





# What is a glacier?

a thick mass of ice that forms **over land** from the compaction and recrystallization of snow and shows evidence of past or present **flow**







# Two Types of Glaciers

Continental glaciers = Ice sheets

*Currently there are two of these on the planet: Greenland and Antarctica*

Alpine glaciers



# Antarctica





# Greenland

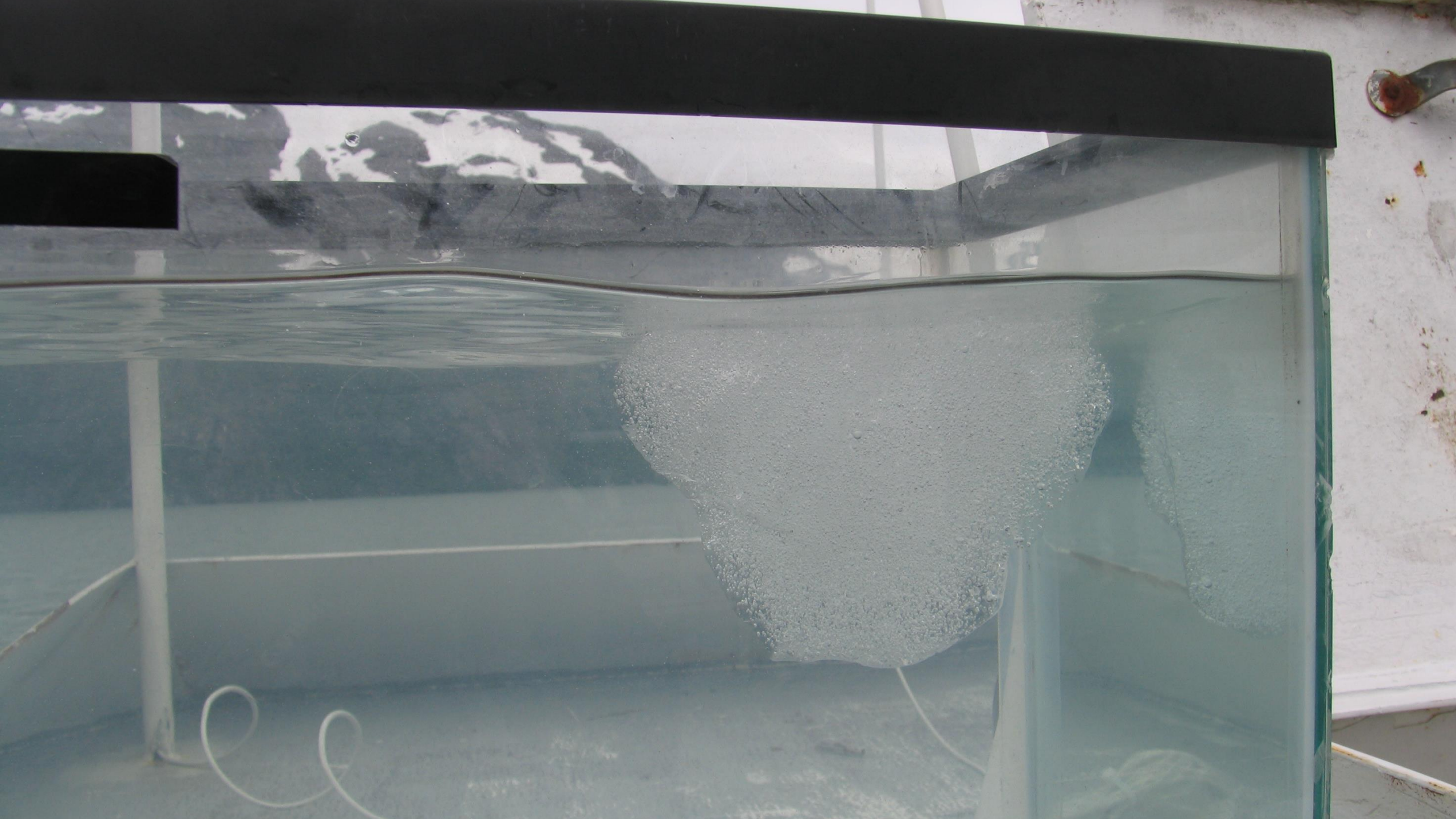




# Glacier vs Sea Ice

- A glacier forms on land and flows downslope
- Sea Ice is frozen water floating in the ocean







