Transverse crevasses and seracs

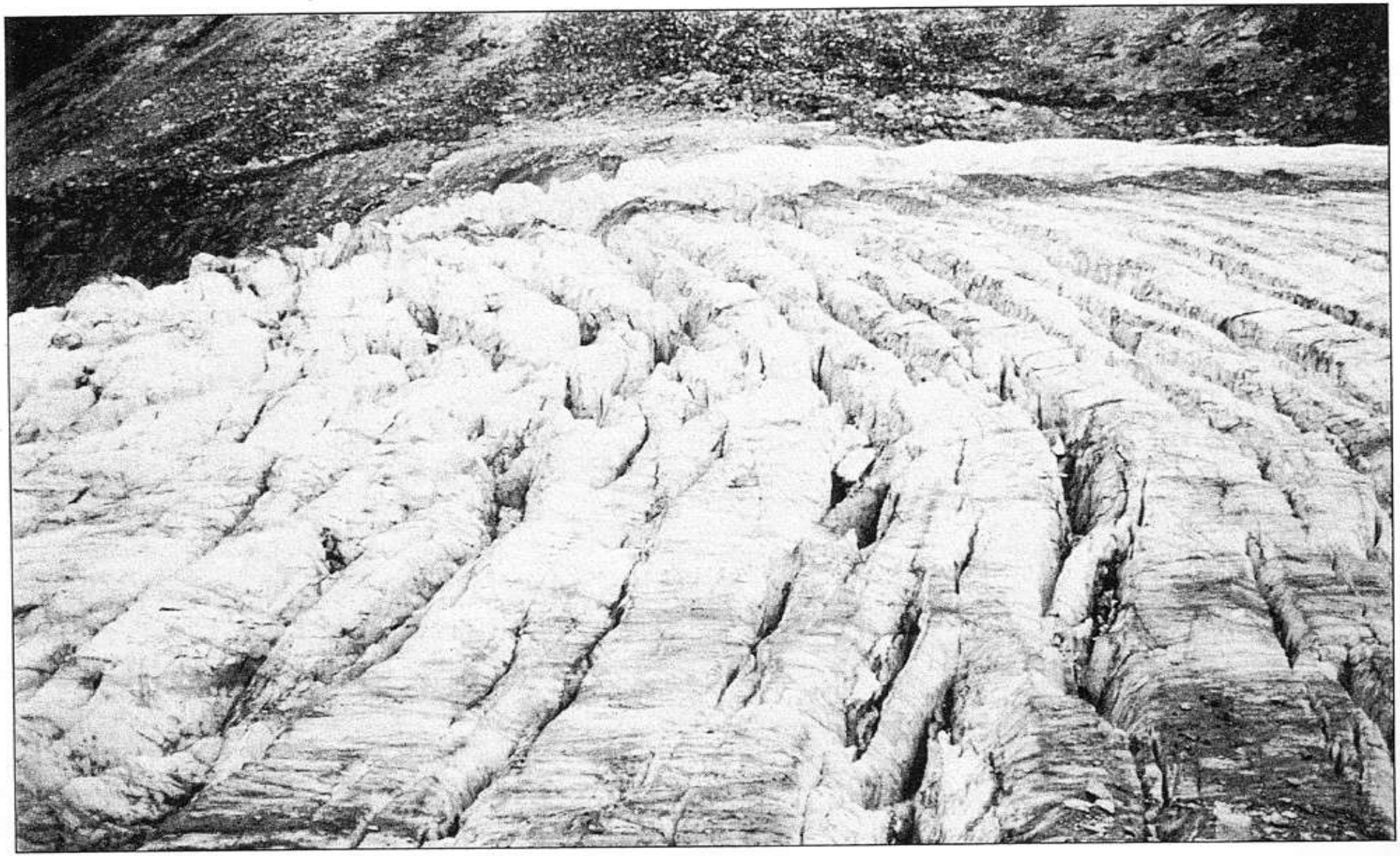


Figure 9.26
Transverse crevasses developed at icefall on Little Yanert Glacier, Alaska Range.

