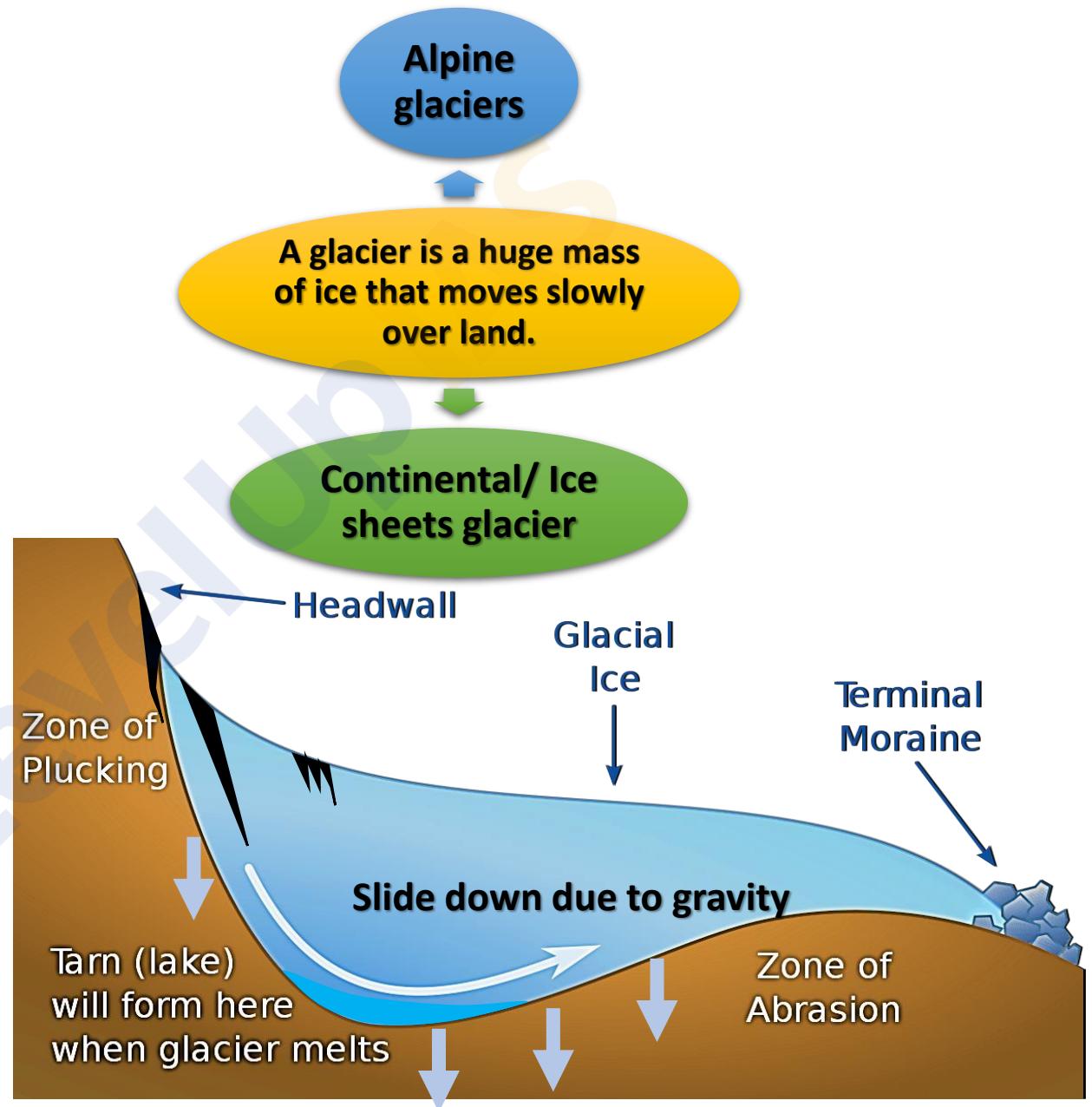




## **GS FOUNDATION BATCH FOR CSE 2024**

### **Geography - 03 (Landforms Glacier, Coastal, Desert)**

1. Masses of ice moving as sheets over the land (continental glacier or piedmont glacier if a vast sheet of ice is spread over the plains at the foot of mountains) or as linear flows down the slopes of mountains in broad trough-like valleys (mountain and valley glaciers) are called glaciers
2. The movement of glaciers is slow unlike water flow.
3. The movement could be a few centimetres to a few metres a day or even less or more.
4. Glaciers move basically because of the force of gravity.
5. Erosion by glaciers is tremendous because of friction caused by sheer weight of the ice.





1. The material plucked from the land by glaciers (usually large-sized angular blocks and fragments) get dragged along the floors or sides of the valleys and cause great damage through abrasion and plucking.
2. Glaciers can cause significant damage to even unweathered rocks and can reduce high mountains into low hills and plains.
3. As glaciers continue to move, debris gets removed, divides get lowered and eventually the slope is reduced to such an extent that glaciers will stop moving leaving only a mass of low hills and vast outwash plains along with other depositional features.

# **Landforms of erosion**

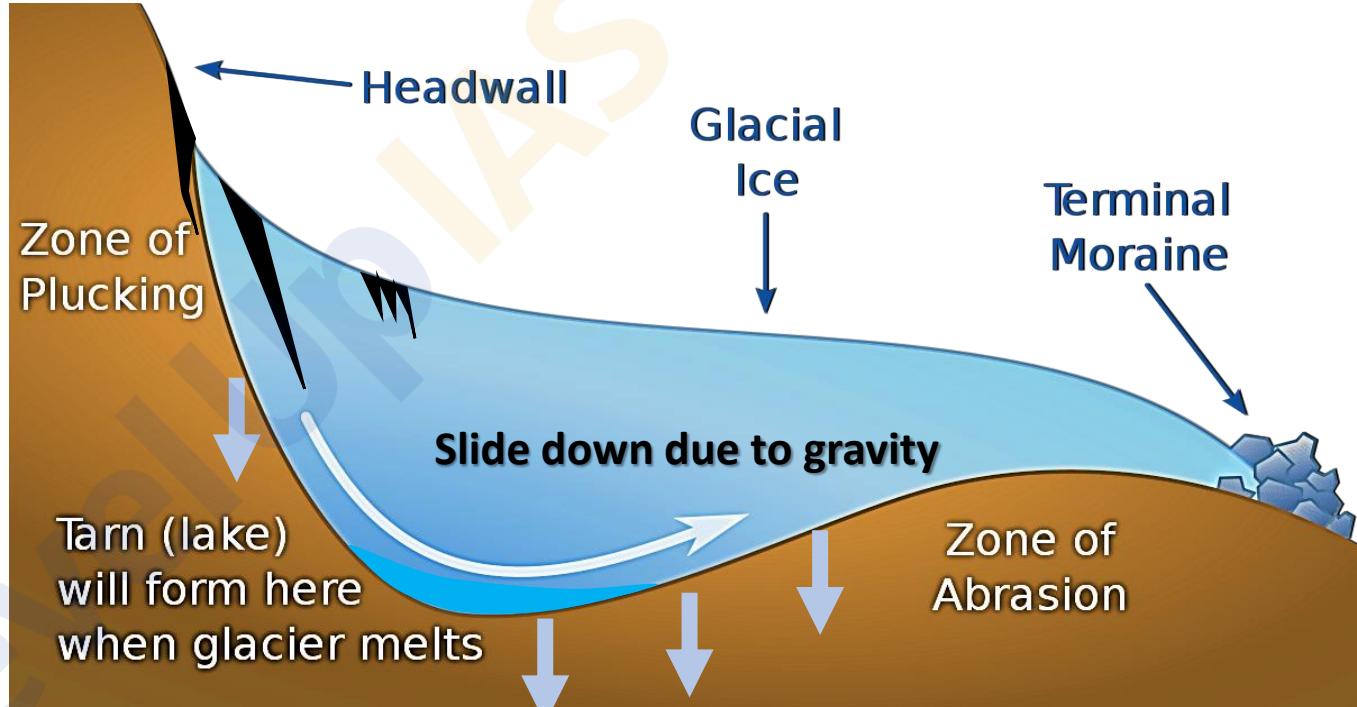
**Cirque/ Cwm/  
Corrie**

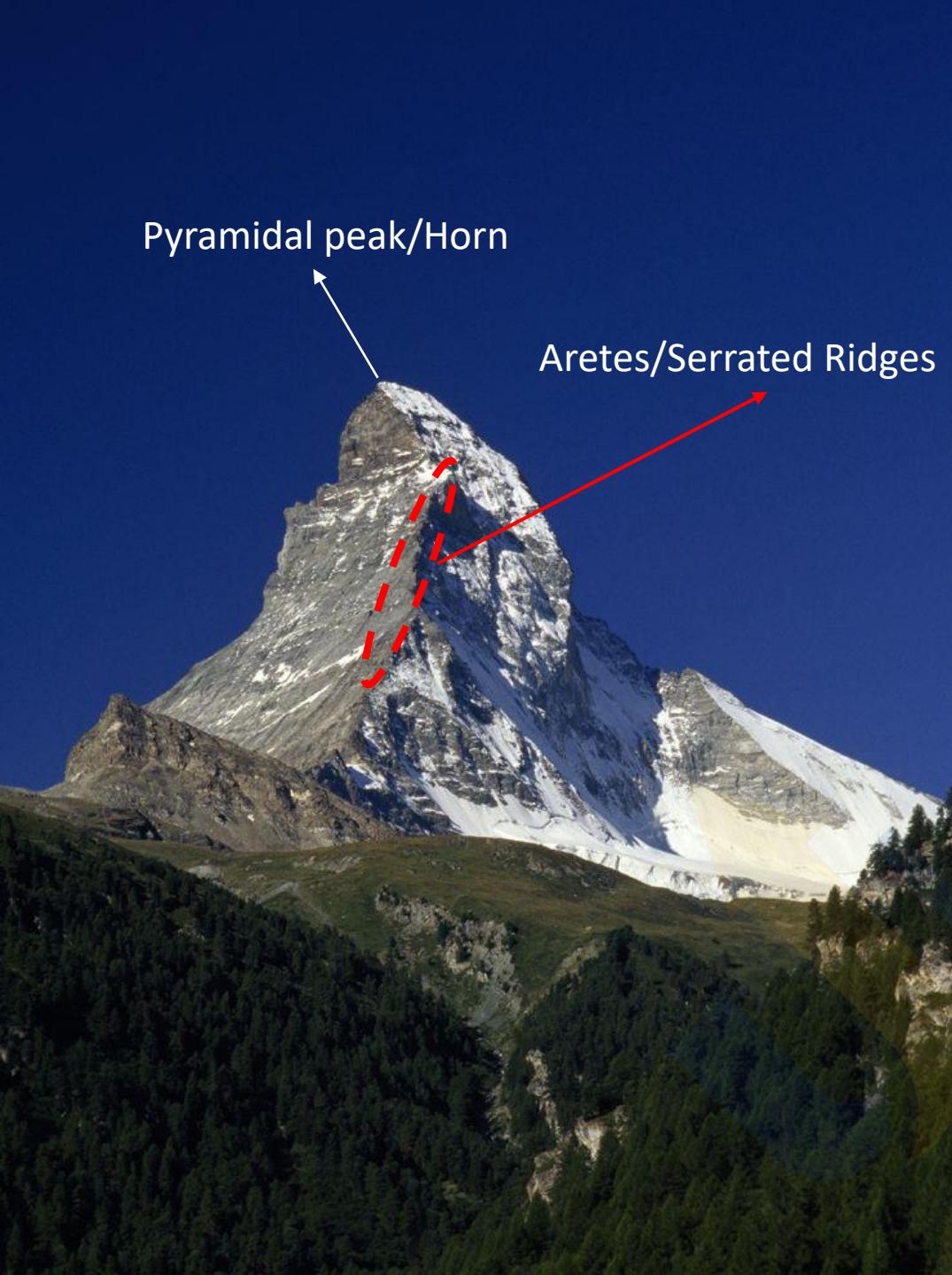
**Horns (Pyramidal  
Peak) and Serrated  
Ridges (Arete)**

**Glacial  
Valleys/Troughs:  
Hanging Valley and  
U Shaped Valley**

# Cirque/ Cwm

1. Most common landform in the glaciated mountains
2. Found at the head of the glacial valleys
3. Downward movement of the glaciers leads to intense shattering of the upland slope producing a depression
4. Plucking operates on the back wall while movement of ice abrades the floor creating a depression called as Corrie/ Cirque/ Cwm
5. When the ice eventually melts water is collected in the depression called as Corrie Lake or Tarn

