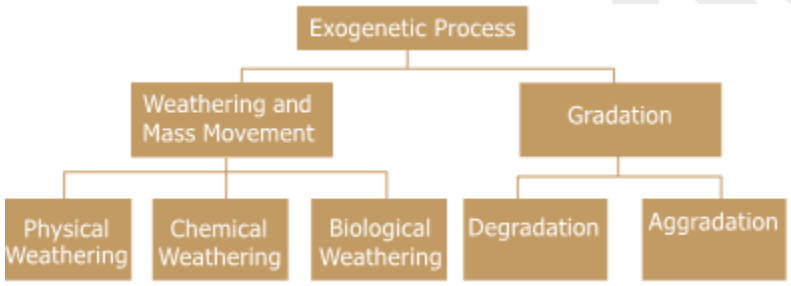
9th Social Science Lesson 20 Notes in English

20] Lithosphere – II Exogenetic Processes

Introduction

- The Earth is a **dynamic system** that undergoes various changes due to **internal** and **external processes**.
- The continuous interaction of these two processes controls the structure of the earth's surface.
- The external processes are the consequence of **solar energy** and **gravitational forces**, whereas the internal processes are an outcome of **the earth's internal heat**.



Weathering

- Weathering is the breaking, disintegration and decomposition of materials of the earth's crust by their exposure to **atmosphere**.
- There are three types of weathering **Physical weathering**, **Chemical weathering** and **Biological weathering**

Physical weathering

- It is the breakdown of rocks without changing their **chemical composition**, through the action of physical forces.
- The constant freezing and thawing of rocks during the night and day leads to the expansion and contraction of rocks.
- **Cracks** are formed and disintegration occurs eventually.
- **Exfoliation**, **block disintegration, granular disintegration**, are the major types of physical weathering.

Exfoliation

- **The alternate heating** and **cooling** on rounded rock surfaces leads to the peeling of rocks, layer by layer like an onion.
- This is called **exfoliation**.
- **Sheeting** and **shattering** are the other forms of exfoliation.

Granular Disintegration:

- Granular disintegration takes place in **crystalline rocks** where the grains of the rocks become **loose and fall out.**
- This is due to the action of temperature.

Block Disintegration:

- **Repeated expansion** and **contraction** of rocks during day and night respectively causes stress on the joints of the rocks which results in block disintegration

Chemical Weathering

- **Disintegration** and **decomposition** of rocks due to **chemical reactions** is called Chemical Weathering.

- This is predominantly high in the hot and humid regions such as the **equatorial**, **tropical** and **sub tropical zones.**
- Chemical weathering takes place through the processes of oxidation, carbonation, solution, and hydration.
- The agents of Chemical weathering are **Oxygen**, **Carbon-dioxide, Hydrogen** and **water**.

Oxidation

- **Oxygen** in the atmosphere reacts with the **iron** found in rocks, thus leads to the formation of **iron oxide.**

- This process similar to the rusting of iron, pressure of air and water is known as **oxidation**, which results in **the weakening of rocks**.

Carbonation

- Carbonation is the **mixing of water** with the atmospheric **carbon-dioxide**, forming **carbonic acid.**
- Carbonation is important in the formation of caves, in **limestone** region.
- When the carbonic acid reacts with the carbonate rocks, the rocks get disintegrated.

Solution

- **The dissolution of rock substances** in water result in the loosening of the rock particles.
- This in turn breaks down the rocks.

Hydration

- **Absorption of water** into the mineral structure, certain chemicals in the rock enlarge in size in humid conditions.
- These minerals found in the **rock swell** and this results in the **development of cracks** and the rock wears down. This type of weathering is called **hydration**.

Biological Weathering

- Biological weathering occurs due to **the penetration** and **expansion** of plant roots, earthworms, burrowing animals (rabbits, rats) and some human activities.

