ENDOGENIC PROCESSES

DIASTROPHISM

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

- (i) orogenic processes involving mountain building through severe folding and affecting long and narrow belts of the earth's crust;
- (ii) epeirogenic processes involving uplift or warping of large parts of the earth's crust;
- (iii) earthquakes involving local relatively minor movements;
- (iv) plate tectonics involving horizontal movements of crustal plates.

VOLCANISM

Volcanism includes the movement of molten rock (magma) onto or toward the earth's surface and also formation of many intrusive and extrusive volcanic forms.

EXOGENIC PROCESSES

- All the exogenic geomorphic processes are covered under a general term, **denudation**. The word 'denude' means to strip off or to uncover.
- Weathering, mass wasting/movements, erosion and transportation are included in denudation.

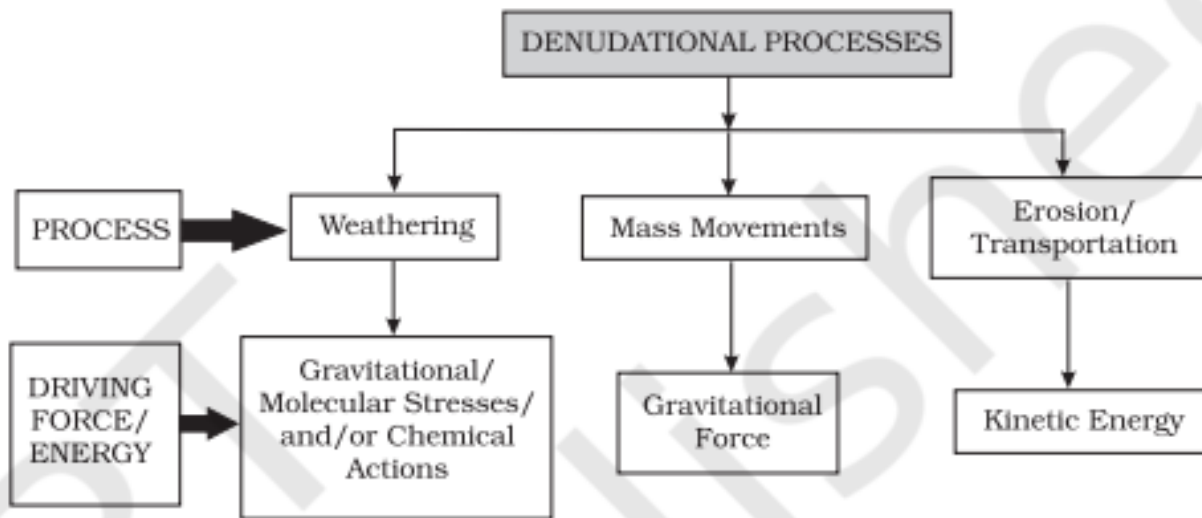


Figure 5.1 : Denudational processes and their driving forces

EXOGENIC PROCESSES

WEATHERING

- Weathering is action of elements of weather and climate over earth materials.
- There are three major groups of weathering processes :
 - (i) Chemical;
 - (ii) Physical or Mechanical;
 - (iii) Biological weathering processes

EXOGENIC PROCESSES

CHEMICAL WEATHERING

- 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.

EXOGENIC PROCESSES

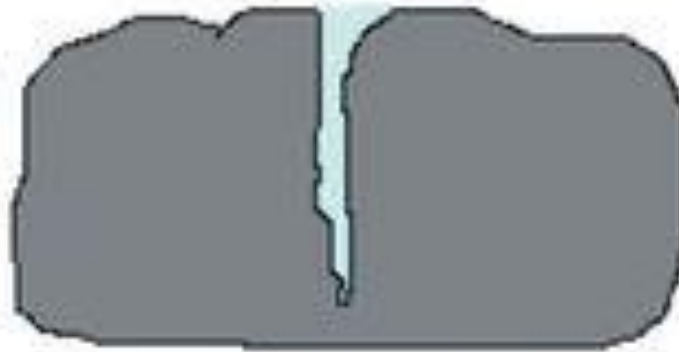
PHYSICAL WEATHERING

- Physical or mechanical weathering processes depend on some applied forces - Thermal expansion and Pressure Release .
- The applied forces could be:
 - (i) gravitational forces such as overburden pressure, load and shearing stress;
 - (ii) expansion forces due to temperature changes, crystal growth or animal activity;
 - (iii) water pressures controlled by wetting and drying cycles.

Ex - Freezing, Thawing and Frost Wedging



Water seeps into cracks and fractures in rock.



When the water freezes, it expands about 9% in volume, which wedges apart the rock.



With repeated freeze/thaw cycles, rock breaks into pieces.

EXOGENIC PROCESSES

BIOLOGICAL WEATHERING

- Biological weathering is contribution to or removal of minerals and ions from the weathering environment and physical changes due to growth or movement of organisms.
- Burrowing and wedging by organisms like earthworms, termites, rodents etc., help in exposing the new surfaces to chemical attack and assists in the penetration of moisture and air.
- Decaying plant and animal matter help in the production of humic, carbonic and other acids which enhance decay and solubility of some elements.

MASS MOVEMENTS

- These movements transfer the mass of rock debris down the slopes under the direct influence of gravity.
- That means, air, water 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.
- The movements of mass may range from slow to rapid, affecting shallow to deep columns of materials and include creep, flow, slide and fall.
- Gravity exerts its force on all matter, both bedrock and the products of weathering.
- So, weathering is not a pre-requisite for mass movement though it aids mass movements.