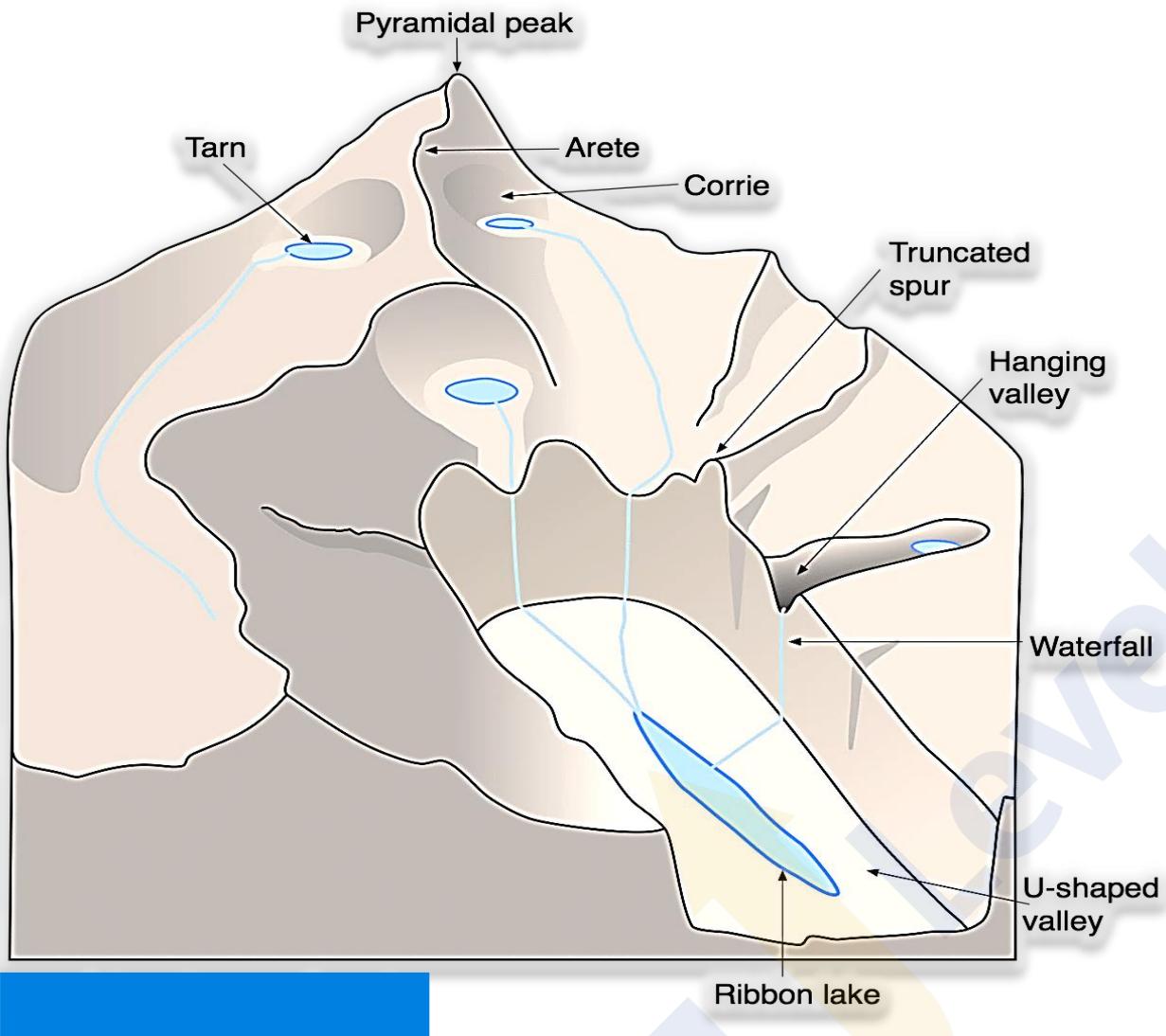




## **Pyramidal peak/Horn, Arete / Serrated Ridge**

- 1. Arete:** When two Corries cut back on the opposite side of the mountain a Knife-edged ridge/ Zigzag Ridge are formed called Arete or Serrated Ridge
- 2. Horn:** When 3/more cirques cut back together they form angular horn or pyramidal peak.

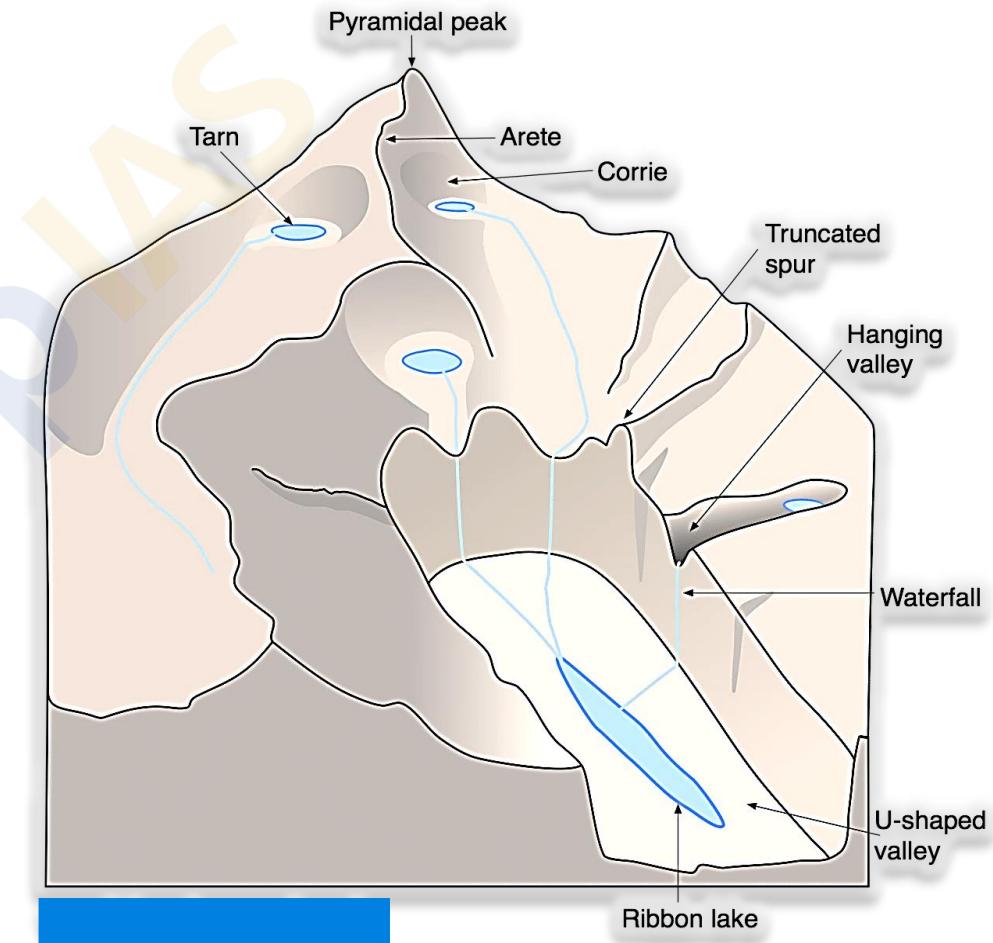
**The Matterhorn, part of the Alps in Switzerland, is a glacial horn.**



## Glacial Valleys/Troughs

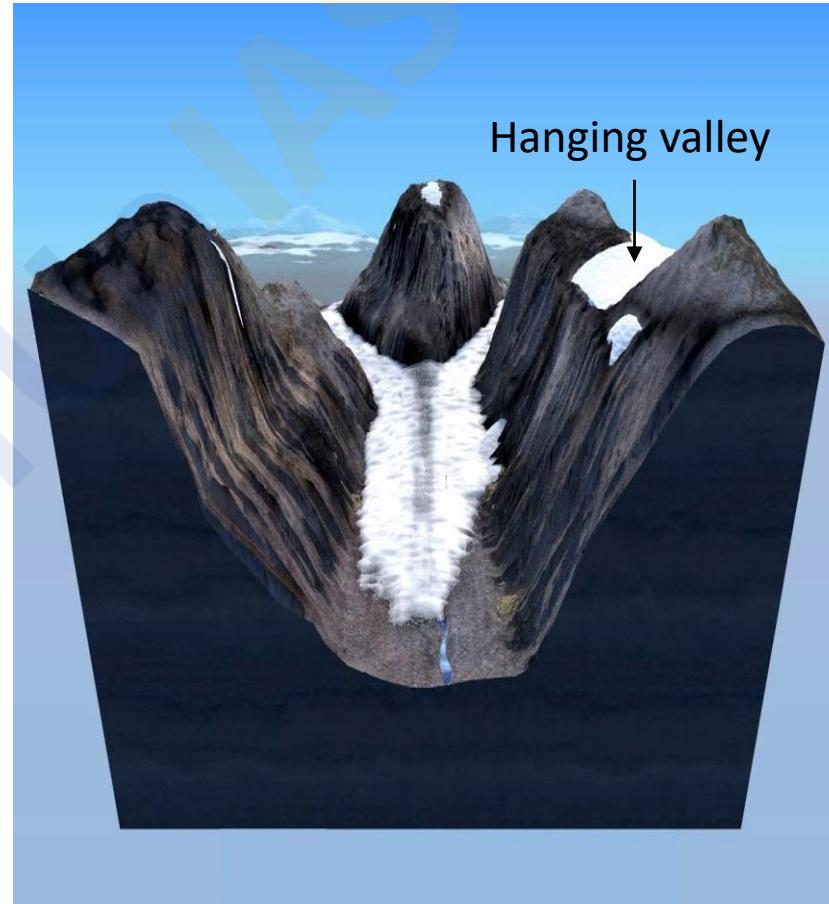
# U shaped Valley

- Glacier on the downward journey fed by ice from several Corries like tributaries that join a river begins to wear away the sides and the floor of valley down
- It straightens any protruding spur on its course and the interlock spurs are blunted to form truncated spurs
- A U shaped valley is formed because of this process.
- After the disappearance of the ice, glacial valley may be filled with water forming Ribbon Lake

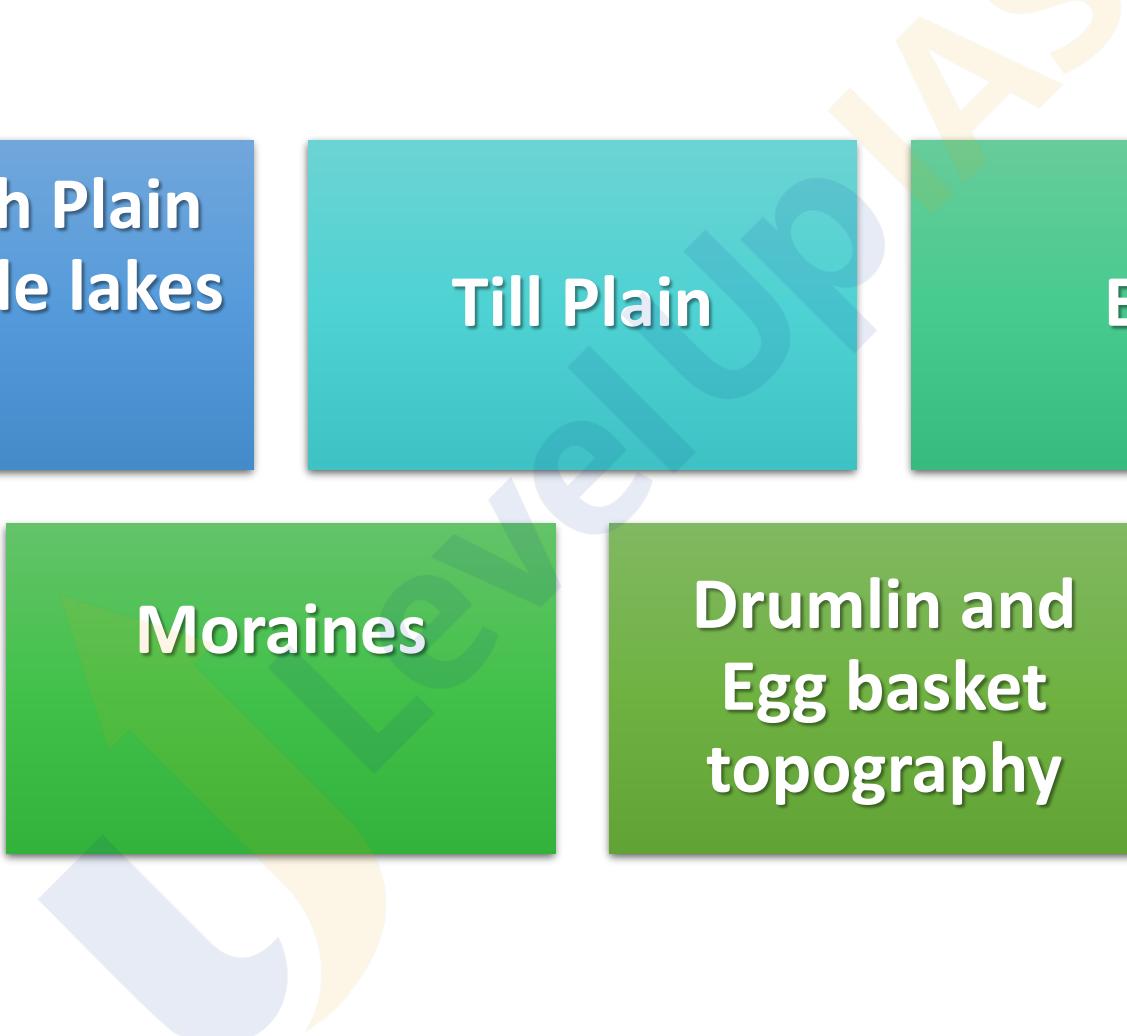


# Hanging Valley

- The main valley is eroded much rapidly than the tributary valleys
- After the ice has melted, a tributary valley therefore hangs above the main valley.
- Search tributary valleys are termed as hanging valley



