# GLACIATION AND GLACIER TYPES

# INTRODUCTION

- Glaciers constitute much of the earth that makes up the cryosphere, the part of the earth that remains below the freezing point of water.
- Most of the glacial ice found today in the polar region, in the Arctic and Antarctic region.
- Although it consist about **3% of earth surface and 11% of total earth's land area**, but there are evidences which shows earth covers much higher proportion of ice or glacial cover in the geological past.
- Last glacial maximum occurred about 20,000 years ago, during the last phase of the Pleistocene epoch. At that time, global sea level was more than 400 feet lower than it is today, and glaciers covered approximately: 8% of earth's surface and 25% of earth's land area.

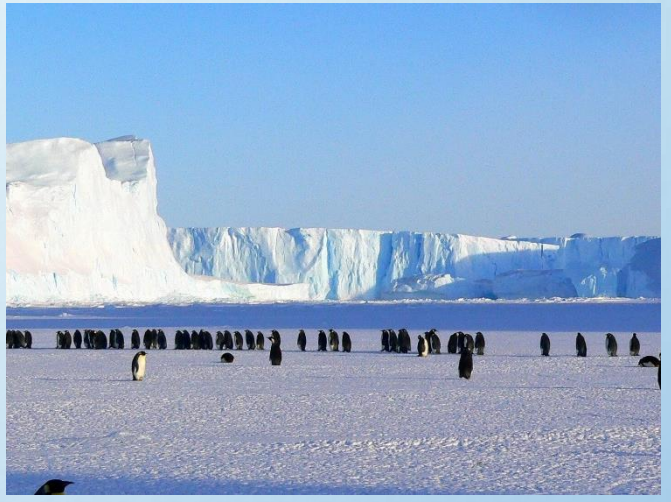
# TYPES OF GLACIER

- A Glacier is a permanent (on a human time scale, because nothing on the earth is really permanent) body of ice, consisting largely of recrystallized snow, that shows evidence of downslope or outward movement due to the pull of gravity

- Glaciers are majorly categorised into 3 types
  1. **Mountain glaciers:** Relatively small glaciers which occur at higher elevations in mountainous regions.

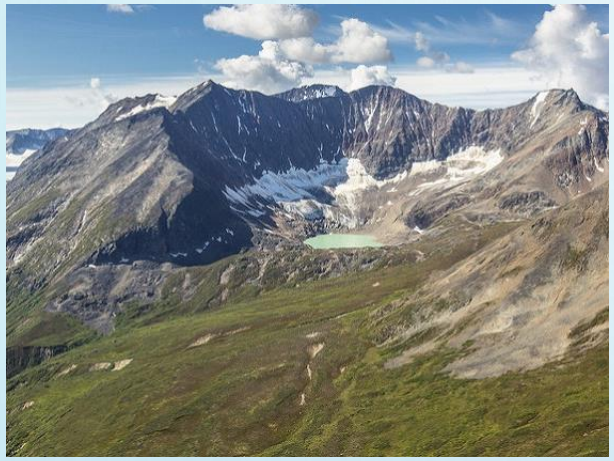
# TYPES OF GLACIER

1. **Ice sheets** (continental glaciers): These are the largest types of glaciers on Earth. They cover large areas of the land surface, including mountain areas. Modern ice sheets cover Greenland and Antarctica.



2. **Ice shelves:** Ice shelves are sheets of ice floating on water and attached to land. They usually occupy coastal embayments, may extend hundreds of km from land and reach thicknesses of 1000 m.

# TYPES OF MOUNTAIN GLACIER



Cirque glaciers

Valley glaciers

Fjord glaciers

Piedmont glacier

Ice caps

# FURTHER TYPES OF GLACIER

Glaciers can also be classified by their internal temperature:

- ***Temperate glaciers*** **-** Ice in a temperate glacier is at a temperature near its melting point.

- ***Polar glaciers*** **-** Ice in a polar glacier always maintains a temperature well below its melting point.

# FORMATION OF GLACIAL ICE

- Three conditions are necessary to form a glacier:
    1. Cold local climate (polar latitudes or high elevation).
    2. Snow must be abundant; more snow must fall than melts
    3. Snow must not be removed by avalanches or wind.
- Glaciers can only form at latitudes or elevations above the **Snowline,** which is the elevation above which snow can form and remain present year round. The snowline, at present, lies at sea level in polar latitudes and rises up to 6000 m in tropical areas.

# MOVEMENT OF GLACIERS

Glaciers move to lower elevations under the force of gravity by two different processes:

- **Internal Flow** - called creep, results from deformation of the ice crystal structure - the crystals slide over each other like deck of cards. This type of movement is the only type that occurs in polar glaciers, but it also occurs in temperate glaciers.
- **Basal sliding** - meltwater at base of glacier reduces friction by lubricating the surface and allowing the glacier to slide across its bed. Polar glaciers are usually frozen to their bed and are thus too cold for this mechanism to occur.