Ogives & Forbes bands

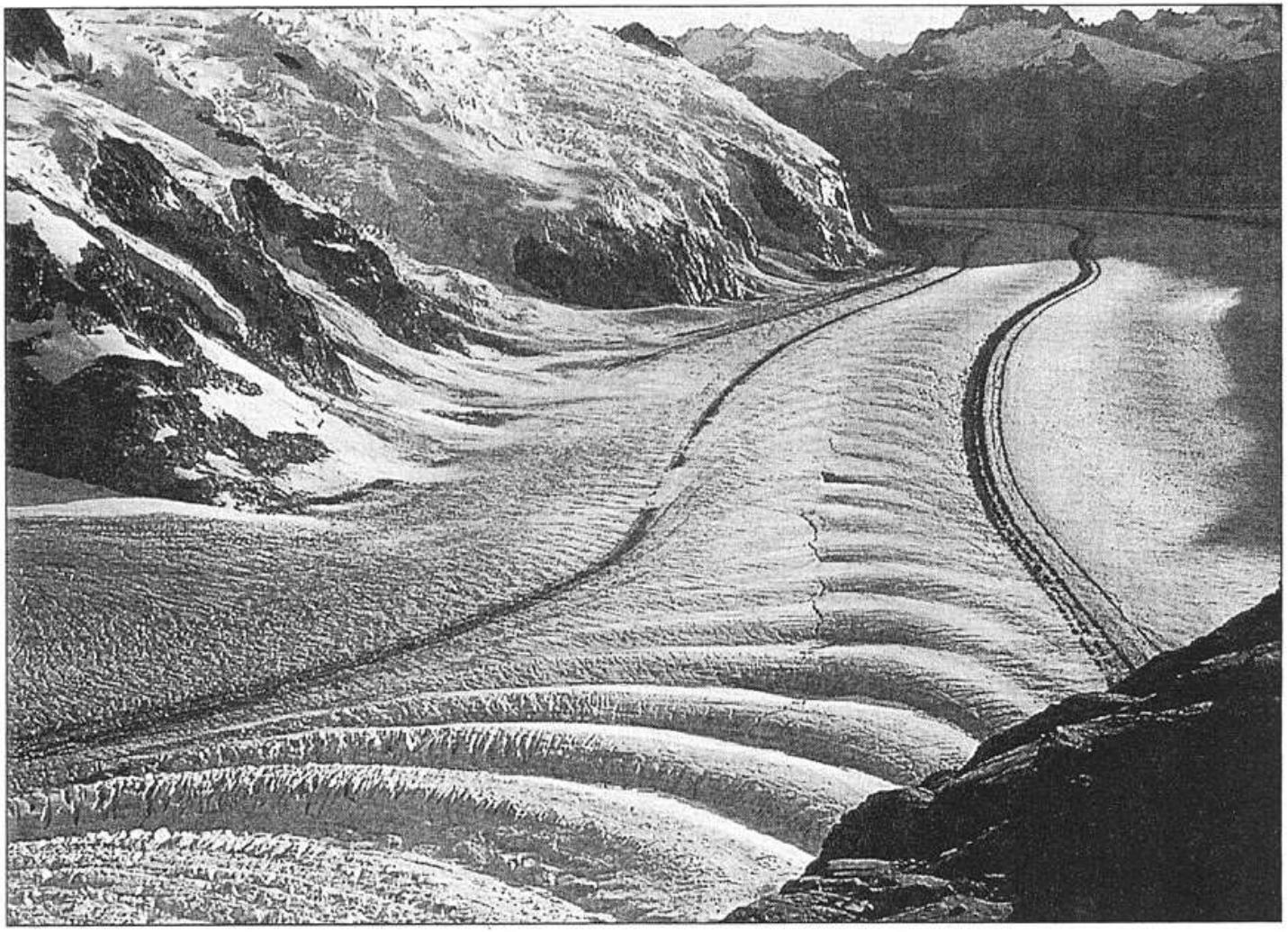


Figure 9.27
Surficial ogives forming on the Gilkey Glacier at the base of the Vaughan Lewis Icefall, Juneau Icefield, Southeast Alaska.