# **Landforms of Deposition**



**Outwash Plain  
and Kettle lakes**

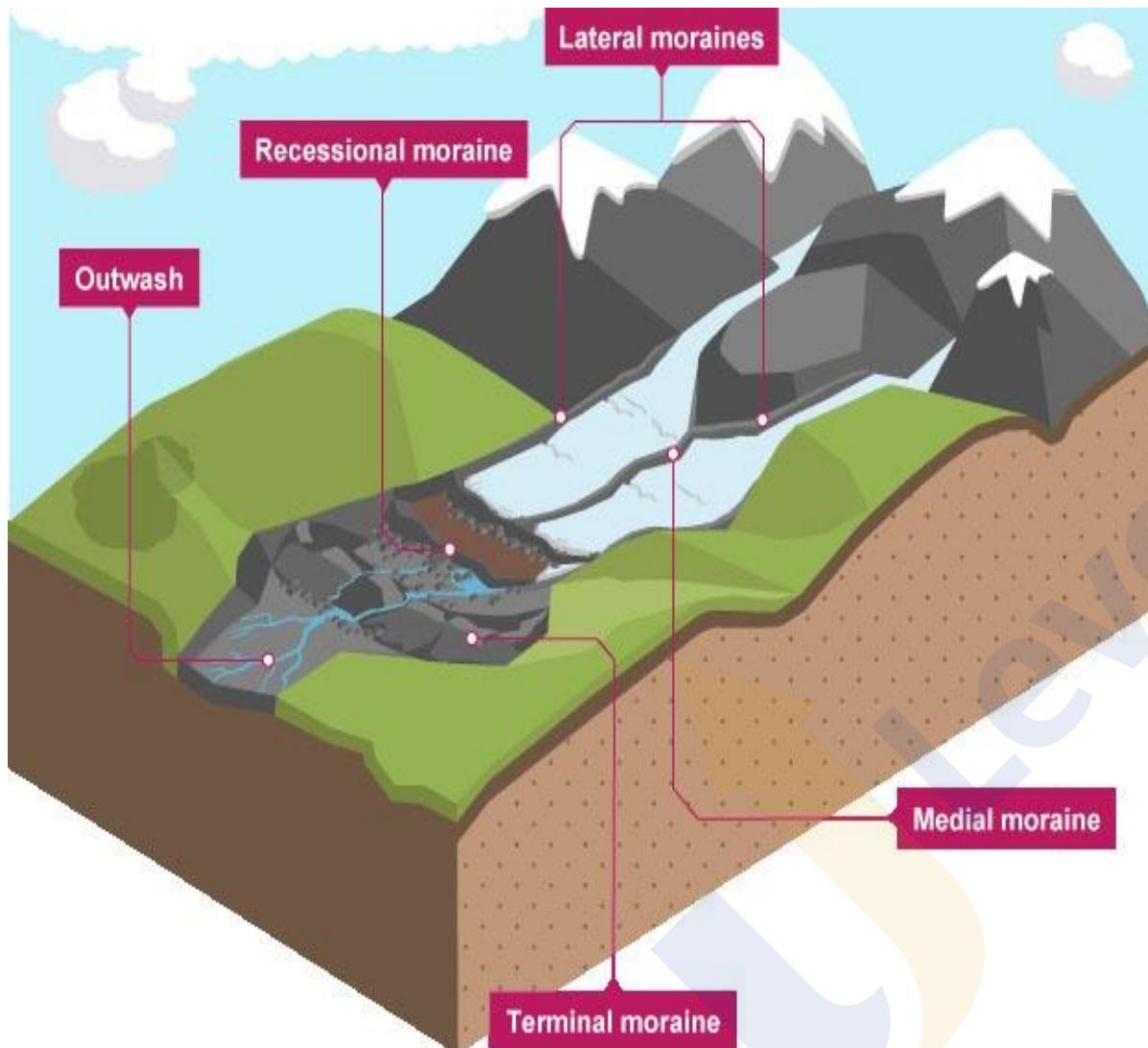
**Till Plain**

**Esker**

**Moraines**

**Drumlin and  
Egg basket  
topography**

# Moraine

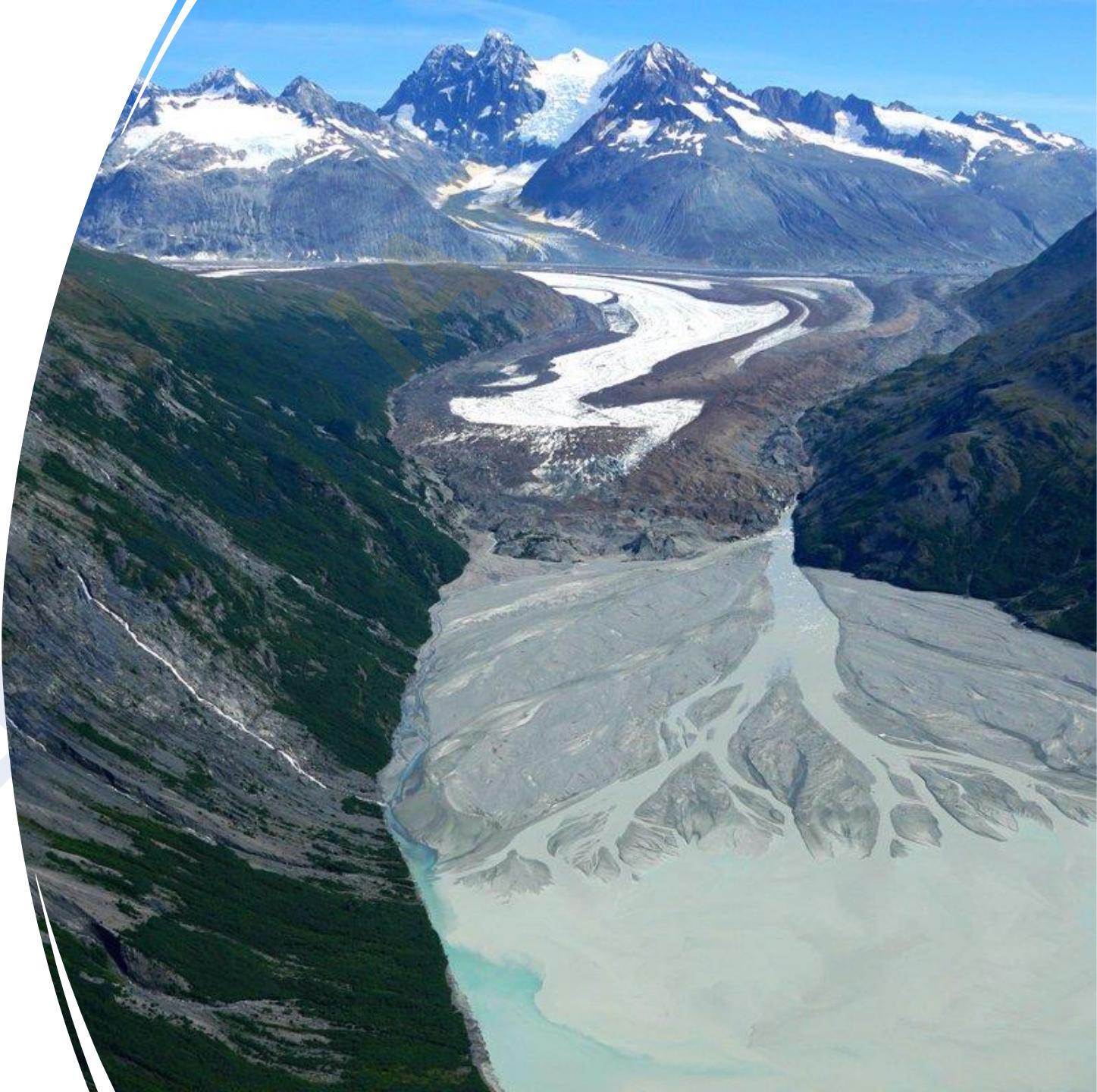


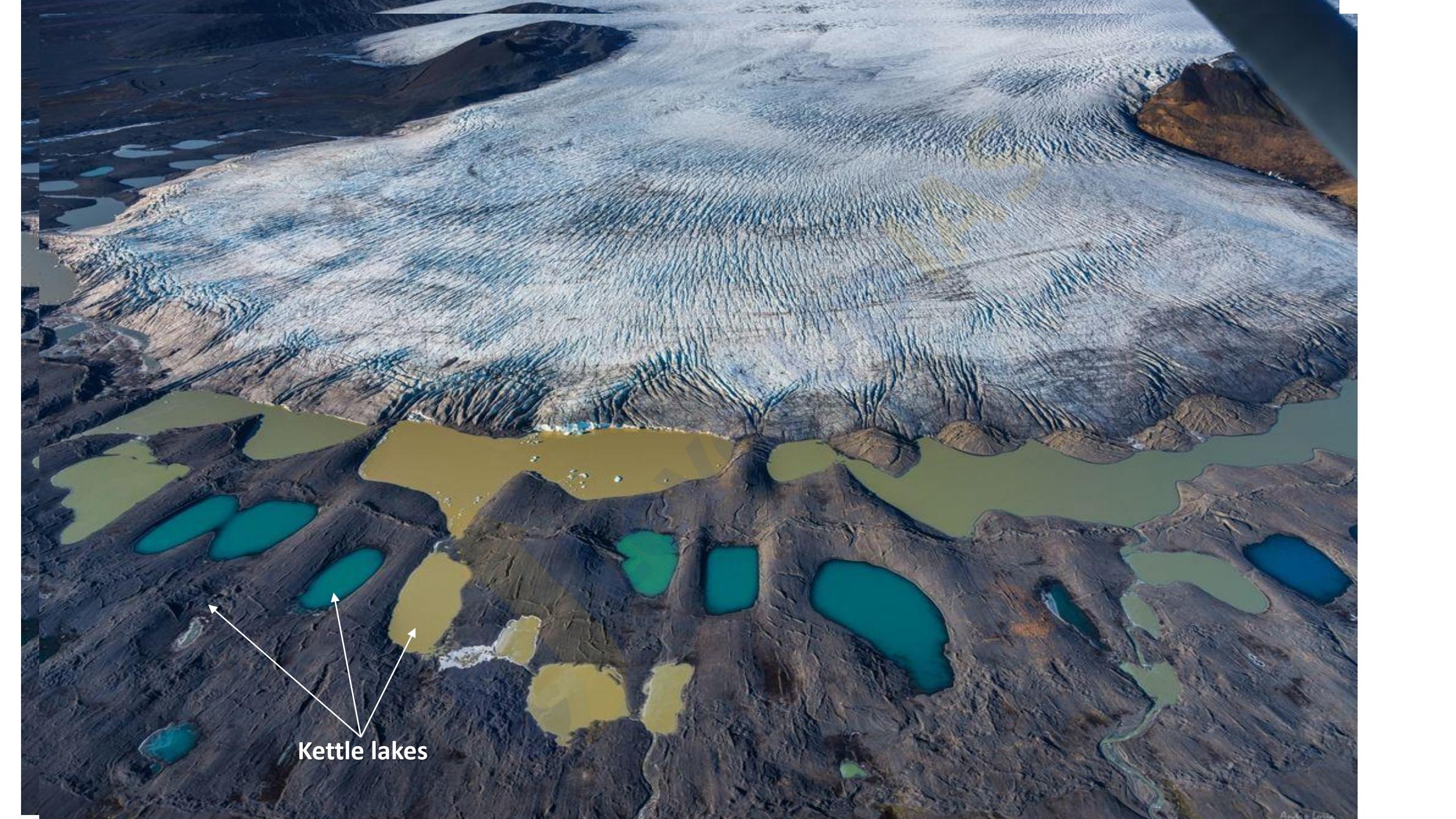
**Moraine:** Long ridges of deposit of glacier till.

- **Terminal moraines:** Long ridges of debris deposited at the end (toe) of the glaciers.
- **Lateral moraines:** Formed along the sides parallel to the glacial valleys. The lateral moraines may join a terminal moraine forming a horse-shoe shaped ridge
- **Medial Moraine:** The moraine in the centre of the glacial valley flanked by lateral moraines
- **Recessional Moraine:** Deposition of end moraine may be in several succeeding waves, as the ice may melt back by stages forming a series of moraine

# Outwash Plain

- Small amount of rock debris are small enough to be carried by the streams formed by the melting glaciers are called as glaciofluvial deposits
- Such glaciofluvial deposits are called outwash deposits
- Unlike till deposits, the outwash deposits are roughly stratified and assorted
- Melt water sort and re-deposits the material in variety of form
- When the deposition takes the form of alternating ridges and depressions the later may contain kettle lakes and give rise to knob and kettle topography



This aerial photograph captures a vast, light blue-grey glacier in the upper half of the frame, characterized by its distinct surface textures and crevasses. Below the glacier, a large, irregularly shaped body of water is visible, showing a gradient from dark brown to bright turquoise. Numerous small, scattered lakes of varying sizes are nestled in the dark, rocky terrain at the base of the glacier. In the bottom left corner, three white arrows point upwards towards a cluster of these smaller lakes, which are labeled "Kettle lakes".