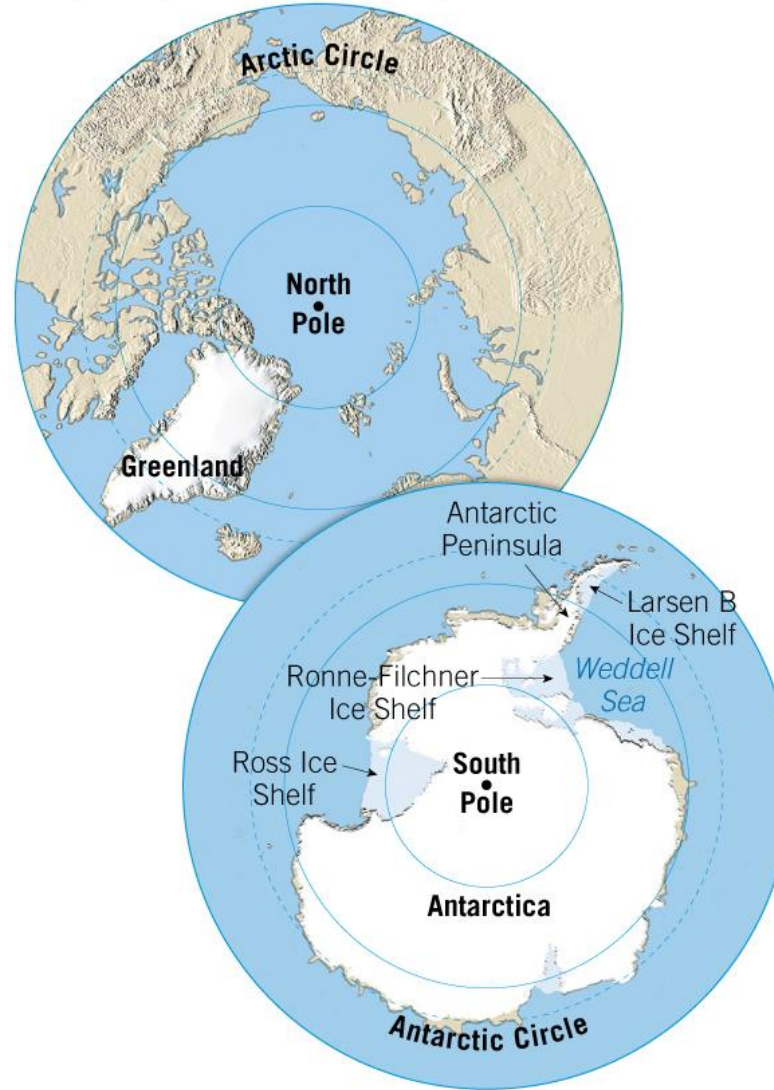








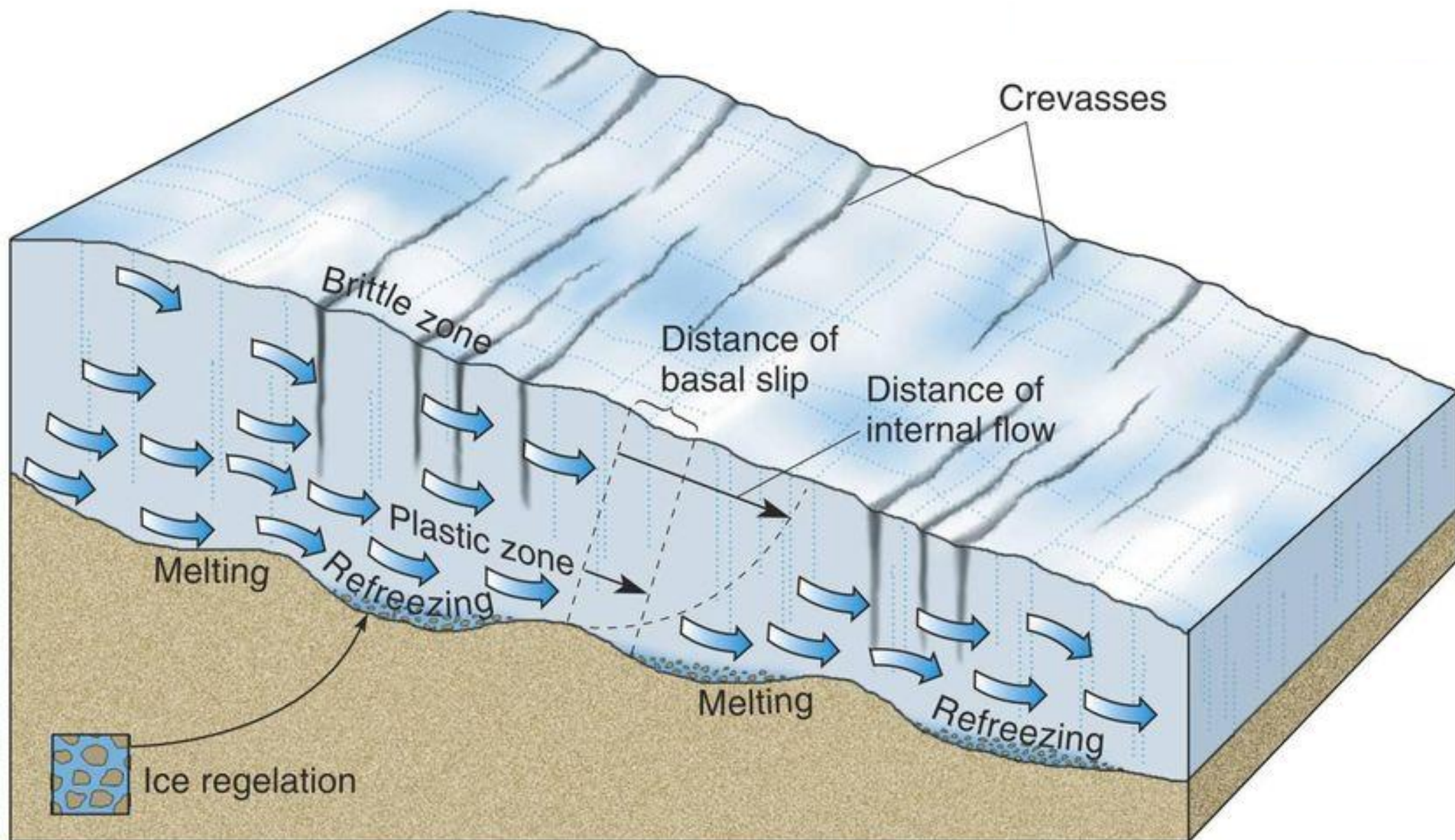
Greenland's ice sheet occupies 1.7 million square kilometers (663,000 square miles), about 80 percent of the island.