Gradation

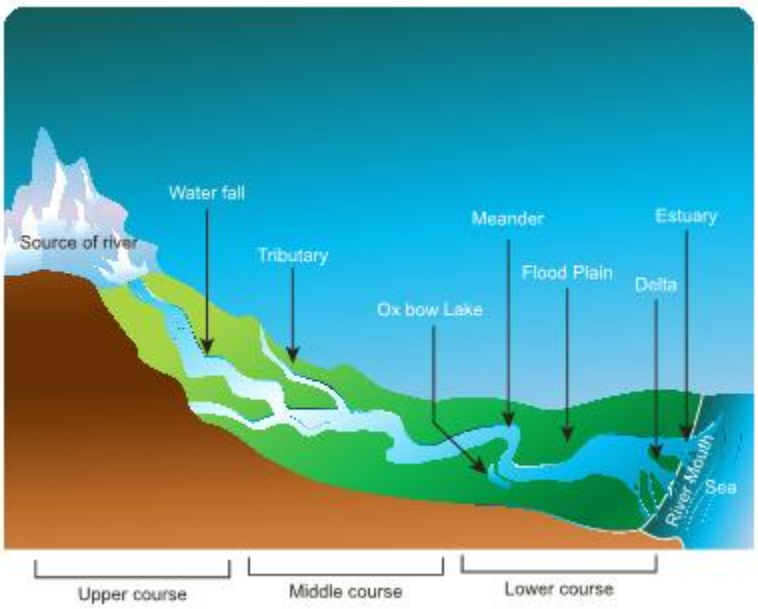
- Gradation is the **process of levelling of the land** by means of natural agents like rivers, ground water, winds, glaciers, and sea waves.

- These agents produce various gradational relief features in due course of time.
- Gradation takes place in two ways: **degradation** and **aggradation**
- **Gradation** is the **levelling land surface** by various natural agents.
- **Aggradation** is **building up of landforms** due to natural agents. Degradation is eroding of land surface

Agents of Gradation

Running water (River) - (Fluvial Land forms)

- **The work of running water** (rivers) is the most extensive among all the other agents of gradation.
- **Rivers originate** on **higher landforms** like, mountains, hills and plateaus that receive water from various sources like the rain, glaciers, springs, lakes, etc.
- The place where the river originates is called **catchment area** and where it joins the sea is known as **mouth**.



Courses of River:

- Rivers generally **originate** from **mountains** and **end** in a **sea or lake**.
- The whole path that a river flows through is called its **course**.
- The course of a river is divided into:

I **The upper course**
II **The middle course and**
III **The lower course**

i. The Upper Course

- **Erosion** is the most dominant action of river in the upper course.
- In this course, a river usually tumbles down the steep mountain slopes.
- The steep gradient increases the velocity and the river channel performs erosion with great force to widen and deepen its valley.
- The land features carved by a river in its upper course are **V- shaped valleys**, gorges, canyons, rapids, pot holes, spurs, and waterfalls.

ii. The Middle Course

- **The river enters the plain** in its middle course.
- **The volume** of water **increases** with the confluence of many tributaries and thus increases the load of the river.
- Thus, the predominant action of a river is transportation. **Deposition** also occurs due to the sudden decrease in velocity.
- The river in the middle course develops some typical landforms like flood plains, meanders, ox-bow lakes etc.,

iii. The Lower course

- The river, **moving downstream** across a broad, level plain is loaded with debris, brought down from its upper and middle courses.
- Large deposits of sediments are found at the level bed and the river, splits into a number of channels called **distributaries**.
- The main work of the river here is deposition and it develops typical landforms like **delta** and **estuary**.

1) **Tributary** – Small streams that join the main river. Eg. River Bhavani
2) **Distributary** – River channels that get separated from the main river. E.g., River Kollidam.