**Kettle lakes**

# Till Plain



- The **unsorted** coarse and fine debris dropped by melting glacier is called as glacial till
- Most of the rock fragments in the angular to sub angular
- It is spread in sheets and not mounds
- Form Till Plain
- Landform is monotonous and featureless



# Esker



They are long narrow sinuous ridges composed of sand and gravel



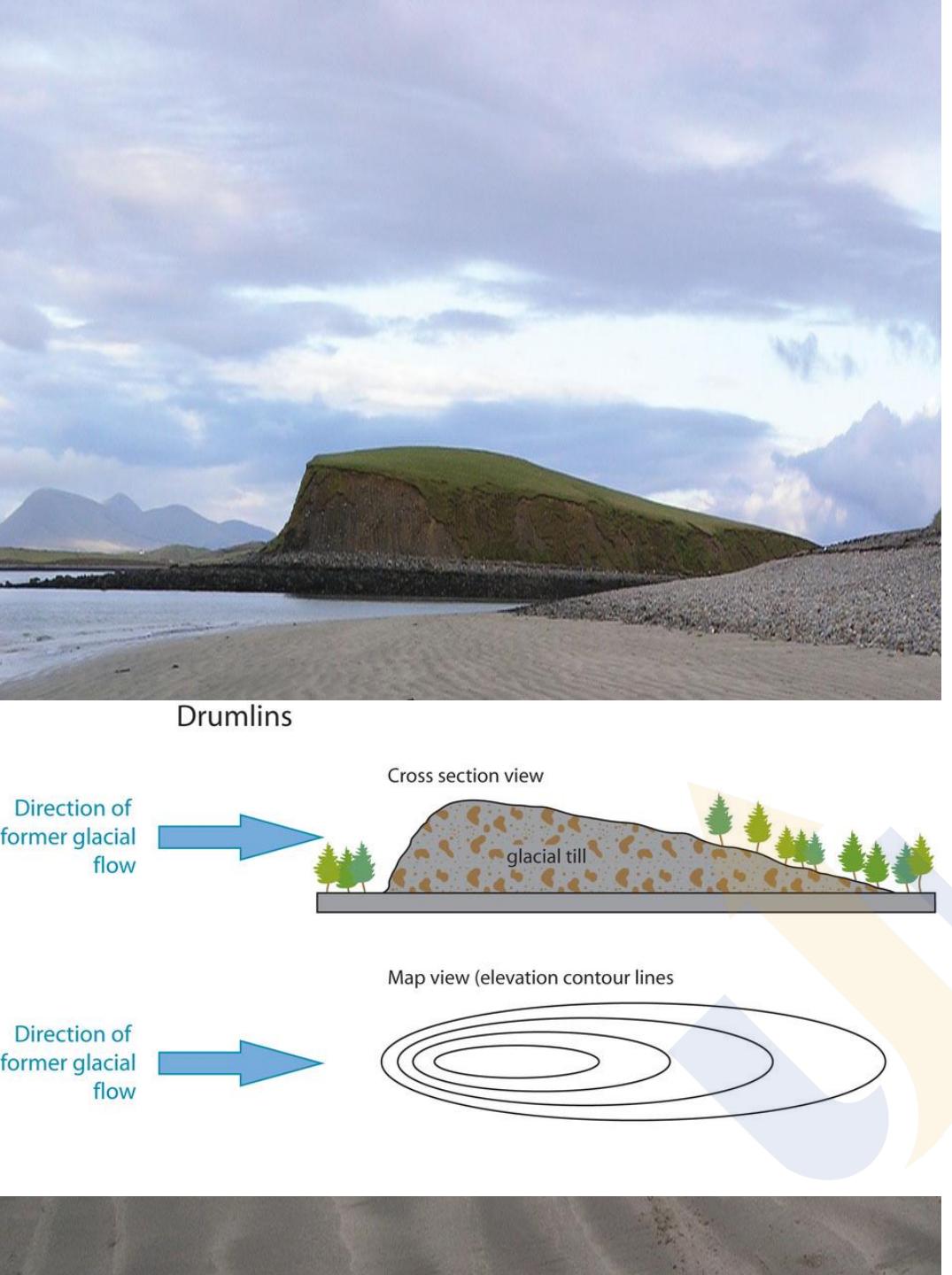
They mark the former site of subglacial meltwater streams



They may be few feet in height but are several miles long



they are made up of highly porous sand and gravel so water is rapidly drained off from their crest



# Drumlin



They are smooth Oval shaped features composed of glacial till along with gravel and sand



The long axis of drumlin are parallel to the direction of the ice movement so drumlin indicate the direction of glacier movement



One end of the drumlin facing the glacier are called stoss end which is a blunter and steeper than the other end



The stoss end gets blunter due to pushing by the moving ice

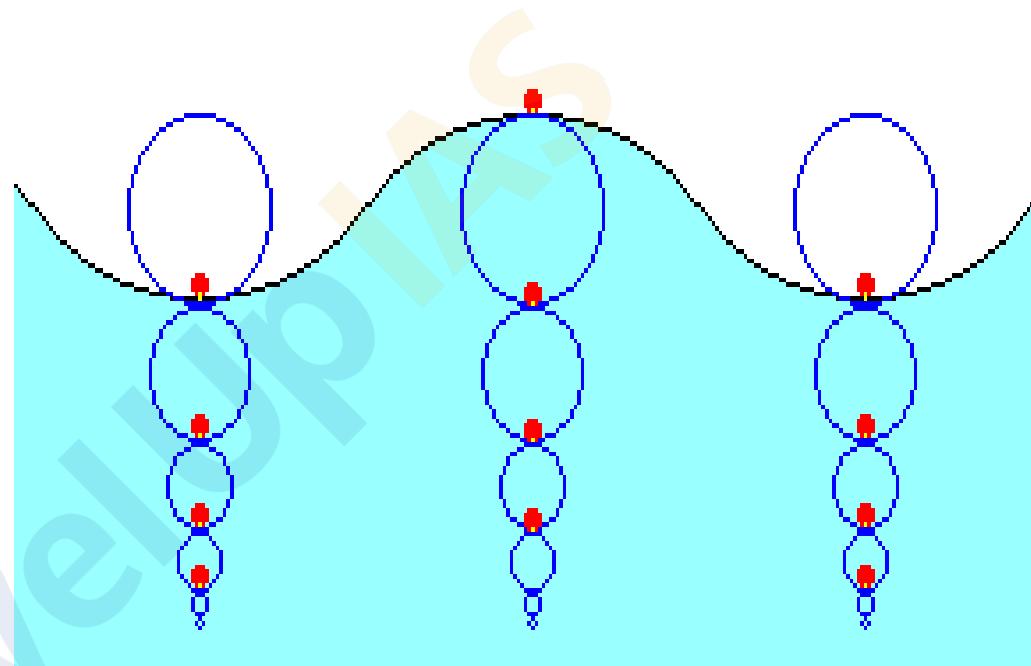
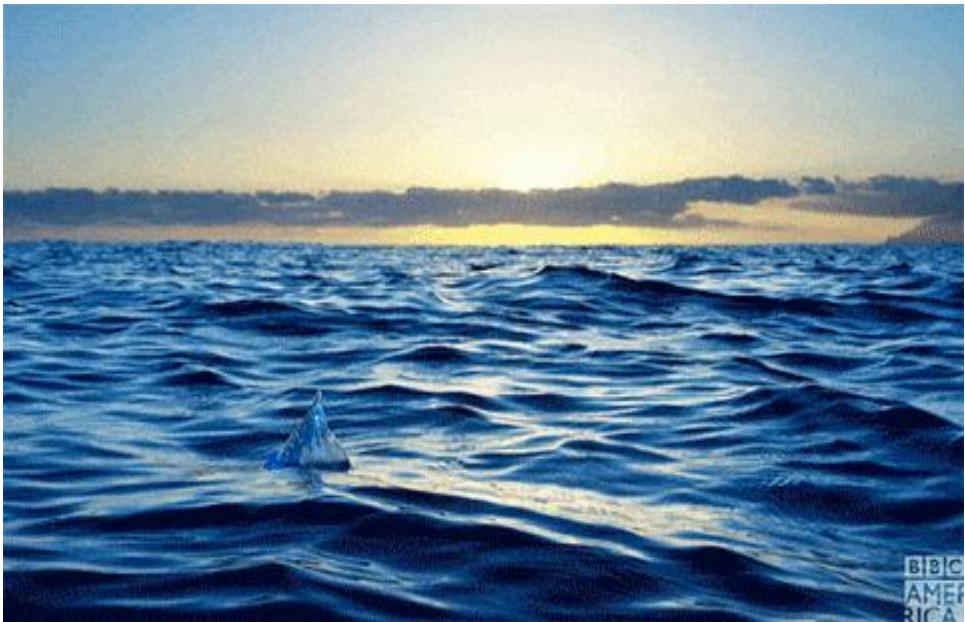