The area of the Antarctic Ice Sheet is almost 14 million square kilometers (5,460,000 square miles). Ice shelves occupy an additional 1.4 million square kilometers (546,000 square miles).



# Zone of Fracture









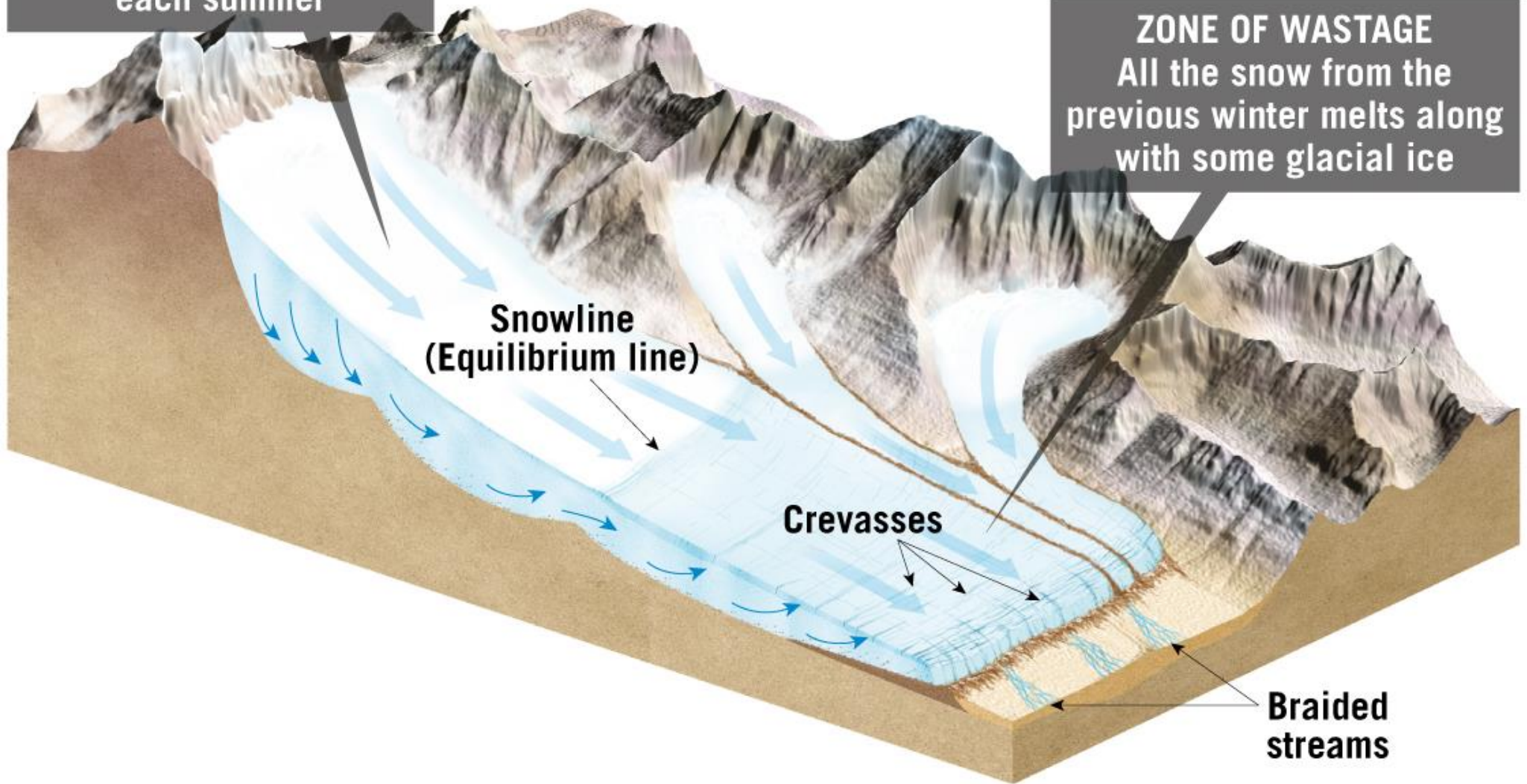
# Crevasses





**ZONE OF ACCUMULATION**  
More snow falls each winter than melts each summer