# GLACIATION

- Glaciation is the modification of the land surface by the action of glaciers. The movement of glaciers across the continents profoundly changed the landscape through extensive erosion, transportation, and deposition of rock and sediment.
- Glaciation generally happens when ice sheets move over a land surface. Two types of glaciation are recognized: **Continental and Alpine**.
    1. **Continental glaciation** affects a broad section of a continental land mass, such as antarctica.
    2. **Alpine glaciation** is usually restricted to deep valleys in high mountainous terrain

# LANDFORMS PRODUCED BY ICE CAPS AND ICE SHEETS

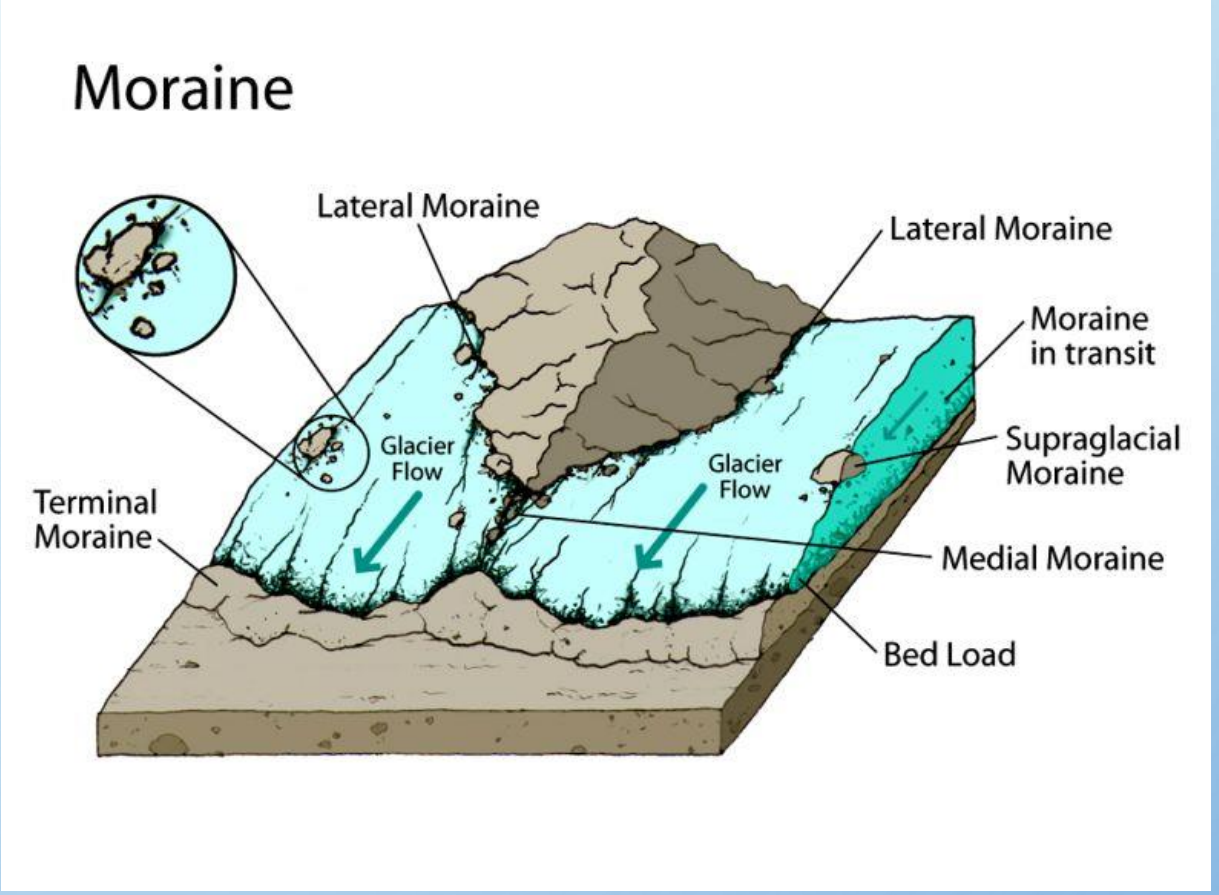
- **Abrasional features** - Small-scale abrasional features such as striations and glacial polish can occur beneath ice caps and ice sheets, particularly in temperate environments.
- **Streamlined forms** - Land surface beneath a moving continental ice sheet can be molded into smooth elongated forms called **Drumlins.** Other elongated hills carved into bedrock by plucking and abrasion are called **Roche Mountomées**