The other end is called as tail



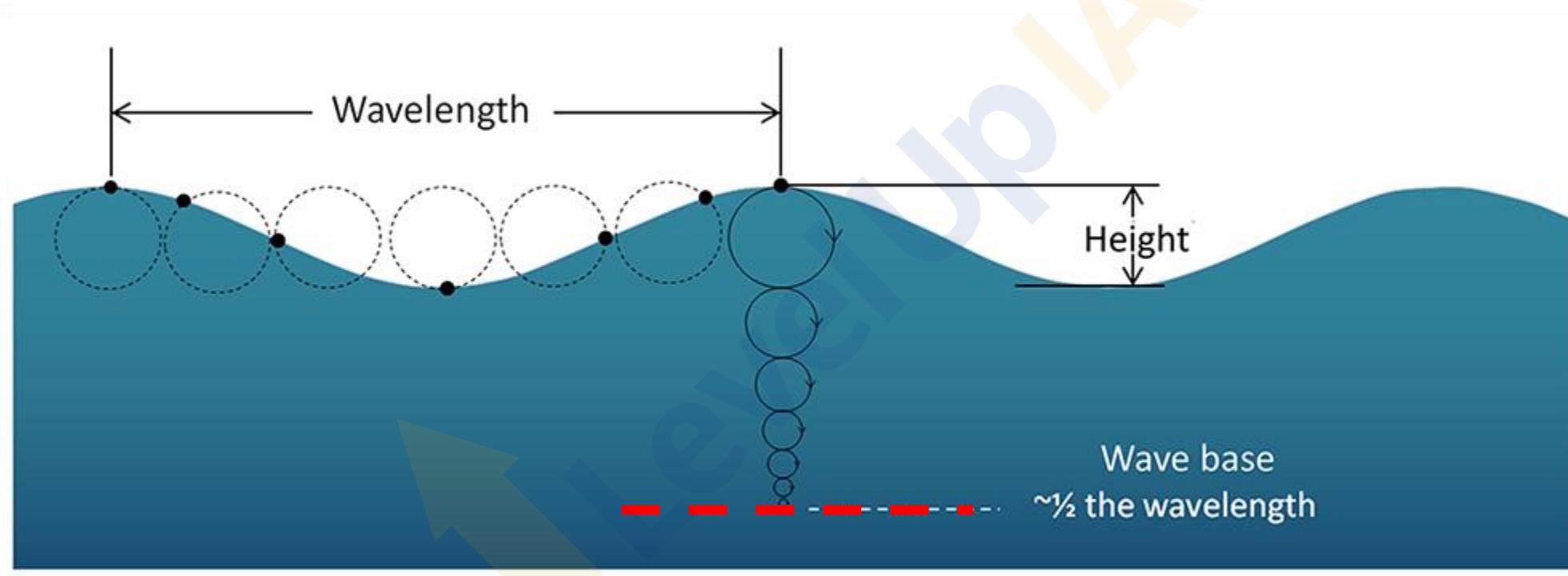
**Egg basket topography**

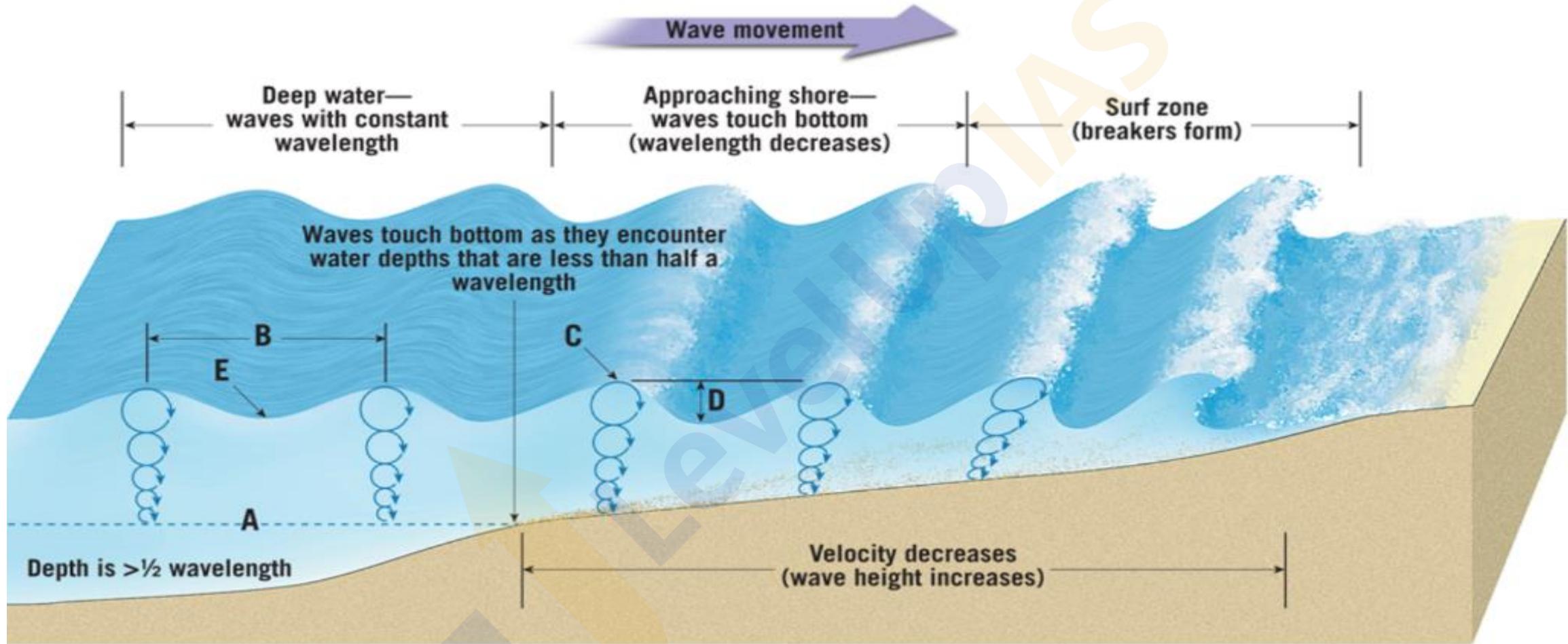
# Waves



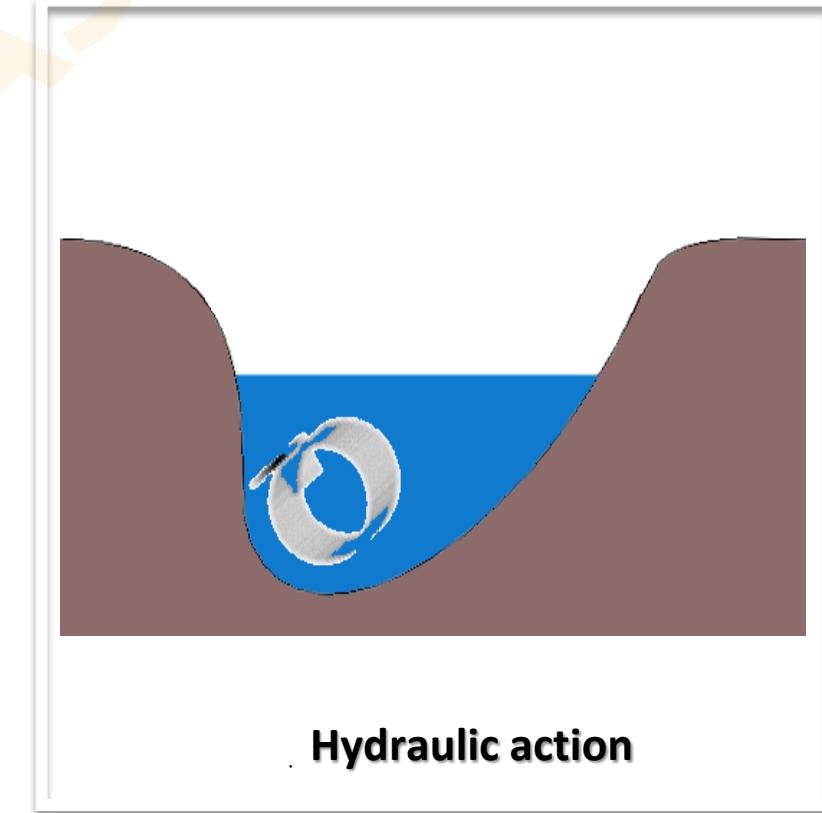
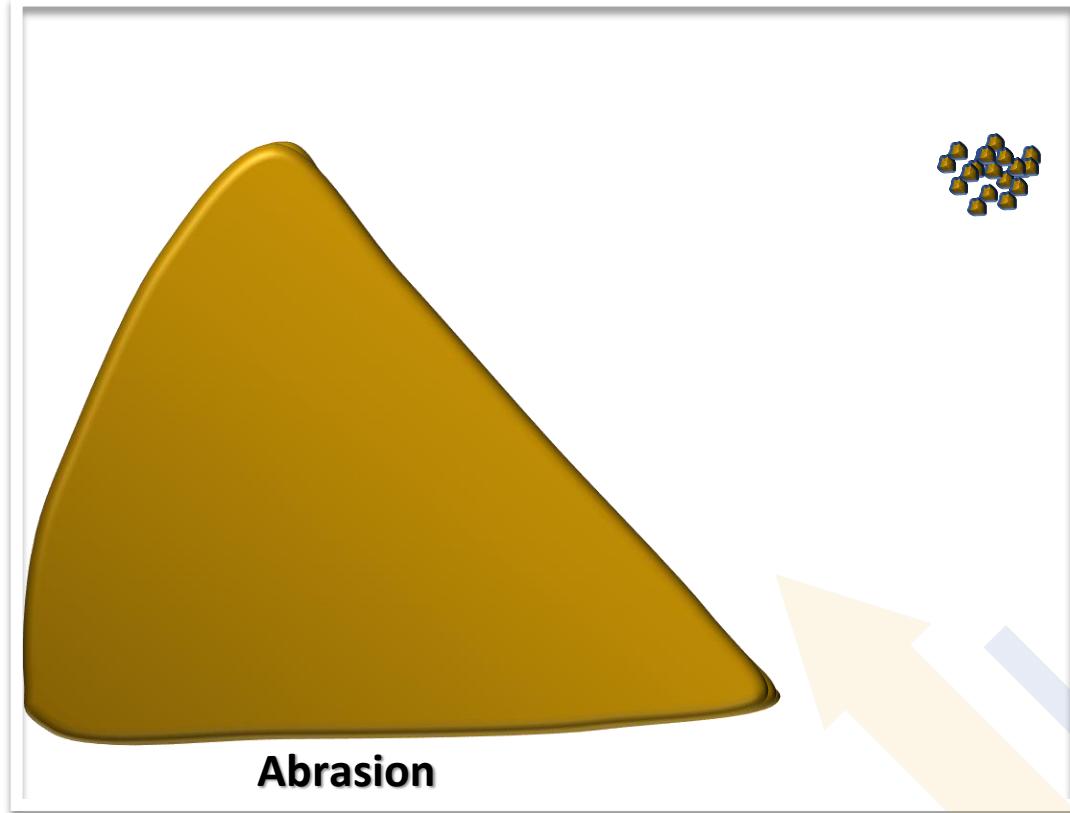
## Waves:

1. Waves are disturbances or ripples formed over sea surface as energy moves from one place to another.
2. Do not involve movement of water particles it is the only the energy which moves.
3. Formed when producing force remains smaller than the resisting force due to which the energy is unable to carry the water particle and is only successful in creating disturbances





# Erosion by the water



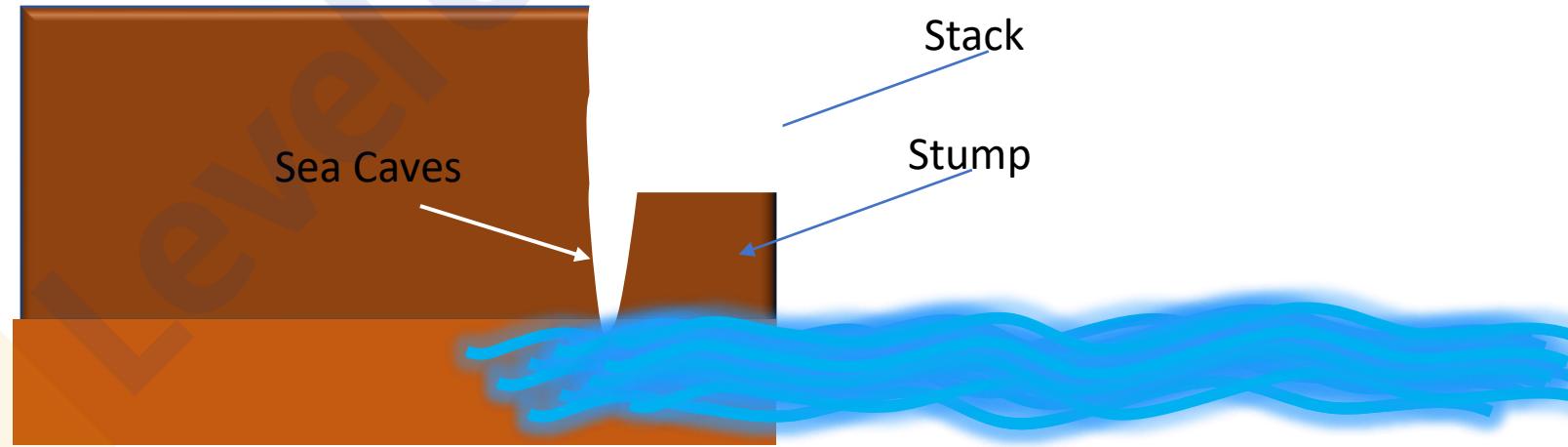
# Erosional Landforms

1. **Wave-cut cliffs** is one of the most dominant erosional landform
2. Almost all sea cliffs are steep
3. At the foot of such cliffs there may be a flat or gently sloping platform covered by rock debris derived from the sea cliff behind. Such platforms occurring at elevations above the average height of waves is called a wavecut terrace.

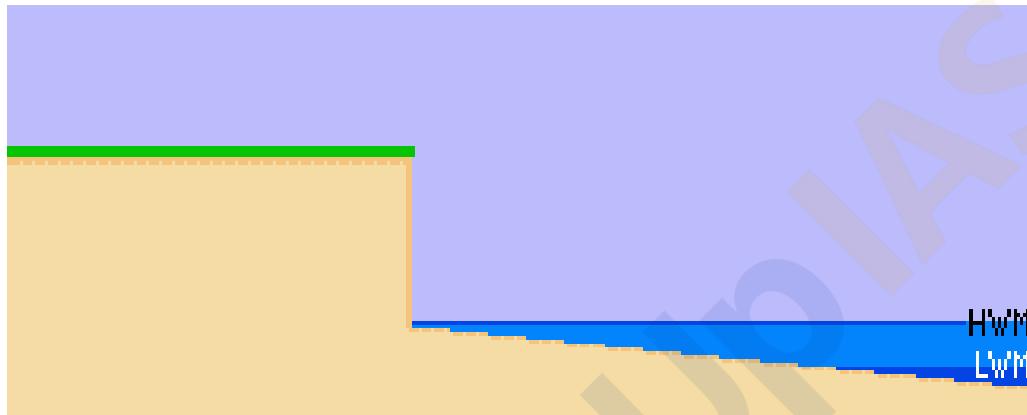


## Cave

1. The lashing of waves against the base of the cliff and smashing of rock against the cliff create hollows and these hollows get widened and deepened to form sea caves.
2. The roofs of caves collapse and the sea cliffs recede further inland.
3. Retreat of the cliff may leave