**ZONE OF WASTAGE**  
All the snow from the previous winter melts along with some glacial ice

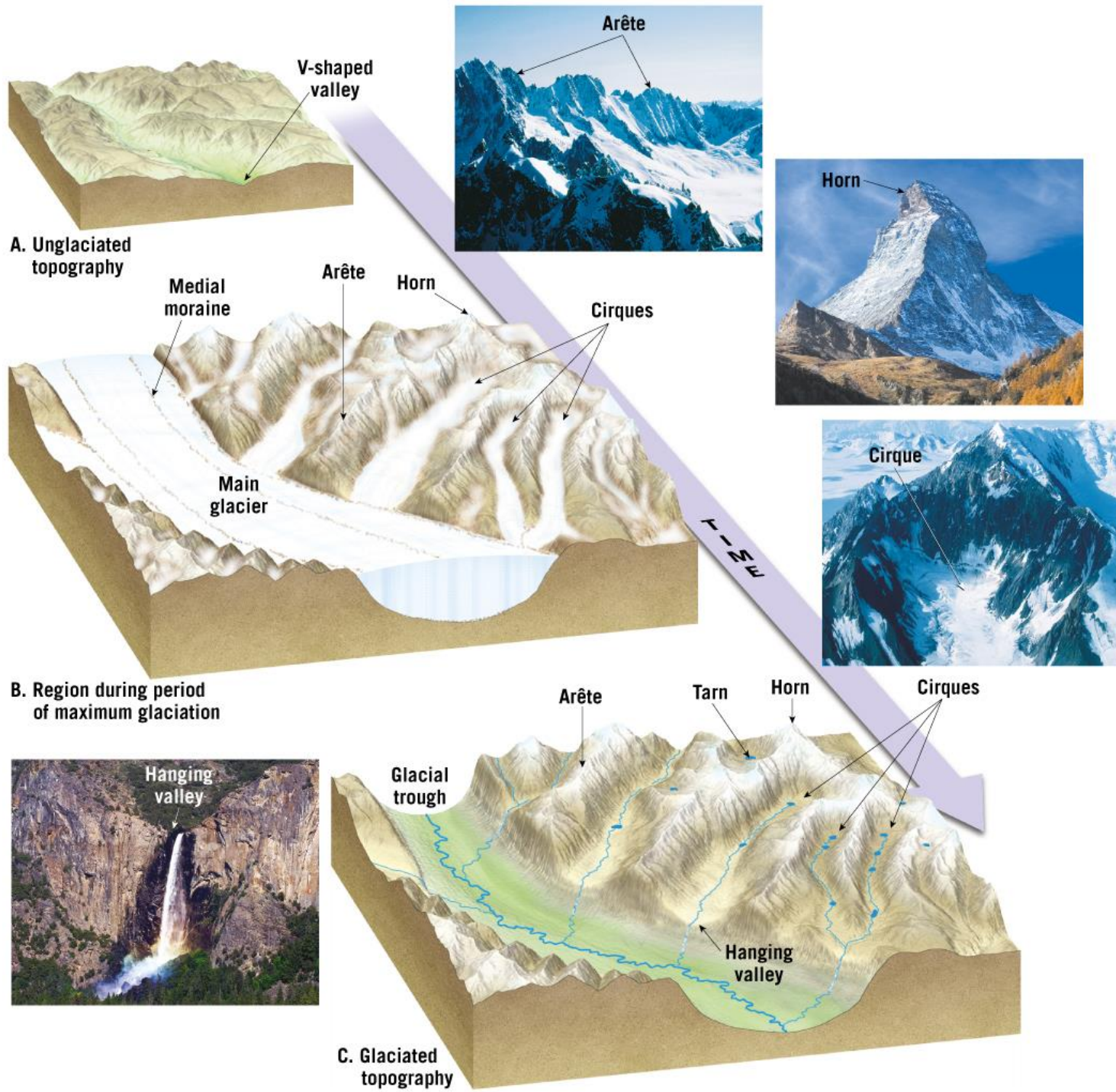




# Landforms

- Glacial trough
- Hanging valley
- Cirque
- Arête
- Horn
- Fiord











**Trough**









# Cirque









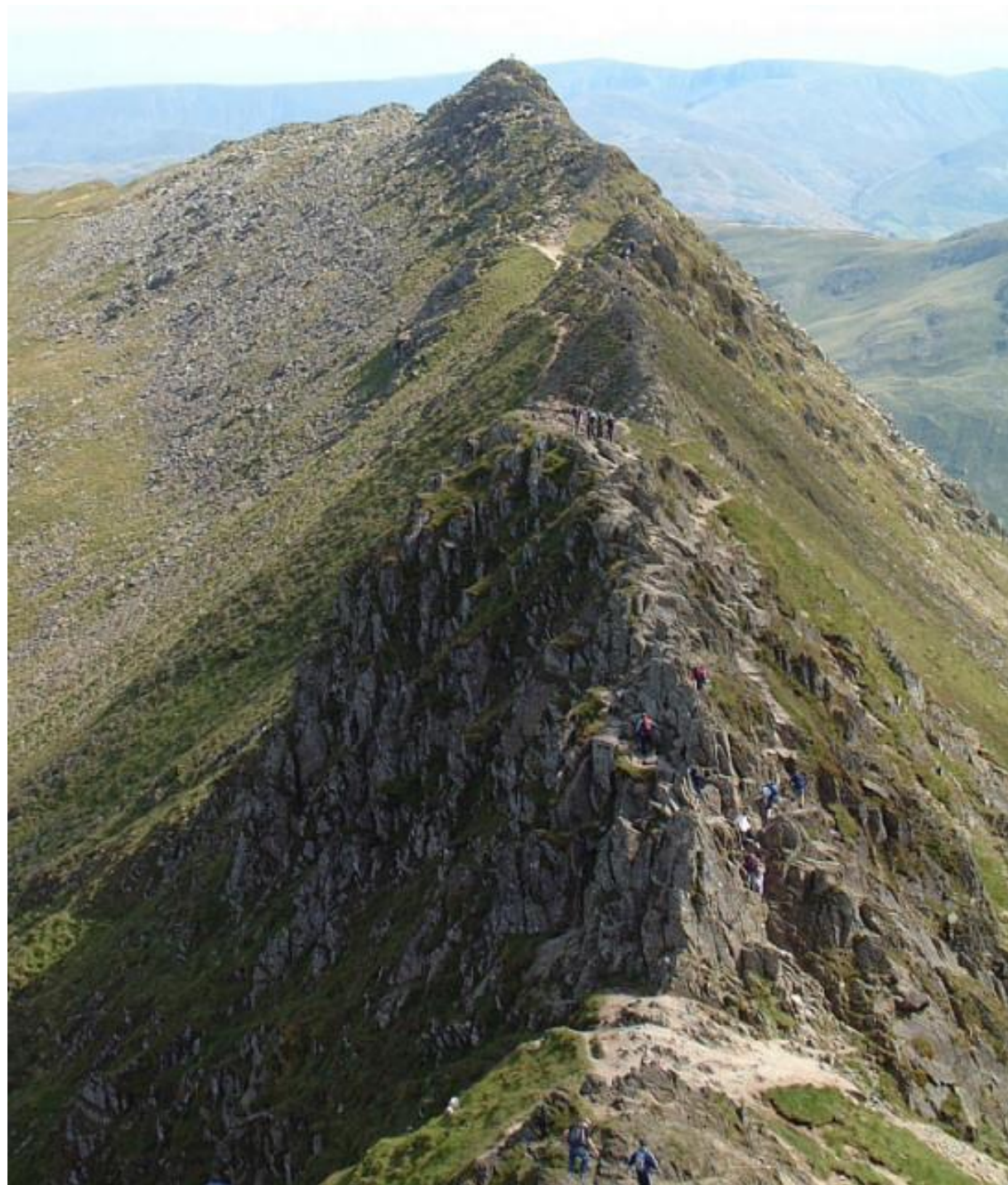