# LANDFORMS PRODUCED BY MOUNTAIN GLACIERS

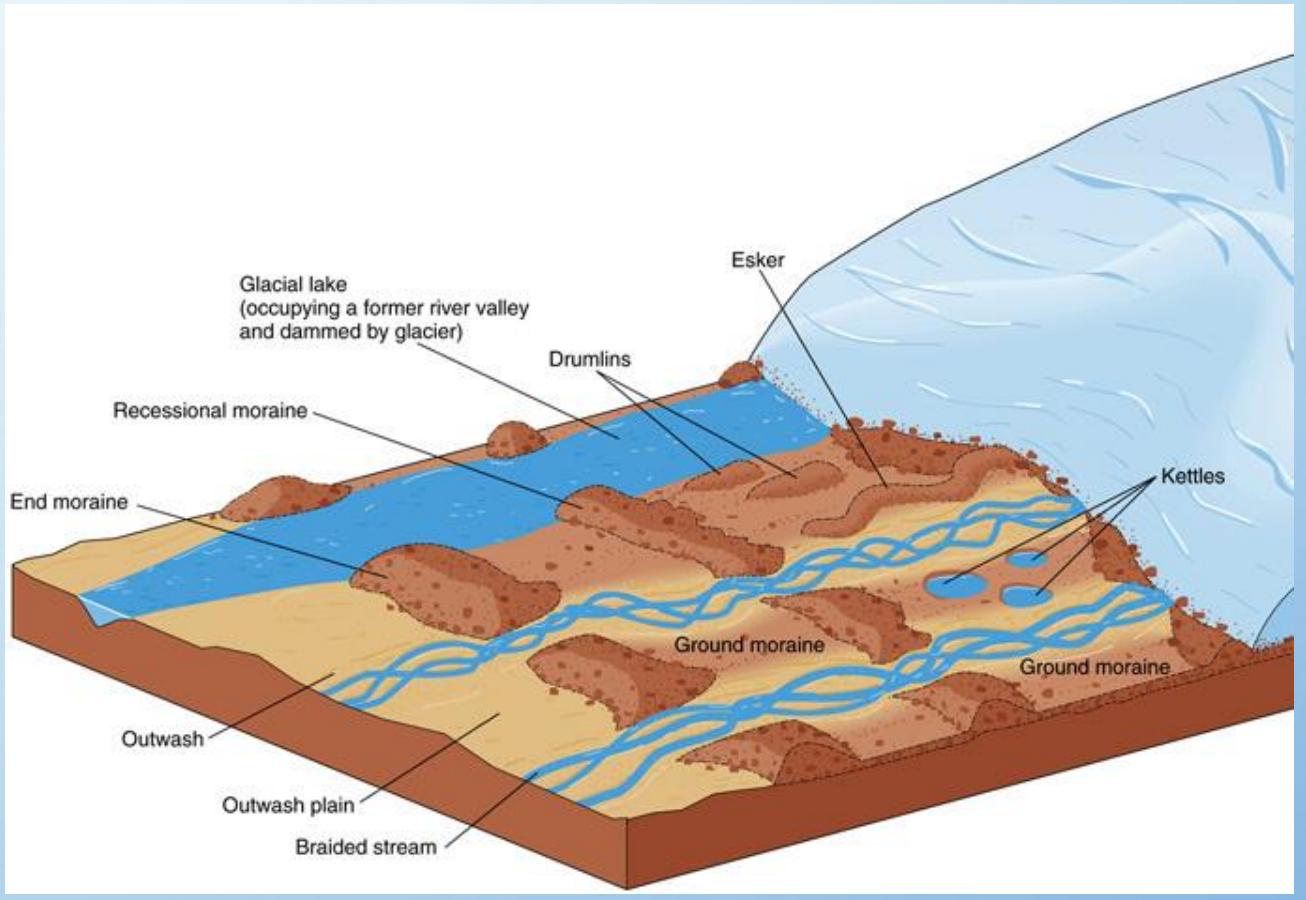
- **Cirques** - bowl shaped depressions that occur at the heads of mountain glaciers
- **Glacial valleys** - valleys that once contained glacial ice become eroded into a "U" shape in cross section
- **Arêtes** - if two adjacent valleys are filled with glacial ice, the ridges between the valleys can be carved into a sharp knife-edge ridge, called an arête
- **Horns** - where three or more cirques are carved out of a mountain, they can produce a sharp peak called a horn
- **Hanging valleys** - when a glacier occupying a smaller tributary valley meets the larger valley
- **Fjords** - fjords are narrow inlets along the seacoast that were once occupied by a valley glacier, called a fjord glacier

# GLACIAL DEPOSITION AND DEPOSITS

- Ice laid deposits
  1. Till
  2. Erratics
  3. Moraines
     1. Ground moraines
     2. End moraines and terminal moraines
     3. Lateral moraines
     4. Medial moraines



- Stratified drift - glacial drift can be picked up and moved by meltwater streams which can then deposit that material as stratified drift.
    1. Outwash plains
    2. Kettle lakes
    3. Kames and kame terraces
    4. Eskers
    5. Meltwater lakes



# CONSEQUENCES OF GLACIATION

- **Ice loading and glacial rebound:** the weight of glacial ice sheets depress the lithosphere into the mantle causing the crust to subside. After the ice melts, the depressed lithosphere rebounds.
- **Sea level change:**

➢During glacial periods much sea water was tied up in glaciers so sea level was lower.

➢During interglacial periods sea level was higher due to melting of the ice.

- **Ice dams, drainage reversals, and lakeses:** When glacial ice forms, it can block existing drainages causing the formation of new lakes and forcing streams to find new pathways that develop into new drainage networks.