Classifications of glaciers

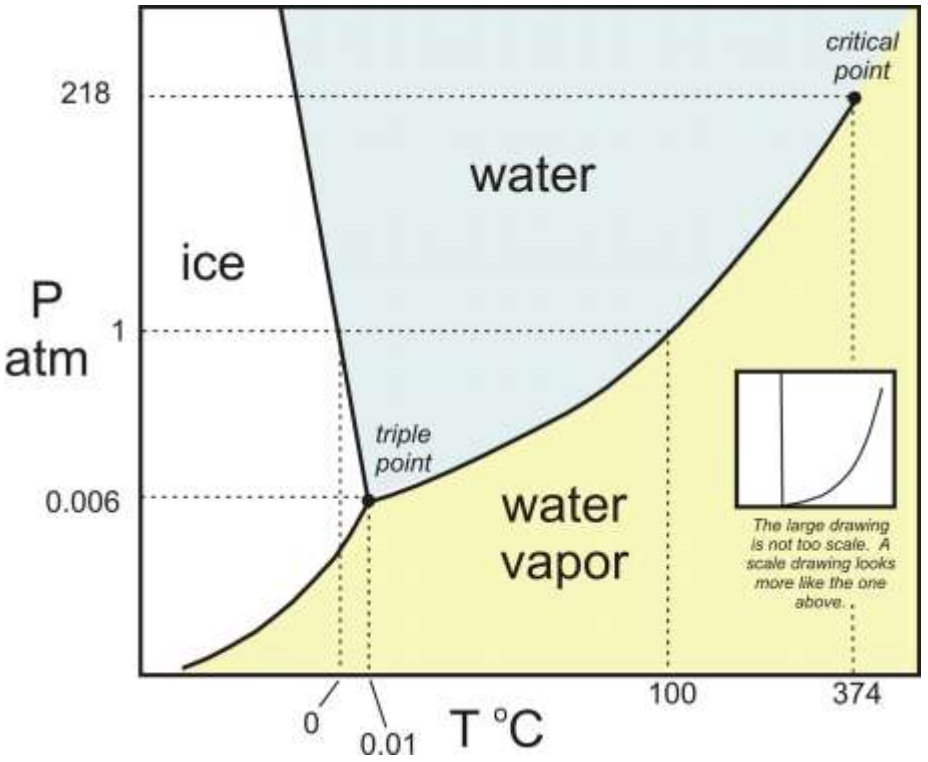
1. Thermal classification (temperature)

2. Dynamic classification

3. Morphological classification

Thermal classification

- Warm-based ('temperate') glaciers:
  - Ice at pressure-temperature melting point throughout.
  - Meltwater at base.
  - No permafrost below.
  - Have basal slip.
  - Pleistocene midcontinent ice.
    was warm-based…
- Cold-based ('polar') glaciers:
  - Ice frozen to substrate.
  - No meltwater at base.
  - Permafrost below.
  - No basal slip:
    - No erosion at base!



https://serc.carleton.edu/research_education/equilibria/phaserule.html

Dynamic classification

- Active glaciers (ice is moving forward every year, regardless of what terminus is doing)
- Passive or inactive (not much movement)
- Dead glacier (climatically and dynamically stagnant)

Morphological classification

- Niche glacier (cliff, glacierette)
- Cirque glacier
- Valley glacier (alpine type)
- Valley glacier (outlet type [from ice cap])
- Transection glacier (transfluent breaches ~ice overflows cols of adjacent valleys)
- Piedmont glacier
- Floating ice tongue (calving bay idea)
- Mountain ice cap
- Lowland ice cap
- Continental ice sheet