# Horn: Matterhorn, Alps

















**Arête**













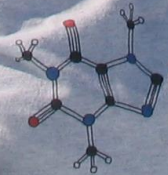


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CAF  
Cavalier

Melting Point: 235°C  
Boiling Point: 178°C  
Molar Mass: 199.19 g/mol



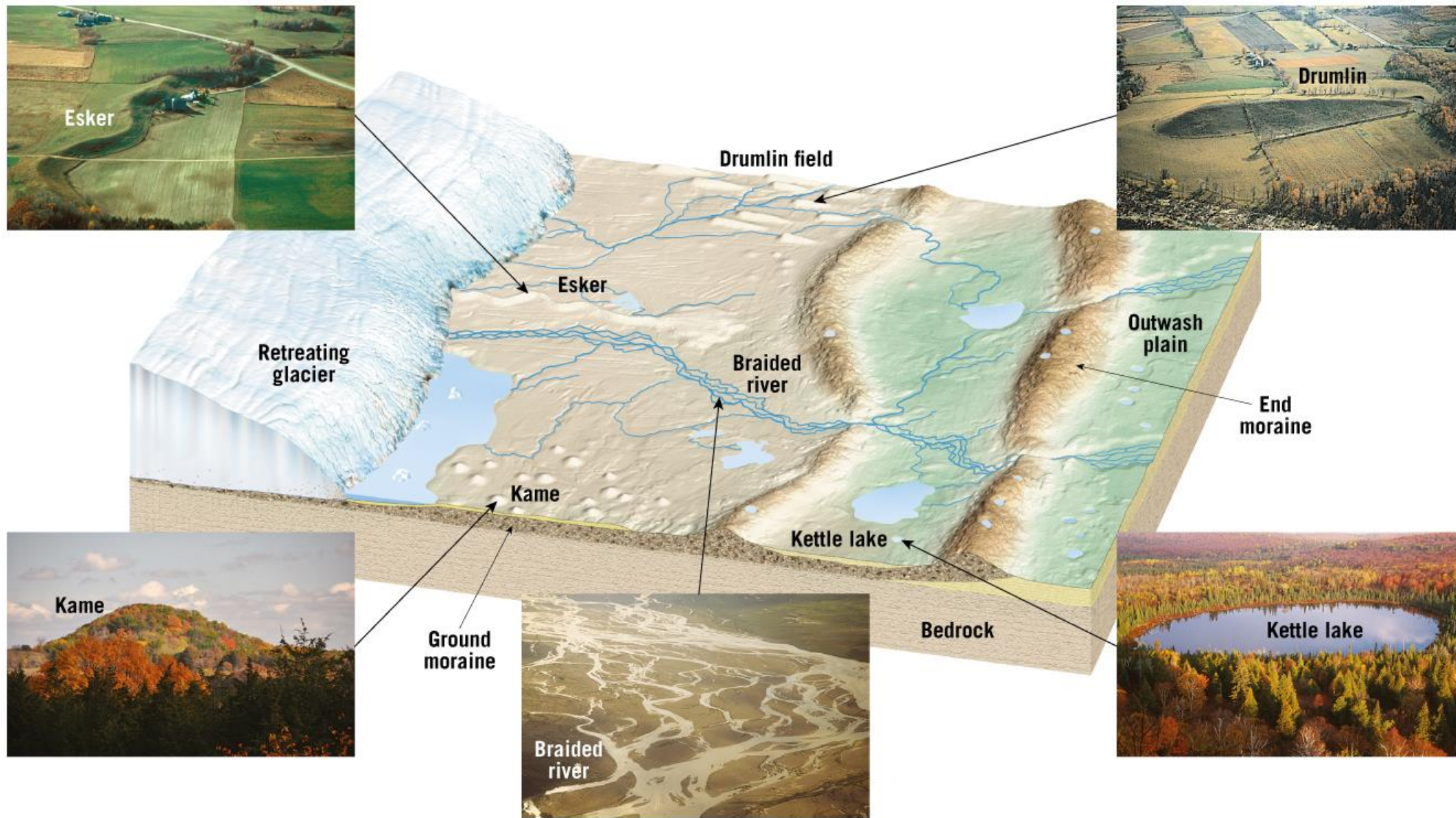














# Glacial Striations









# Medial Moraine





# **Braided Streams on Outwash Plain**

















**Glacial till is an unsorted mixture of many different sediment sizes.**



**A close examination of glacial till often reveals cobbles that have been scratched as they were dragged along by the ice.**