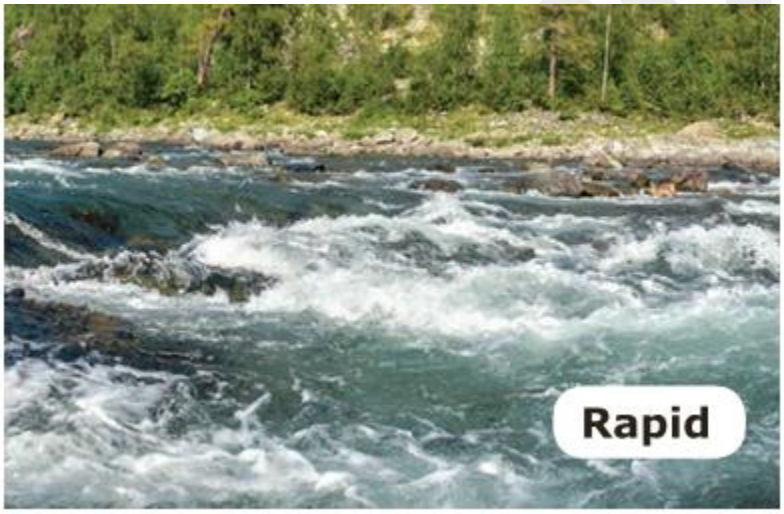
Erosional Landforms of River

- **Gorges and Canyons**: When the river flows through a mountainous region made up of hard rocks, it forms a **valley** with **almost vertical sides** called **gorge.**

- In India, deep gorges have been formed by Brahmaputra and Indus in **the Himalayas**.
- **A deep gorge** with steep sides that runs for hundreds of kilometres is referred to as **canyon** e.g. Grand Canyon of the river Colorado in **the U.S.A.**

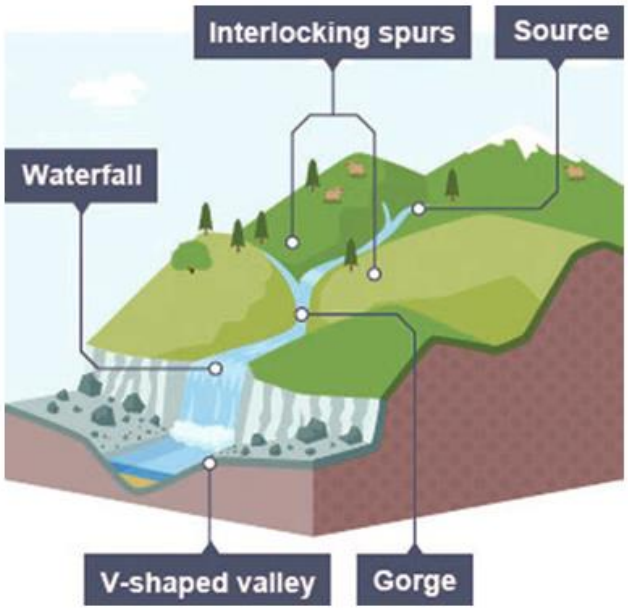
Waterfall

- When a **river flows** in a region where **hard rocks** lie over **soft rocks horizontally**, the soft rocks get eroded quickly and the hard rocks projects outwards.
- Thus, the river falls vertically from a **steep slope** to form a waterfall.
- When the water falls with great force, it erodes the rock material beneath and creates a depression called **a plunge pool.**
- Shallow fast flowing water in a stream is called **a rapid** or **river jumps**
- The highest waterfalls in the world is **Angel falls (979 m)** in **Venezuela**.



V-shaped valley

- **A 'V'- shaped valley** is formed by the **vertical erosion of the river** where the valley is deepened and widened.



Pot hole

- Due to the river action, **cylindrical holes** are drilled vertically in the river bed, with varying depth and diametre. These are called **pot holes**.

Meander

- As the river loaded with **debris flows slowly**, it forms sweeping loops and bends.
- It is referred to as **meanders**.

Ox bow lake

- **Meanders** in due course of time become almost a complete circle with narrow necks.
- This in turn gets abandoned and **forms a lake.**
- This is called an **Ox-bow lake**.
- The world's largest oxbow lake is **Lake Chicot** is Arkansas of **USA**.
- **Lake Kanwar** in Bihar (**India**) is **Asia's largest fresh water** ox **bow lake**.

Depositional Landforms of River

Alluvial Fan

- A **fan shaped deposition** made by the river at the foothills is called an **alluvial plain**

Flood Plain

- **Fine sediments** are **deposited** on river banks when a river floods.
- These sediments make the region **rich** and **fertile**.
- This is called a **flood plain.**
- As the height of the river banks gets increases due to continuous deposition of a flooded river, levees are formed.