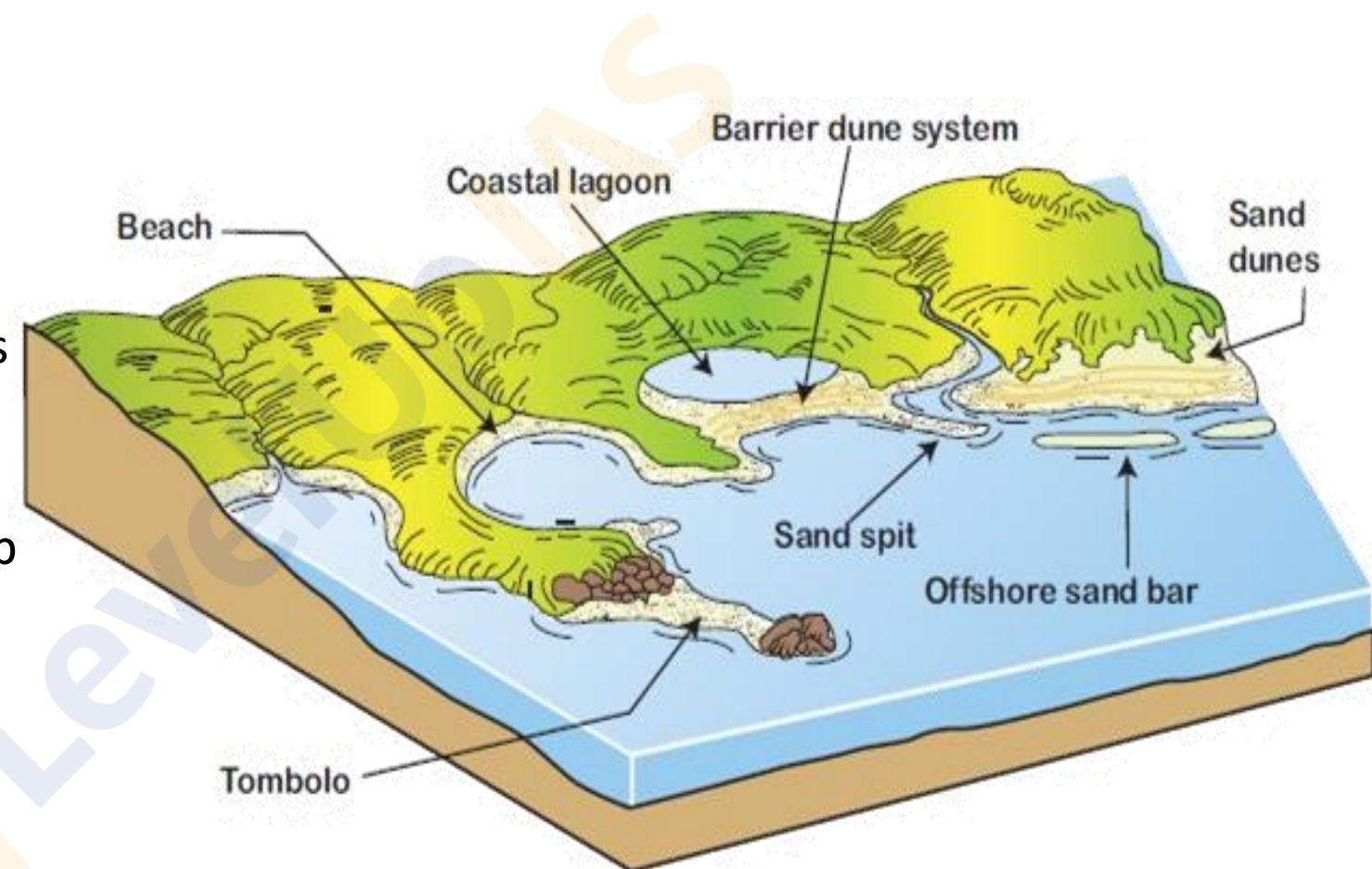


# Coastal Landform of erosion

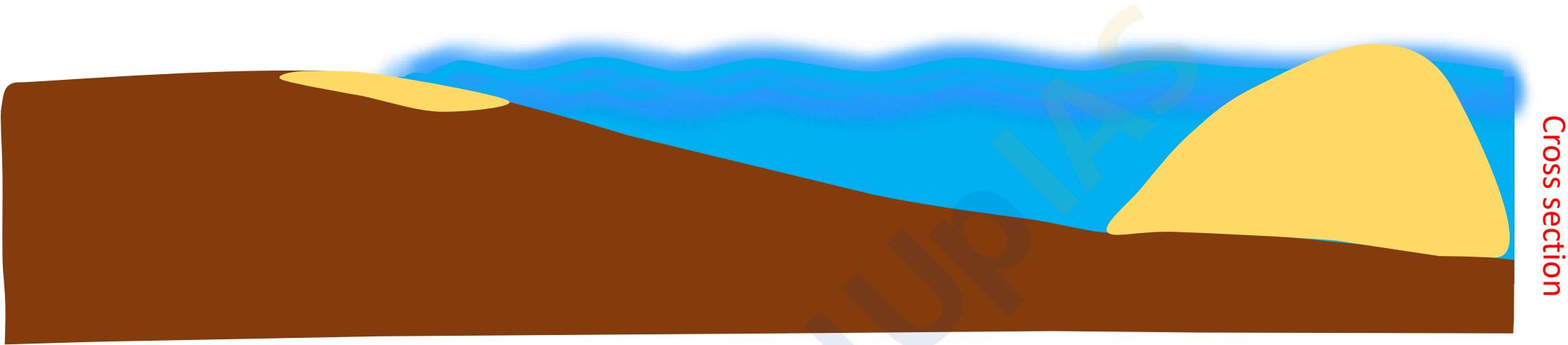


# Formation of offshore Bars/ spits/ Tombola

1. **Offshore Bar:** A ridge of sand and shingle formed in the sea in the off-shore zone lying approximately parallel to the coast is called an off-shore bar.
2. **Barrier Bar:** An off-shore bar which is exposed due to further addition of sand is termed a barrier bar.
3. **Spits:** When barrier bars get keyed up to one end of the bay when they are called spits
4. Barriers, bars and spits developed along a bay can gradually extend leaving only a small opening of the bay **into the sea forming a lagoon.** The lagoons get filled up gradually by sediment



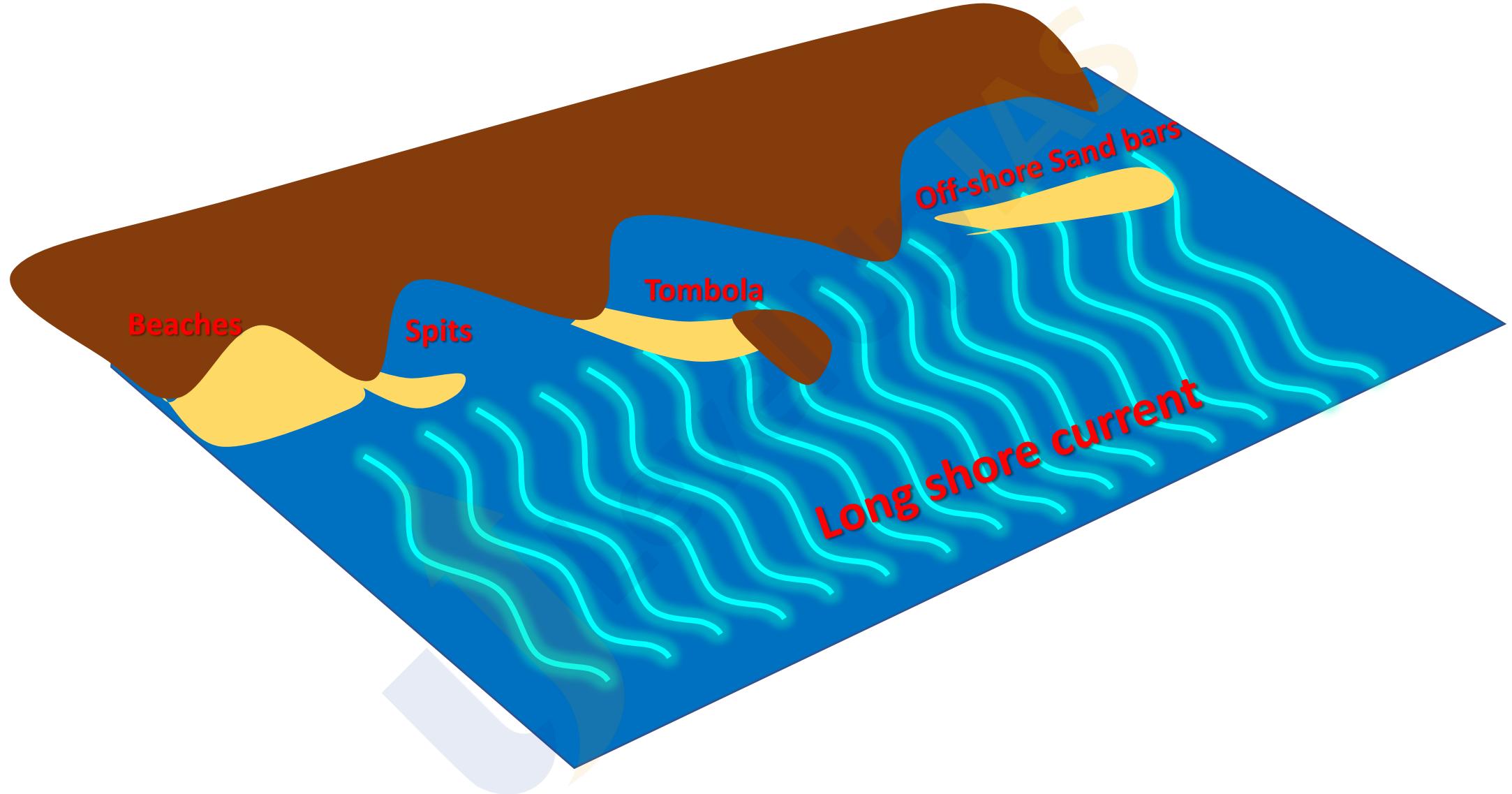
## Formation of offshore Bars/ spits/ Tombola



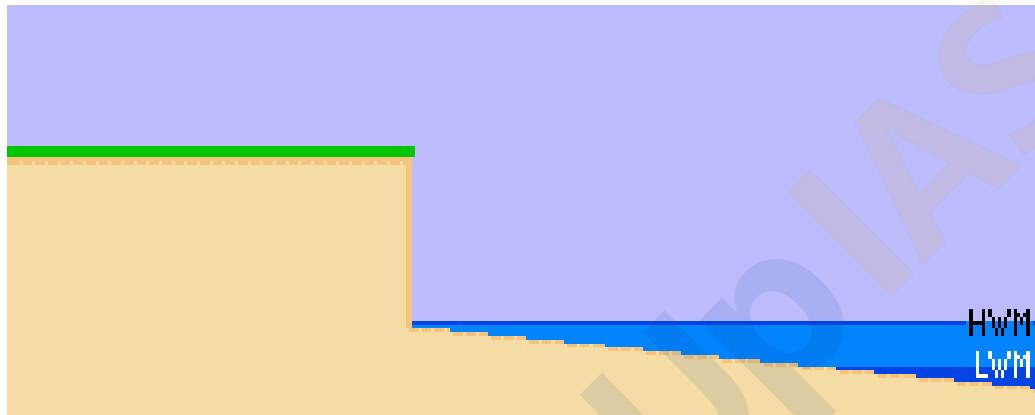
Cross section



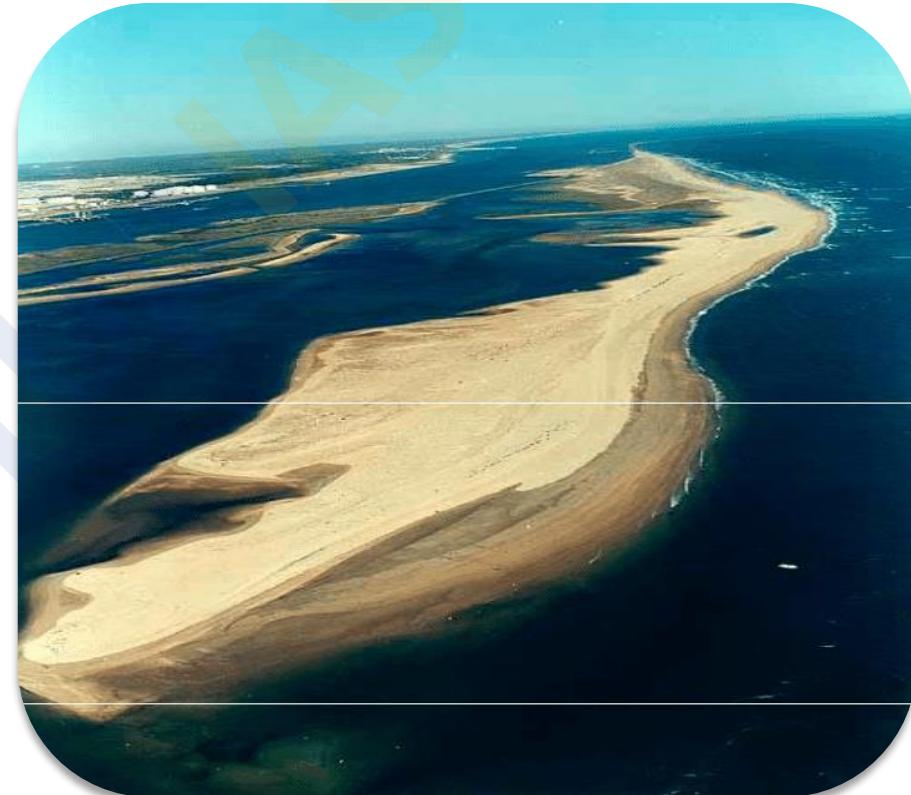
Top view



# Coastal Landform of erosion



**Identify**



# Desert

- Nearly 20% of world land's is made up of deserts.
- Characteristics of deserts:
  - Low mean annual rainfall (less than 250 mm)
  - Practical absence of vegetation
  - Very high daily and annual ranges o f temperature,
  - Dust storms, high velocity winds
  - Dominance of sands
  - Occasional torrential rainfall
- Some deserts are rocky, others stony and rest sandy.