Glaciers, Ice Caps, and Ice Sheets

- If snow accumulation > melting of snow then **glaciers** can form
- Seasonal conditions that enable glaciers to form exist at high elevations in mountains and at high latitudes near the north and south poles
- Mountain (**alpine**) glaciers vary from small patches to large rivers of ice that slowly flow downslope; ice movement carves many landforms that are distinctive of glacial regions

Figure 2.16 Glaciers in Southern Alaska
Glaciers carve deep valleys, move broken and ground-up rock along their base and margins, and coalesce into large masses of ice. These glaciers flow from an ice cap in the coastal mountains of southern Alaska.

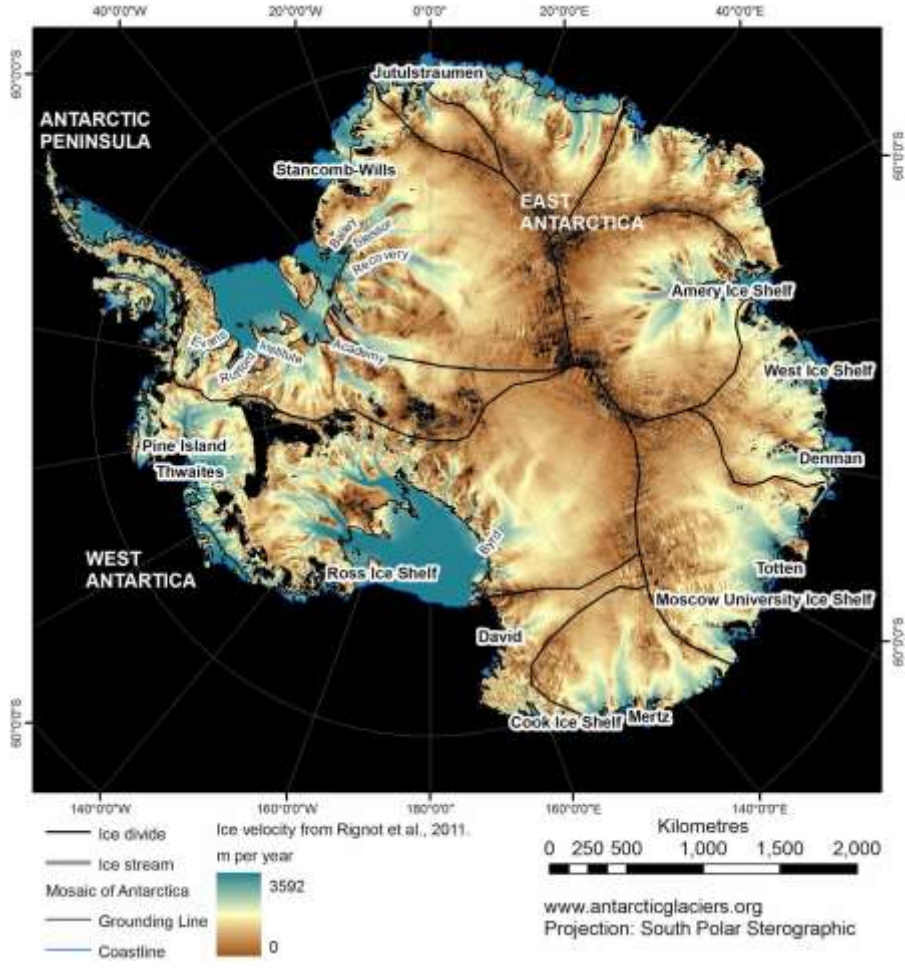
Glaciers, Ice Caps, and Ice Sheets (cont.)