Estuary:

- Estuary is formed where **the rivers meets the sea.**
- **Deposition of silt** by the river is not possible here in the estuaries like delta as if the waves keep on eroding the deposits. Ex. **River Narmada** and **Tapti**.

Delta

- **A triangular shaped low lying area** formed by the river at its mouth is called **delta**.

- Deltas have fine deposits of sediments enriched with minerals. Eg. **Cauvery Delta,** Tamil Nadu.

The Greek letter (△)pronounced delta closely resembles the triangular delta of the river Nile. Sunderban Delta formed by the river Ganga-Brahmaputra is the largest delta in the world.

- **The Greek letter** pronounced delta closely resembles **the triangular delta** of the river **Nile**.
- **Sunderban Delta** formed by the river **Ganga-Brahmaputra** is the largest delta in the world.

Karst Topography

- As an **agent of gradation**, underground water creates distinct landforms in lime- stone regions called **Karst Topography.**
- Ground water is an active agent in **limestone** regions.
- Karst topography is formed due to the **dissolution of soluble rocks** such as **limestone, dolomite and gypsum**.
- Limestone topography of **Western Slovenia** extends for a distance of 480 km in length and 80 km in width which is termed as Karst in **the Slavic language**.
- The world's largest karst area is the Nullarbar located on **the Great Australian Coast**. Karst regions are also found in Southern France, Spain, Mexico, Jamaica, Western Cuba, Central New Guinea, Sri Lanka and Myanmar.

Karst Areas in India

1) **Western Bihar** - Guptadham caves
2) **Uttarakhand** - Robert cave and Tapkeshwar temple
3) **Madhya Pradesh** - Pandav caves Pachmari hills
4) **Bastar district in Chattisgarh** - Kutumsar
5) **Andhra Pradesh** (Visakhapatnam) - Borra caves

Erosional Landforms of Underground Water

- Most of **erosion** takes place due to **the process of solution**.
- When rain water mixes with **carbon-di- oxide** and enters into a **limestone region**, it dissolves and destroys much of the limestone.
- As a result, landforms such as Terra rossa, Lappies, sinkholes, swallow holes, dolines, uvalas, poljes, caves and caverns are formed.

Terra Rossa (Italian term for Red soil)

- **Deposition of red clay soil** on the surface of the Earth is due to the dissolution of limestone content in rocks.
- The redness of the soil is due to the presence of **iron oxide**.

Lappies

- When the joints of limestone rocks are corrugated by groundwater, long furrows are formed and these are called **LAPPIES**.

Sinkhole

- A **funnel shaped depressions** formed due to dissolution of limestone rock is called sinkholes.

- Their average depth ranges between three and nine meters

Caves and Caverns

- **Caves** and **caverns** are **subterranean** features of karst topography.
- Caves are **hollows** that are formed by the **dissolution of limestone** rocks when **carbon-di-oxide** in air turns into **carbonic acid** after its reaction with water.
- They vary in size and shape.
- Caverns are **the caves with irregular floors**. Eg. Guptadham caves in **Western Bihar**.
- All types of deposits in the caves and caverns are collectively called **speleothems** which includes travertines, tufa, dripstones.
- Swallow Holes, Uvalas, Dolines, Poljis are other erossional Features of karst regions predominant in other parts of the world.

Depositional Landforms of Underground Water

- It is interesting to know that a **variety of depositional features** are formed on the **floor, ceiling** and **walls of the caves** and **caverns** of the Karst Topography.

Stalactite, Stalagmite and Column

- When the water containing **dissolved calcite** gradually drips from the ceiling of the caves, water evaporates and the remaining **calcite hangs from the ceiling**.
- Thus **Stalactites** are formed.
- When the calcite deposits rises upward like a **pillar Stalagmites** are formed.
- Sometimes, Stalactites and Stalagmites meet together to form **Columns** or **Pillars**.