**Hamada**

**Hamada el Haroma in Sahara desert, Libya,**



**Reg**

**Serir in Sahara desert, Libya,**

## **Five types of deserts**



**Mountain desert**

**Ahaggar mountains in Sahara desert,  
Algerian**



**Badland**

**Painted desert of Arizona  
USA**



**Erg**

**Calansico in Sahara desert, Libya,**

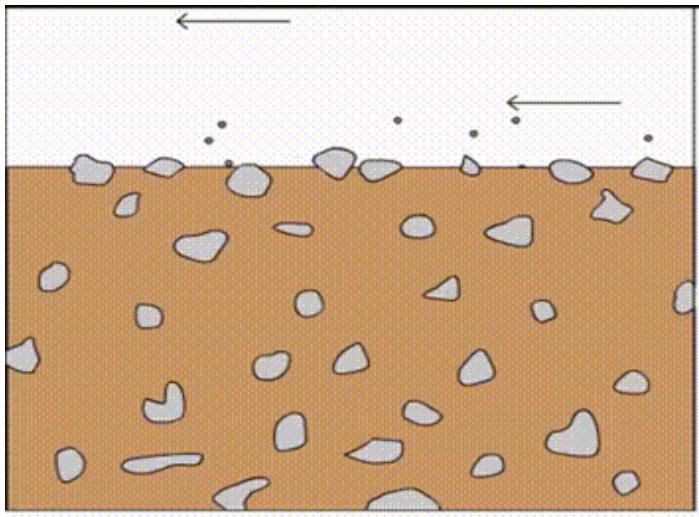
# Weathering of rock



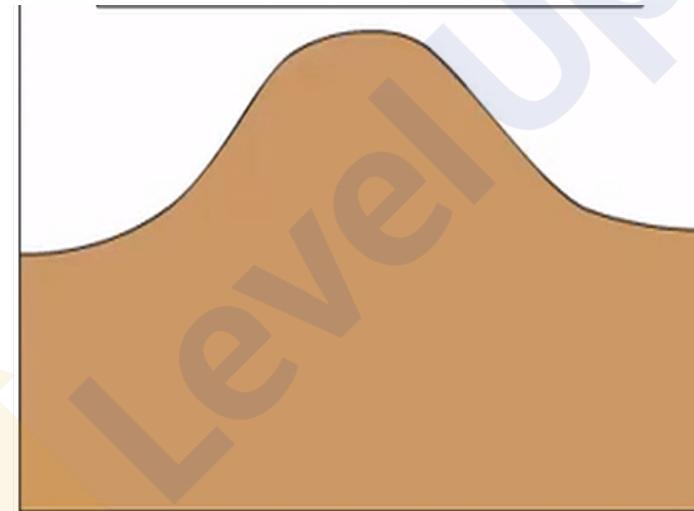
**Onion peeling/ Exfoliation**

- Most potent factor in reducing rocks to sands in the arid region
- Intense heating during day and rapid cooling at night by radiation setup stresses in the rock which eventually crack
- Outer surface of rock is rapidly heated by hot sun while inner rocks remain quite cool
- Heating causes the outer surface to expand and prise itself off from the interior rock in successive layers called as Onion Peeling or exfoliation
- When water gets into crack of rocks the temperature at night suddenly drops and water freezes and therefore expands causing prising of the outer layers

# Wind Erosion: Three ways



**Deflation**



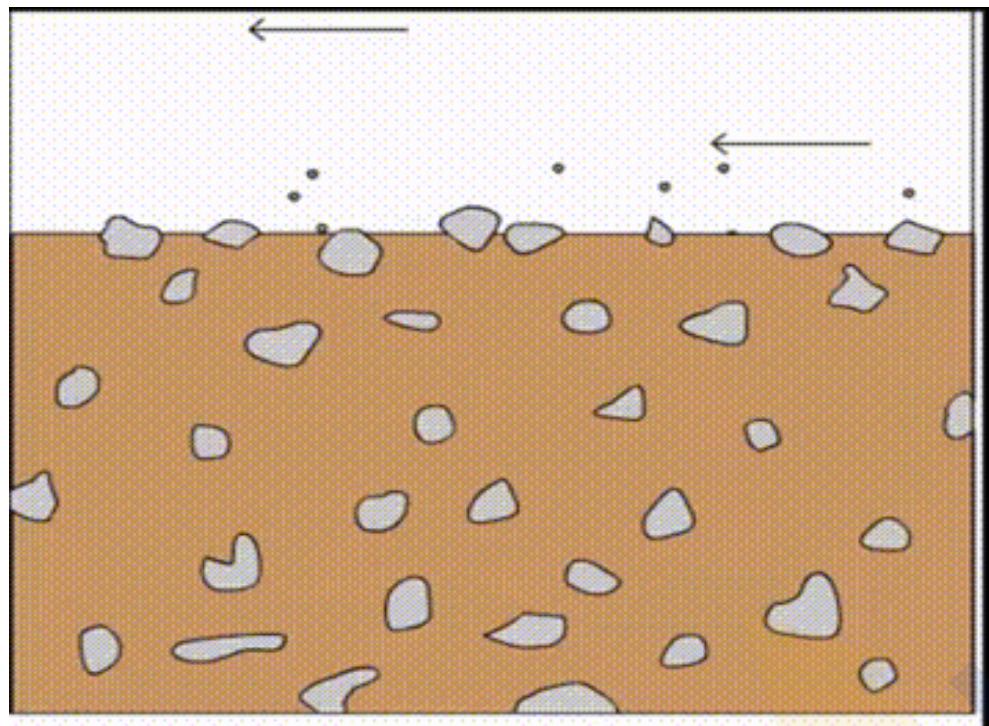
**Abrasion**



**Attrition**

# Deflation

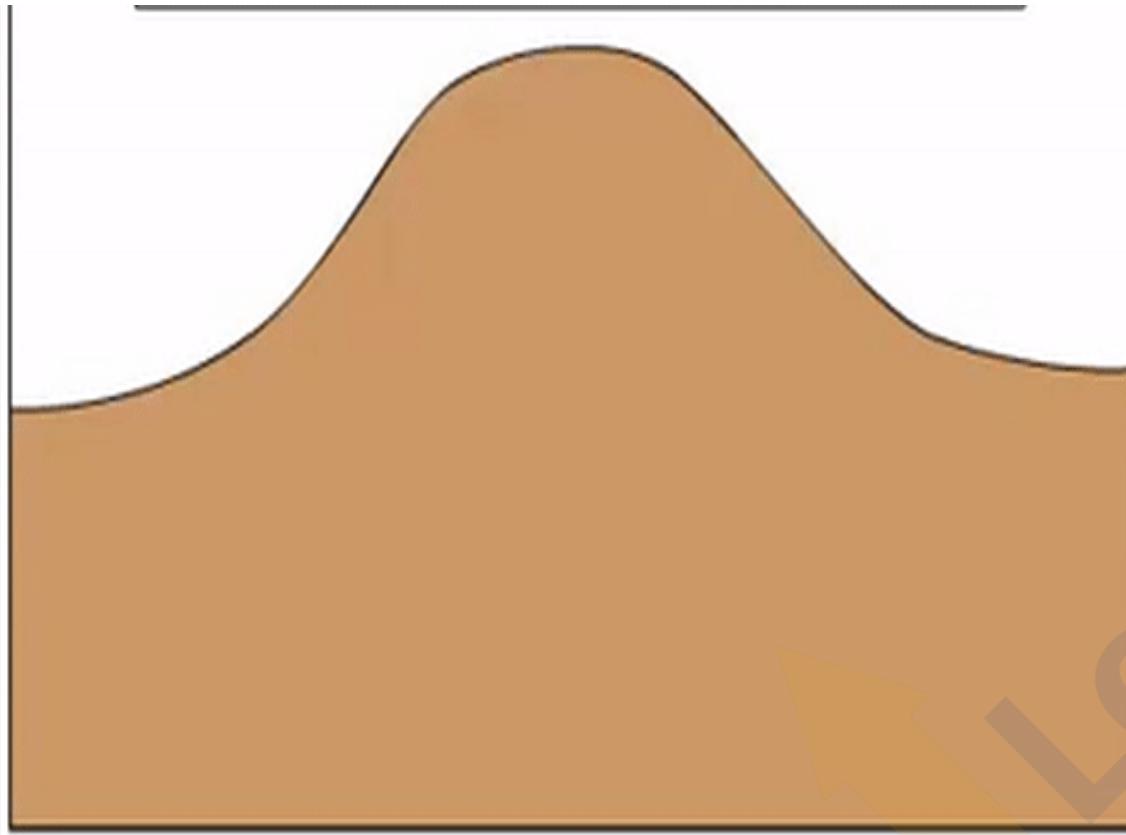
DEFILATION



- Latin word deflatus, which means blowing away
- Process of removing, lifting and blowing away dry and loose particles of sands and dusts by winds
- Long continued deflation removes loose materials forming depressions/ hollows also known as blow outs
- Bedrocks are then exposed to wind abrasion (corrision).

# Abrasion

WINDS



- Wind armed with sand grains acts as tools of erosion attacks the rocks and erodes them
- Also known as sand blasting
- Wind abrasion is minimum at ground level because wind velocity is retarded by friction.
- Beyond the height of 182 cm from the ground level because normal wind cannot lift
- Maximum abrasion occurs at the height between 20-25 cm from the ground surface.
- Abrasion undercuts the upstanding objects from all sides because wind very often changes its direction.
- This explains why Telegraph poles in desert are protected by a covering of metal by a foot above the ground

# Attrition

Attrition



- Mechanical tear and wear of the particles suffered by themselves while they are being transported by wind
- When the particles are moving, they collide against each other and are reduced to finer particles

# Erosional Landforms

Mushroom  
Rocks

Deflation  
Hollows

Ventifacts and  
Dreikanters

Inselberg

Messa..  
Butte..  
Pinnacle



# The Mushroom Rock

THE WHITE DESERT EGYPT

- Rocks having broad upper part and narrow base resembling an umbrella or mushroom
- These mushroom - shaped rocks are formed due to ABRASION
- Base of rock block is abraded vigorously from all sides because of variable directions of wind
- Active abrasion limited to 6 feet height from the ground while the upper part is least affected by abrasion.

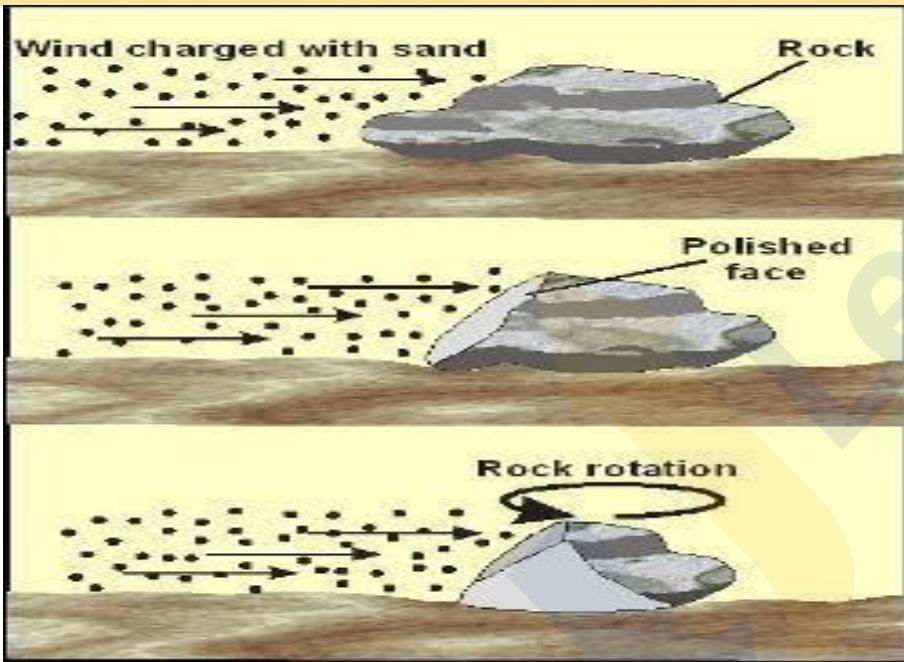


## **Deflation hollows or Deflation Basin or Blow outs or desert Hollows**

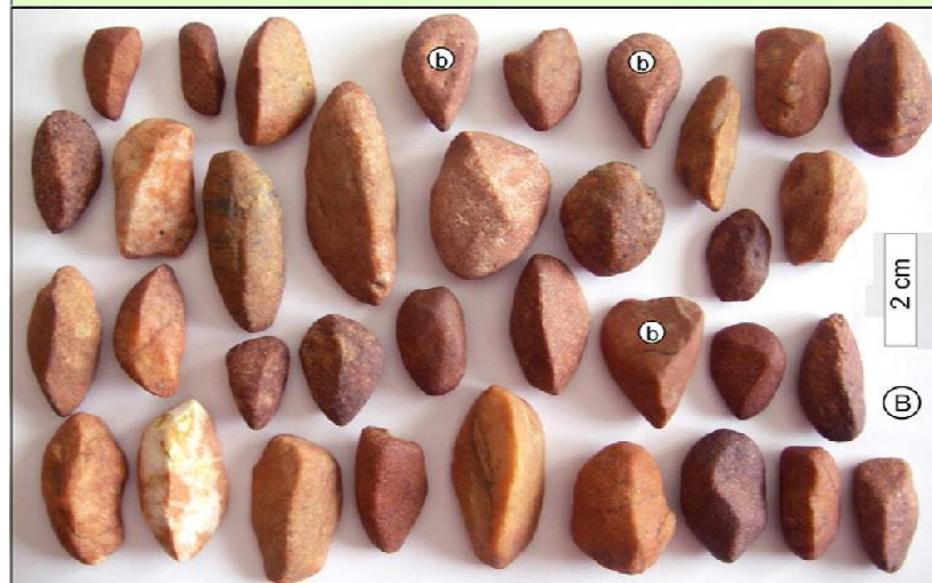
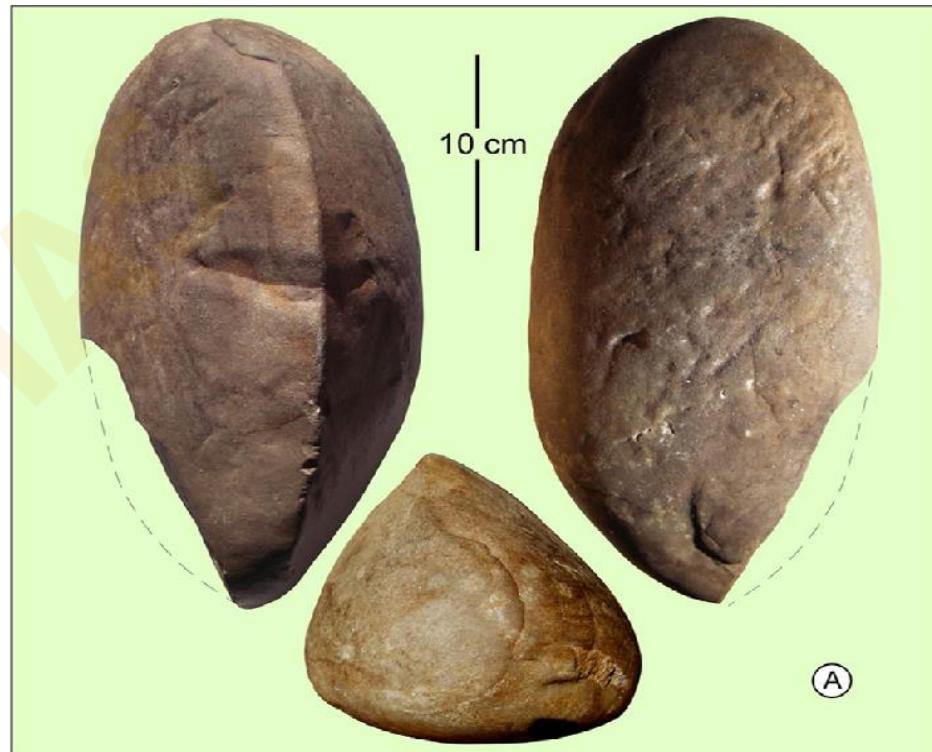
- Depressions in deserts formed due to removal of sands through the process of deflation
- The size of these enclosed depressions varies from smaller ones like 'buffalo wallows' of the American Great Plains to very large depressions such as great
- Qattara depression of Egypt

## ABRASION

# Formation of Ventifact/ Dreikanter



- Faceted rock boulders or pebbles abraded by long periods of wind erosion
- Ventifact or faceted can have as many as eight abraded facets.
- Rock pieces having three abraded facets are called dreikanter
- Boulders with two abraded facets are called Zweikanter.