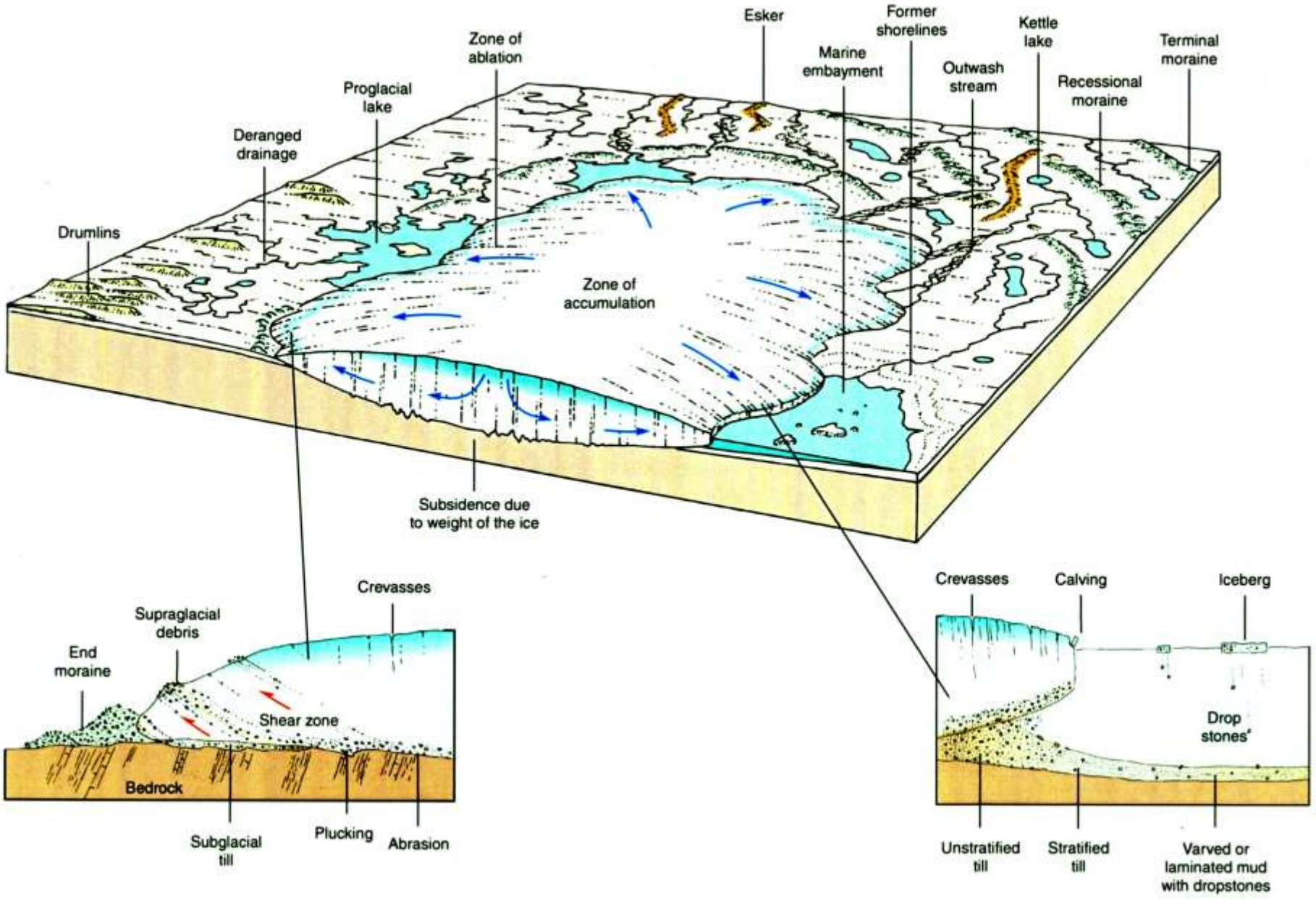
- Where glaciers coalesce and cover larger areas they become ***ice caps*** (less than 50,000 square km, or 19,000 mi^2) and **ice sheets** (greater than square 50,000 square kilometers).
  - Antarctica has an **ice sheet** glacier on it (it's the size of a continent)
  - The tops of mountain ranges (like the Juneau Ice Field) are **ice cap** glaciers (they are much smaller than continents).
- Modern world—ice covers about 10% of Earth's land area; most in ice sheets on Greenland and one on Antarctica