Glaciers:

- A **Glacier** is a **large mass of ice** that moves slowly over the land, from its place of accumulation.
- It is also known as **'River of ice'**. The place of accumulation is called **snowfield**.
- The height above which there is a permanent snow cover in the higher altitude or latitude is called **snowline**.
- Higher the latitude, lower the snowline from sea level.
- The gradual transformation of snow into granular ice is called **'firn'** or **'neve'** and finally it becomes **solid glacial ice.**

Erosional Landforms of Glacier

- Glaciers are powerful **erosive agents**.
- Some of the important erosional landforms are Cirque, Aretes, Matterhorn, U-shaped valley, Hanging valley, Fiords etc.,
- Most of these glacial features are predominantly seen in countries like Switzerland, Norway etc.,

Cirque

- The glacier erodes **the steep side walls of the mountain** and forms a **bowl-shaped armchair** like depression, it is termed as Cirque.

Arete

- Aretes are **narrow ridges** formed when **two cirque walls** joined together back to back, and forms **narrow knife like ridges**.

Pyramidal Peak

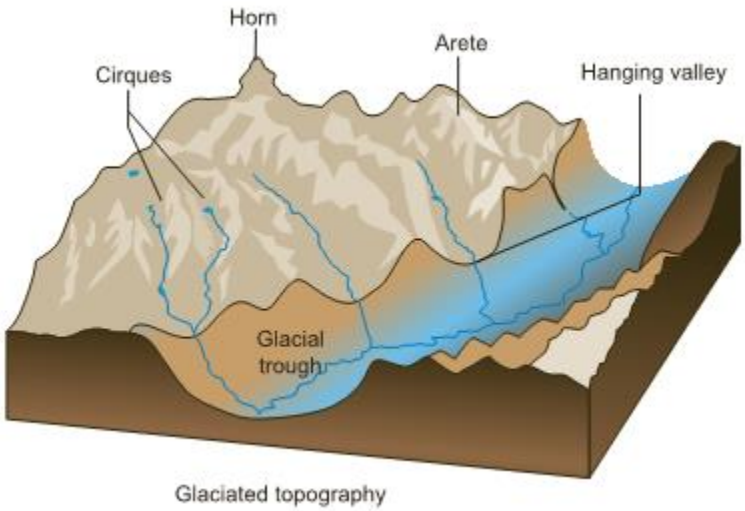
- The pyramidal peaks formed when **three or more cirques** meet together (eg) Matterhorns.

U-Shaped Valley

- When the glacier moves down along a river valley, the valley further gets **eroded deep and wide** to form a **'U' shaped valley.**

Hanging Valley

- These are **valleys eroded by tributary glacier** and that hangs over the main valley.



Glaciated topography

Fjord

- **Fjords** are glacial valleys that are partly submerged in the sea.

Depositional Landforms of glacier

- After getting eroded, fragments of rocks and boulders along with dirt form glacial debris.
- **Glacial debris** gets deposited in the low lying areas and form depositional features like moraines, drumlins, eskers, kames and outwash plains.

Moraine

1) Materials deposited by Glaciers is called **Moraines**.
2) Based on the location, they are classified into **Ground moraine, Terminal moraine** and **Lateral moraine.**

Drumlin (Basket of Egg Topography)

- Drumlins are **deposits of glacial moraines** that resemble giant inverted **teaspoons** or **half cut eggs.**

Esker

- Long narrow ridges composed of **boulders gravel** and **sand deposited by streams** of melting water which run parallel to a glacier are called **eskers**.

Outwash Plain

- An outwash plain consists of **glacial sediments deposited** by the melting ice at the terminus of a glacier.
- It appears as an extensive accumulation of sand, gravel and silt.

Wind

- When air blows horizontally at or near the earth's surface is called **wind**.
- **The erosional, transportational** and **depositional** action of wind is predominant in **arid regions**.
- This is called as **Aeolian Process**.

Erosional Landforms of wind

- Some of the erosional landforms of wind are

I **mushroom rocks**,
II **Inselbergs** and
III **yardangs**.

Mushroom Rock

- Rocks are made up of **hard** and **soft layers**. When a rock's bottom is soft, the sand-laden winds blow against it and wear it down.
- By the constant wearing down action of the wind, the **bottom gets eroded** away to form a **mushroom like structure**.
- This is called a **mushroom** or **pedestal rock**.
- Such rocks are found near **Jodhpur in Rajasthan**.