# Inselberg

Quite controversial landforms.

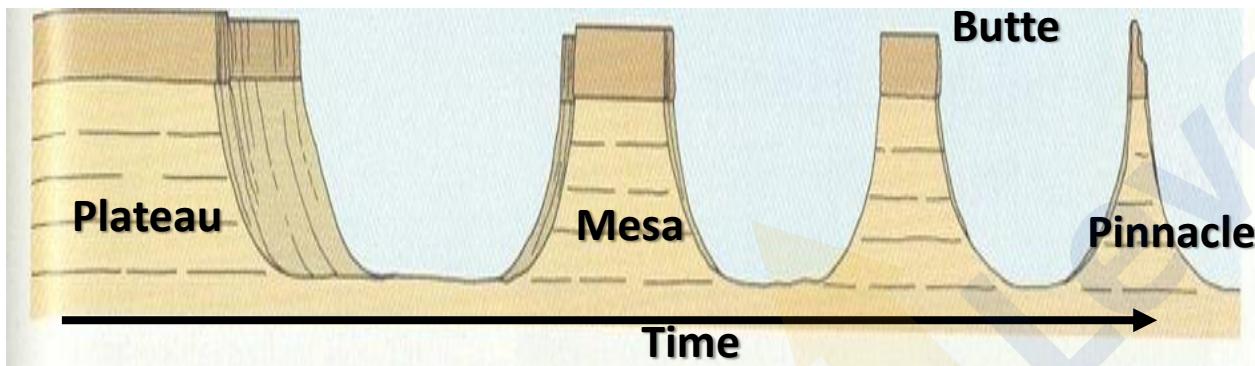
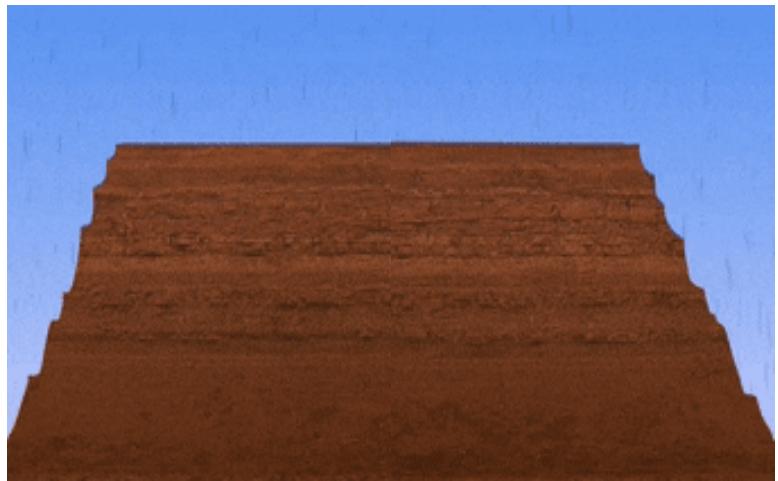
Also known as Bornhardts

Refers to sharply rising residual hill above the flat surfaces

Have steep slope and rounded tops

Are residual hills (remnants of an original plateau) and mounds of relatively resistant rocks (Granitic or Gneissic) in the arid regions

## Formation sequence of Mesa → Butte → Pinnacle



**Monument Valley canyons in Arizona**

Mesa means table

It is a flat table like landmass with very resistant horizontal top layer and very steep sides

Hard stratum on the surface resist denudation and protects the underlying layer of rocks from being eroded away

Continuous denudation through ages may reduce mesa to isolated flat topped hills called buttes

# Deposition and Landforms formed





## **Obstacles at the base of sand dunes**

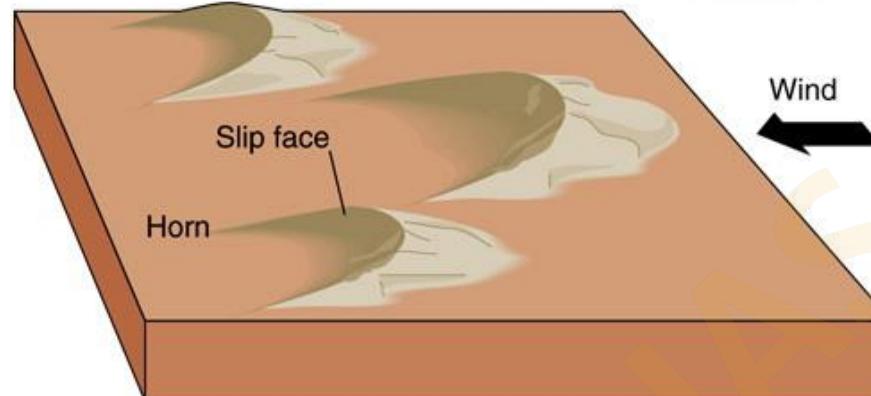
Most of sand dunes are mobile landforms as they generally move forward.

### **Formation of dunes:**

- Begins with the accumulation of sands in form of low sand mounds due to obstruction in the wind speed.
- The mounds then become obstacles in themselves and leads to gradual accumulation of sands
- **Condition for formation:**
  - Abundance of sands
  - High velocity wind to transport huge quantity of sands
  - Obstacles of trees, bushes, forests to trap the sands
  - Suitable places for the accumulation of sands

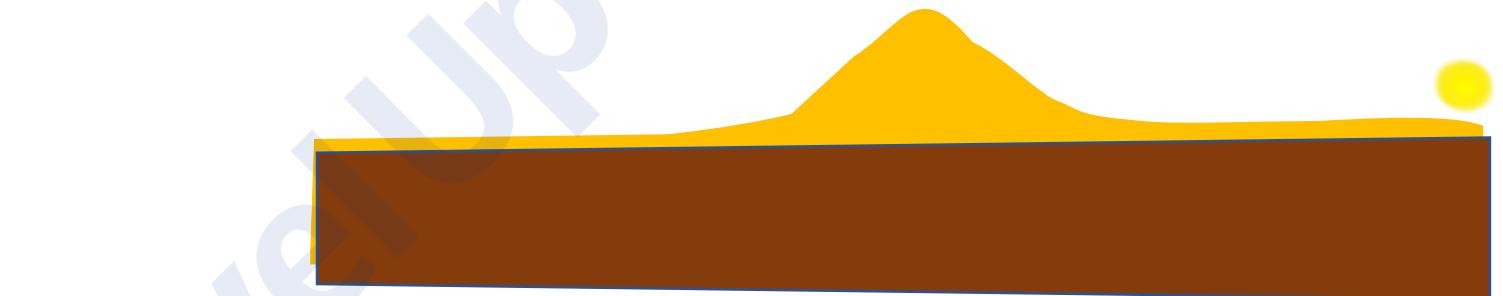
# SAND DUNES

1. Crescent shaped dunes called barchans with the points or wings directed away from wind direction i.e., downwind, form where the wind direction is constant and moderate and where the original surface over which sand is moving is almost uniform.

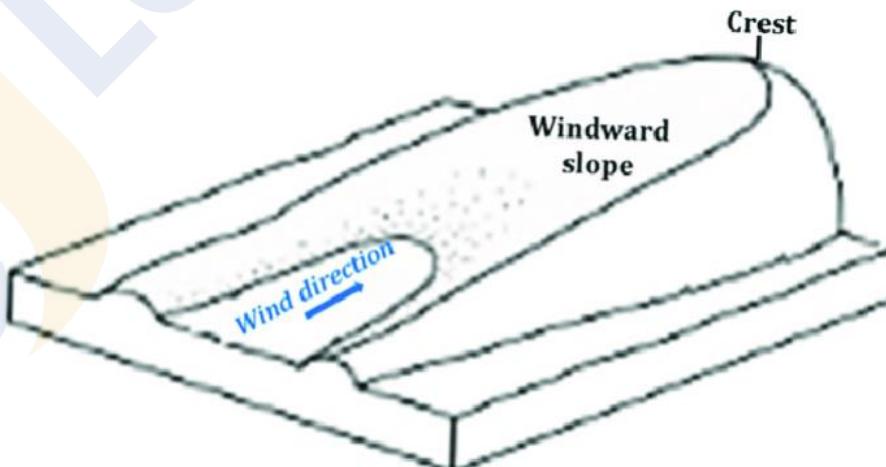


A Barchans

2. Parabolic dunes form when sandy surfaces are partially covered with vegetation. That means parabolic dunes are reversed barchans with wind direction being the same.

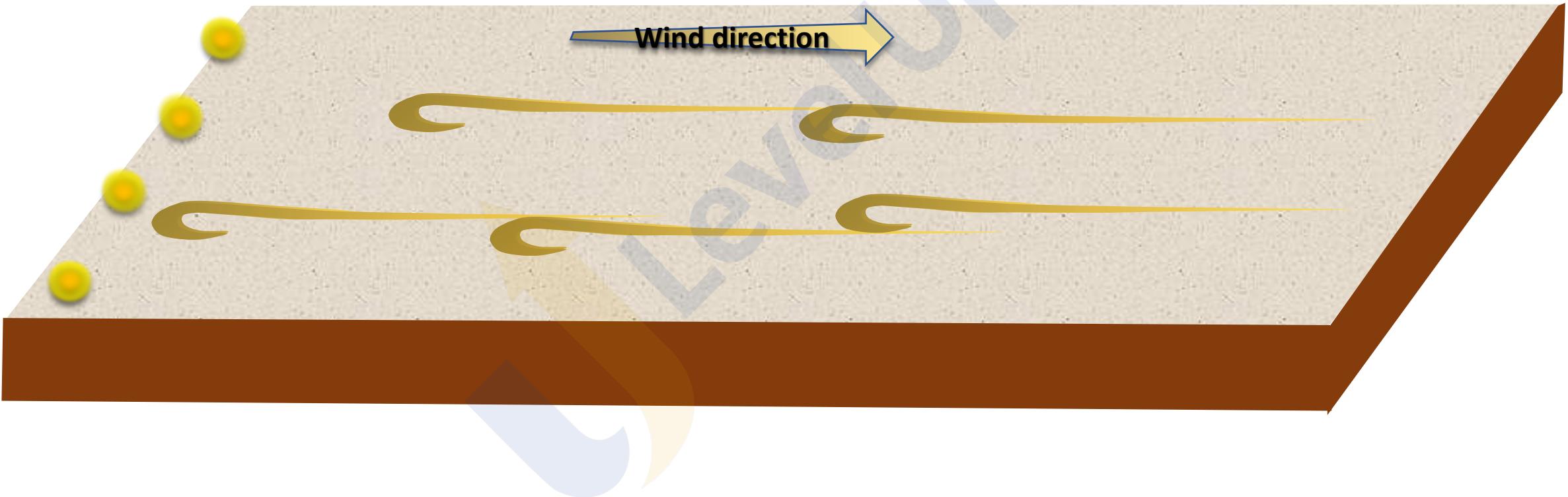


Eddies



# SAND DUNES

**Seif is similar to barchan with a small difference.** Seif has only one wing or point. This happens when there is shift in wind conditions. The lone wings of seifs can grow very long and high. Longitudinal dunes form when supply of sand is poor and wind direction is constant. They appear as long ridges of considerable length but low in height.





# LOESS

Refers to fine loam and thick deposits of fine grained sediments found beyond the desert

Are found at very distant places from the source areas of sediment

It is yellow friable material usually very fertile

It is very coherent and extremely porous

Initial reliefs are eliminated due to deposition of loess and the depositional surface becomes featureless.

The loess terrain can develop huge ravines and gullies leading to formation of badland topography.

Most extensive loess deposit is found in Hwang Ho Basin.

Chinese loess is yellow in colour, very soft and impermeable.



LevelUp IAS

# Sociology

Foundation Batch 2.0

## CSE 2024

by **NISHAT SINGH**



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Quick revision cards  
(Trademark product).



Inter-syllabus discussion.



Hand-crafted notes.



PYQ ( Previous Year  
Questions) Discussion.



Everyday life example.



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of Sociological perspective.



Answer writing sessions.



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