Continental Glaciers (Ice Sheets)

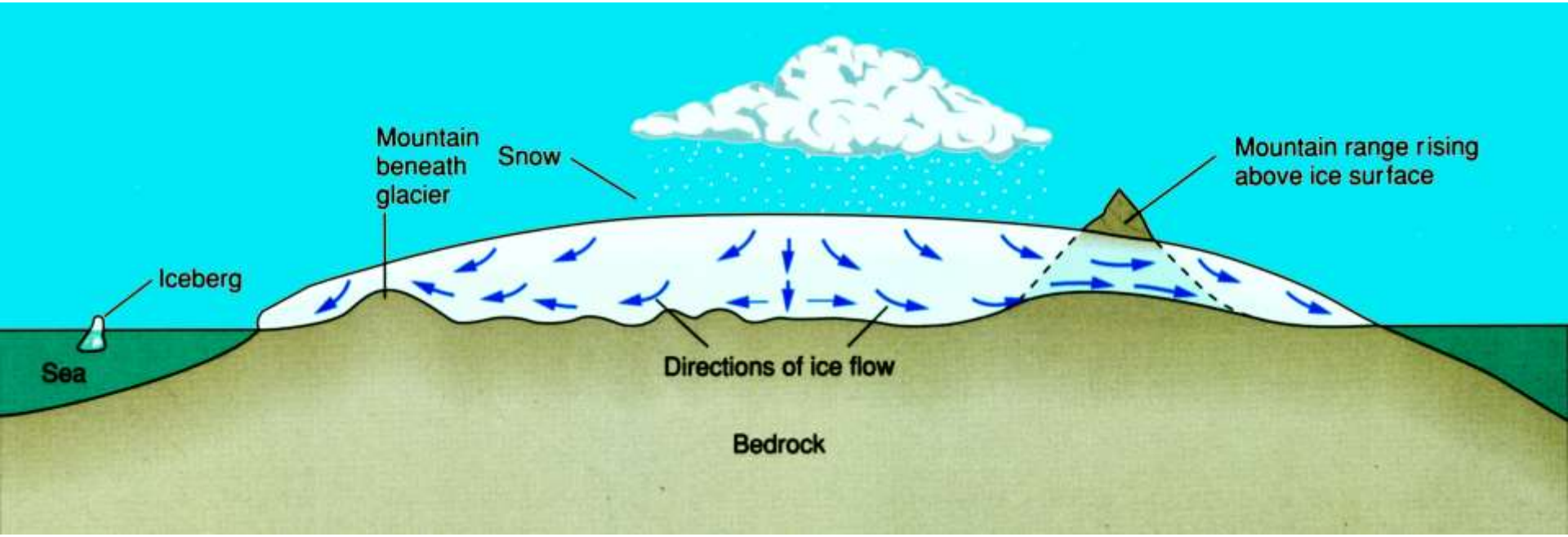
Last Glacial Maximum ~25,000 B.C.E.

from Cosmographic Research Institute




Esker
Former shorelines
Kettle lake
Terminal moraine
Zone of ablation
Marine embayment
Outwash stream
Recessional moraine
Proglacial lake
Deranged drainage
Drumlins
Zone of accumulation
Subsidence due to weight of the ice
Crevasses
Supraglacial debris
End moraine
Shear zone
Bedrock
Subglacial till
Plucking
Abrasion
Crevasses
Calving
Iceberg
Drop stones
Unstratified till
Stratified till
Varved or laminated mud with dropstones