Inselberg

- Inselberg is a German term which means **an island mountain**.
- Certain hard rocks like **igneous rocks** are more **resistant** to **wind action**.
- Such **isolated residual hills** rising abruptly from their surroundings are termed as **inselbergs**. Eg. Uluru or Ayers Rock, **Australia**.

Yardang

- In **arid regions**, certain rocks have hard and soft layers **arranged vertically**.
- When winds blow over these rocks, the soft layers get eroded leaving **irregular crests.**
- These are called **yardangs**.

Depositional Landforms of wind

- Some of the depositional landforms are
  1) **sand dunes,**
  2) **barchans and**
  3) **loess.**

Sand Dune

- In deserts, during sandstorms, **wind carries loads of sand**.
- When the speed of wind decreases, huge amount of **sand gets deposited**.
- These mounds or hills of sand are called **sand dunes.**
- There are different types of sand dunes.

1) **Barchan**

- Barch are isolated, **crescent shaped sand dunes**.
- They have gentle slopes on the **windward side** and **steep slopes** on **the leeward side**.

2) **Transverse Dunes**

- Transverse dunes are **asymmetrical in shape.**
- They are formed by **alternate slow** and **fast winds** that blow from the same direction.

3) **Longitudinal Dunes (Seif dunes)**

- Longitudinal dunes are **long narrow ridges of sand**, which extend in a direction parallel to the prevailing winds.
- These dunes are called **Seifs** in **Sahara**

Loess

- The term loess refers to the deposits of **fine silt** and **porous sand** over a vast region.
- **Extensive loess deposits** are found in Northern and Western **China**, the Pampas of Argentina, in **Ukraine** and in the Mississippi Valley of **the United States.**

Wave

- A steady up (**crest**) and down (**trough**) movement of surface water are called **waves**.
- Sea waves are the most powerful agents of gradation and their erosional, transportational and depositional processes are confined to a very narrow belt along **coastal areas**.

Erosional Land Forms of Waves

- Some of **the erosional landforms of sea waves** are sea cliff, sea cave, arch, stack, beach, bar and spit and wave cut platform.

1. Sea Cliffs

- Sea cliffs are steep rock faces formed when sea waves dash against them.
- The rocks get eroded to form **steep vertical walls**.

2. Sea Cave

- Prolonged wave attack on the base of a cliff erodes rock materials, which result in **the formation of caves**.

3. Sea Arch

- When two caves approach one another from either side of a headland and unite, they **form an arch**. (Eg.) **Neil Island, Andaman and Nicobar**.

4. Sea Stack

- Further erosion by waves ultimately leads to **the total collapse of the arch.**
- The seaward portion of the headland will remain as **a pillar of rock** known as **stack.** Eg the Old man of Hoy in **Scotland**.

5. Wave Cut Platforms

- Flat surface found at the foot of sea cliffs are called as **wave cut platforms**.
- Wave cut platform is also referred as **wave cut benches terrace**.

Depositional Landforms of Waves

Beach

- Sand and gravel are **moved** and **deposited by waves** along the shore to form beaches.
- This is the most dominant and constructive work of the sea. (Eg.) **Juhu** beach along Mumbai coast, **Puri** beach in Odisha and **Marina** beach in Chennai.

Bar

- A bar is an **elongated deposit of sand, shingle** or **mud** found in the sea, almost parallel to the shoreline.

Spit

- A spit is a **ridge** or **embankment of sediment**, attached to the land on one end and terminating in open water on the other end.
- Spits are common at **the mouth of estuaries**. Eg. Kakinada spit

MORE TO KNOW:

Sinkhole

- The World's deepest sinkhole is China's **xianozhai Tienkang** at 2172 feet.
- There are as many as 15000 Sinkholes in **Illinois**

Fake Snow Materials needed:-

- Cup of Baking Soda, Shaving Cream Method:-
- Pour one cup of baking soda,
- Spray the shaving cream The snow will start forming almost immediately..

Facts

- **Cave insects** lose their senses of sight and develop extraordinary long antenna to compensate **the loss of sight**

Loess

- The thickest known deposit of loess is, 335 metre found in **the loess plateau** in **China**.

Facts

- The world's best known geyser is the Old Faithful geyser in **the Yellowstone National Park in Wyoming**, U.S.A