# Glacial Till





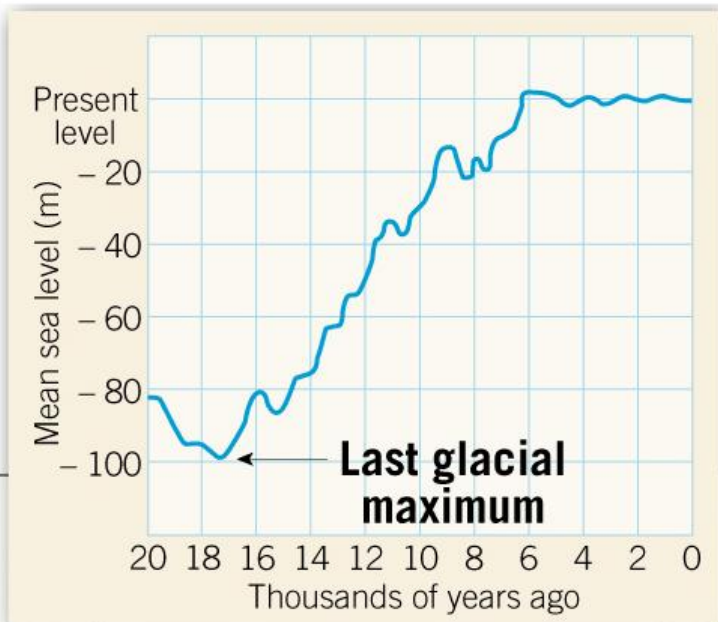






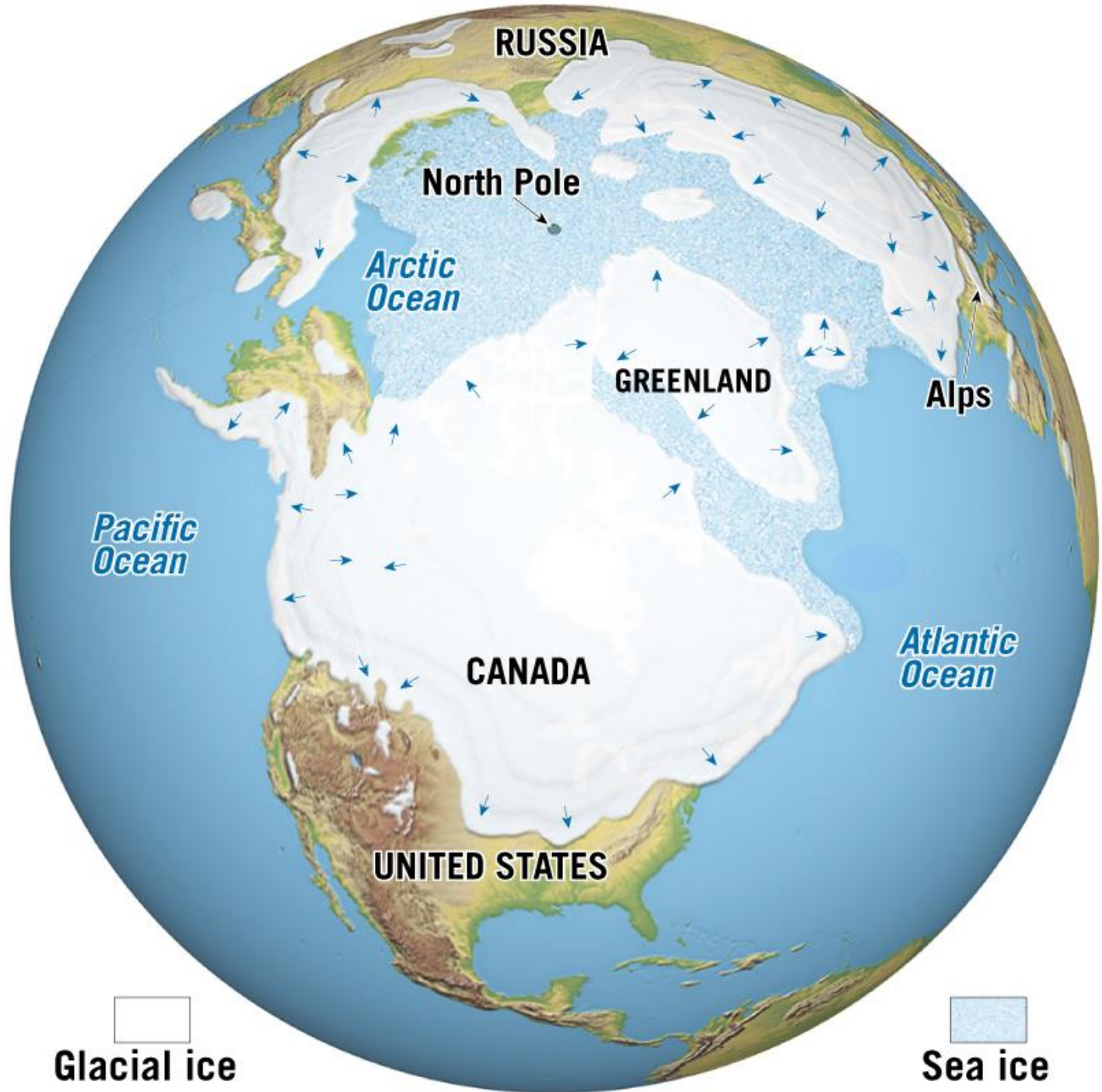


**During the Last Glacial Maximum, about 18,000 years ago, sea level was nearly 100 meters (330 feet) lower than it is today.**