MASS MOVEMENTS

- Several activating causes precede mass movements.
- They are : (i) removal of support from below to materials above through natural or artificial means; (ii) increase in gradient and height of slopes; (iii) overloading through addition of materials naturally or by artificial filling; (iv) overloading due to heavy rainfall, saturation and lubrication of slope materials; (v) removal of material or load from over the original slope surfaces; (vi) occurrence of earthquakes, explosions or machinery; (vii) excessive natural seepage; (viii) heavy drawdown of water from lakes, reservoirs and rivers leading to slow outflow of water from under the slopes or river banks; (ix) indiscriminate removal of natural vegetation.

MASS MOVEMENTS

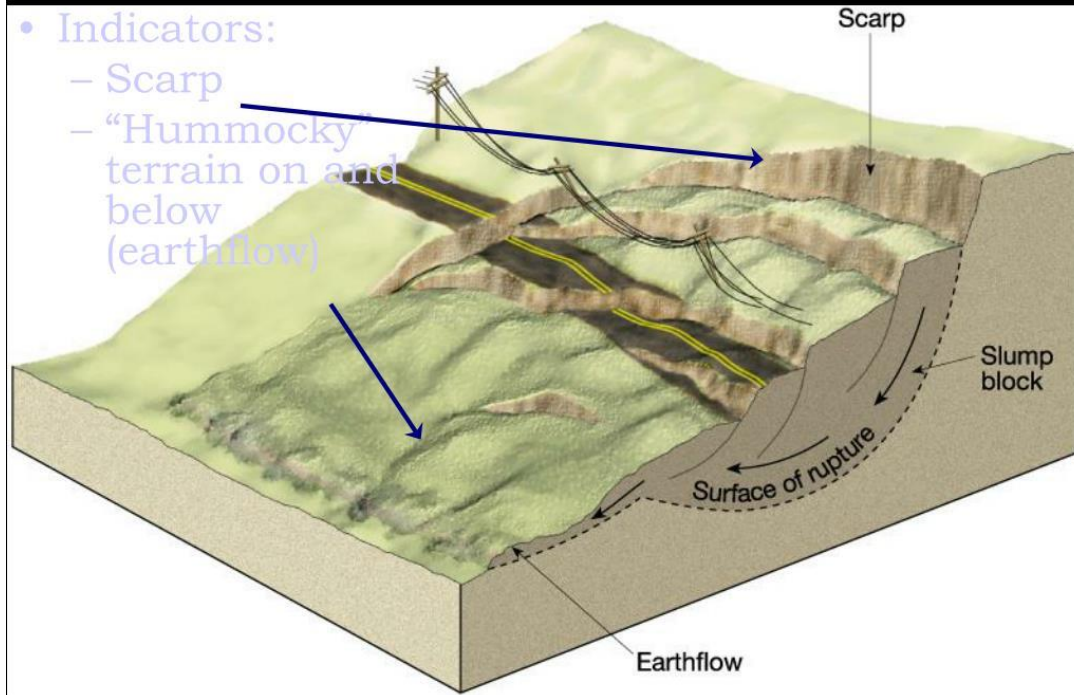
Landslides :

- 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.
- Depending upon the type of movement of materials several types are identified in this category:
- **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.
- Rapid rolling or sliding of earth debris without backward rotation of mass is known as **debris slide**.
- Sliding of individual rock masses down bedding, joint or fault surfaces is **rockslide**.

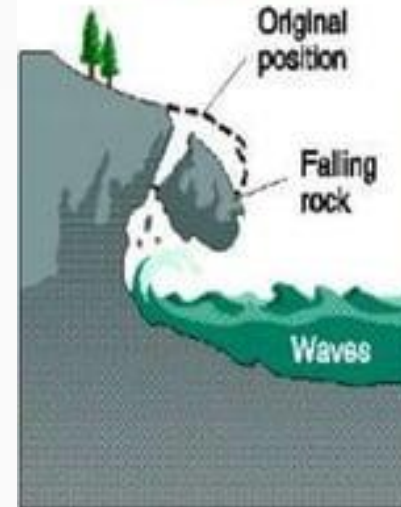
Slump (a type of slide)

- Indicators:

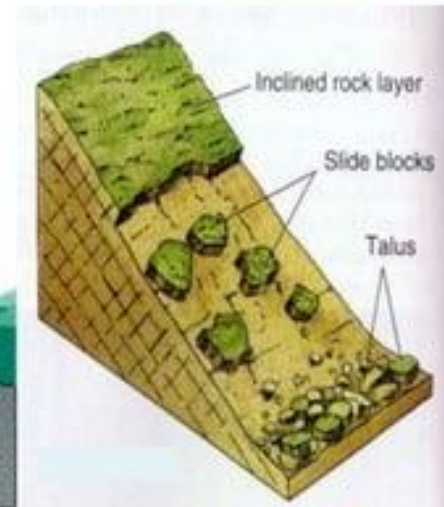
- Scarp
- "Hummocky" terrain on and below (earthflow)



• Rockfall



• Rockslide



EROSION AND DEPOSITION

- Erosion involves acquisition and transportation of rock debris.
- When massive rocks break into smaller fragments through weathering and any other process, erosional geomorphic agents like running water, groundwater, glaciers, wind and waves remove and transport it to other places depending upon the dynamics of each of these agent. by rock debris carried by these geomorphic agents also aids greatly in erosion.
- By erosion, relief degrades, i.e., the landscape is worn down.
- That means, though weathering aids erosion it is not a pre-condition for erosion to take place.
- Weathering, mass-wasting and erosion are degradational processes.
- It is erosion that is largely responsible for continuous changes that the earth's surface is undergoing.



EROSION AND DEPOSITION

- 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.
- In other words, 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.
- The same erosional agents viz., running water, glaciers, wind, waves and groundwater act as aggradational or depositional agents also.

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THANK YOU