**During the Last Glacial Maximum, the shoreline extended out onto the present-day continental shelf.**

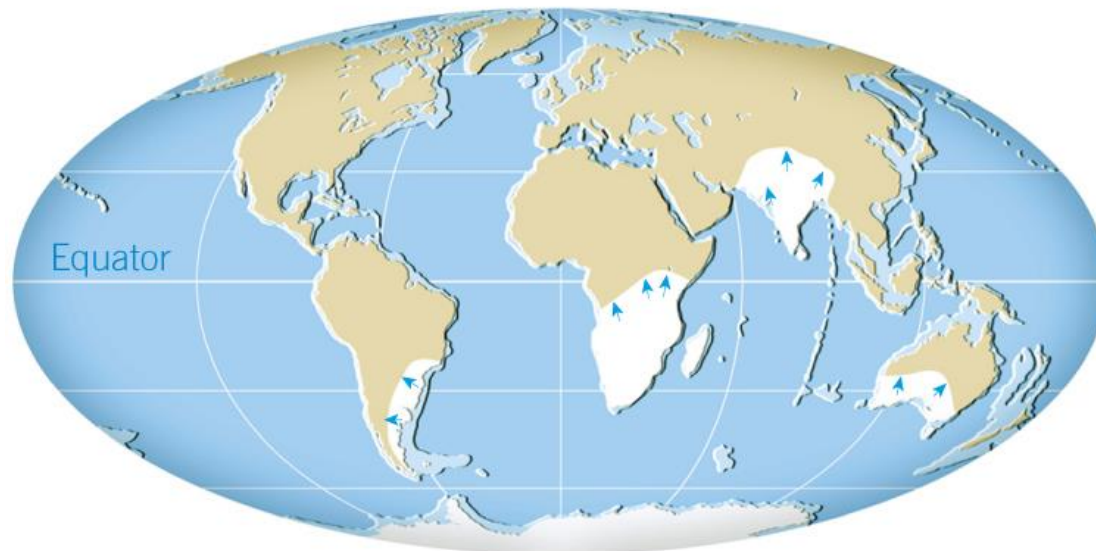








**The supercontinent Pangaea showing the area covered by glacial ice near the end of the Paleozoic era.**

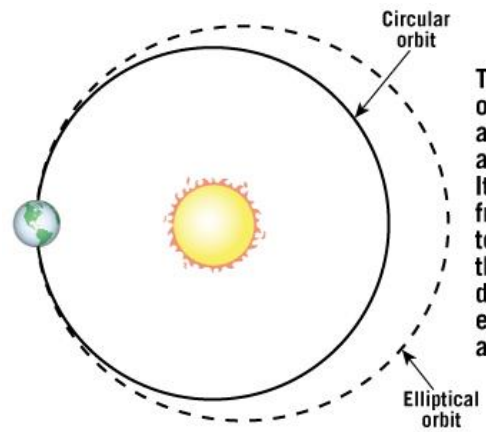


**The continents as they appear today. The white areas indicate where evidence of the late Paleozoic ice sheets exists.**

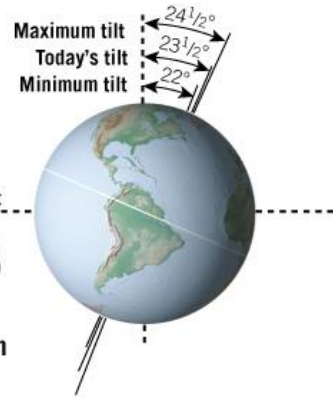


- Variations in Earth's orbit
  - Milankovitch hypothesis
    - Shape (eccentricity) of Earth's orbit varies
    - Angle of Earth's axis (obliquity) changes
    - Axis wobbles (precession)
  - Changes in climate over the past several hundred thousand years are closely associated with variations in Earth's orbit

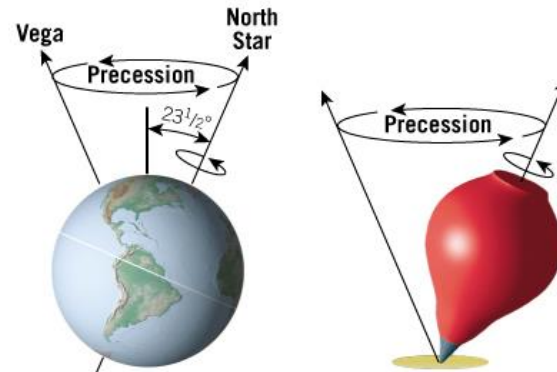




The shape of Earth's orbit changes during a cycle that spans about 100,000 years. It gradually changes from nearly circular to more elliptical and then back again. This diagram greatly exaggerates the amount of change.



Today the axis of rotation is tilted about 23.5 degrees to the plane of Earth's orbit. During a cycle of 41,000 years, this angle varies from 22.1 to 24.5 degrees.



Earth's axis wobbles like a spinning top. Consequently, the axis points to different spots in the sky during a cycle of about 26,000 years.





# **Drumlin Field Wisconsin**











# Vocabulary

Alpine Glacier

Arête

Cirque

Crevasse

Drumlin

Moraine

Esker

Fiord

Glacial Erratic

Glacial Striations

Glacial Trough

Glacier

Hanging Valley

Horn

Ice Sheets

Kame

Kettle

Loess

Outwash Plain

Plucking

Rock Flour

Tarn

Till

Zone of Accumulation

Zone of Wastage