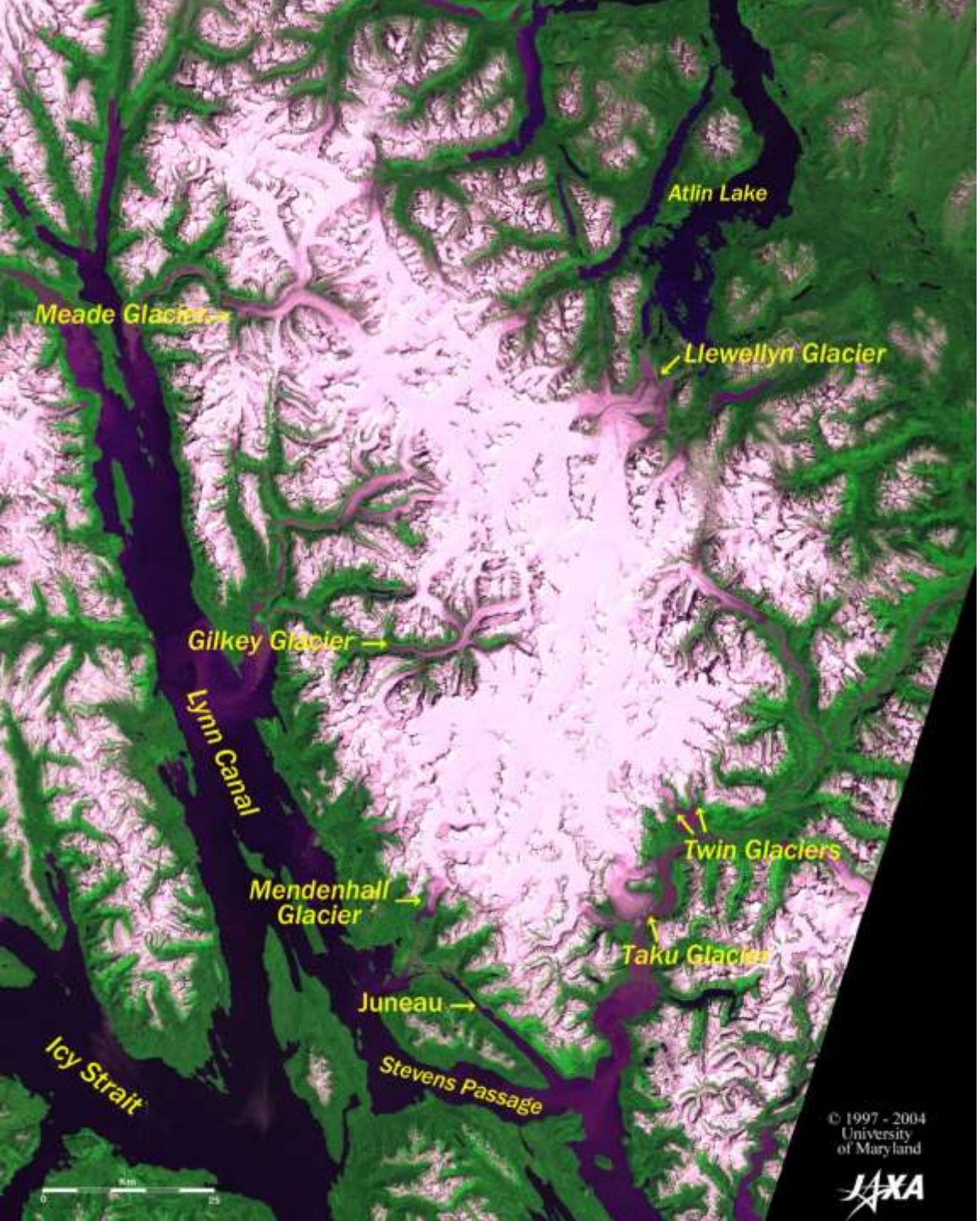
Continental Glacier



Acquired from J. Shroder

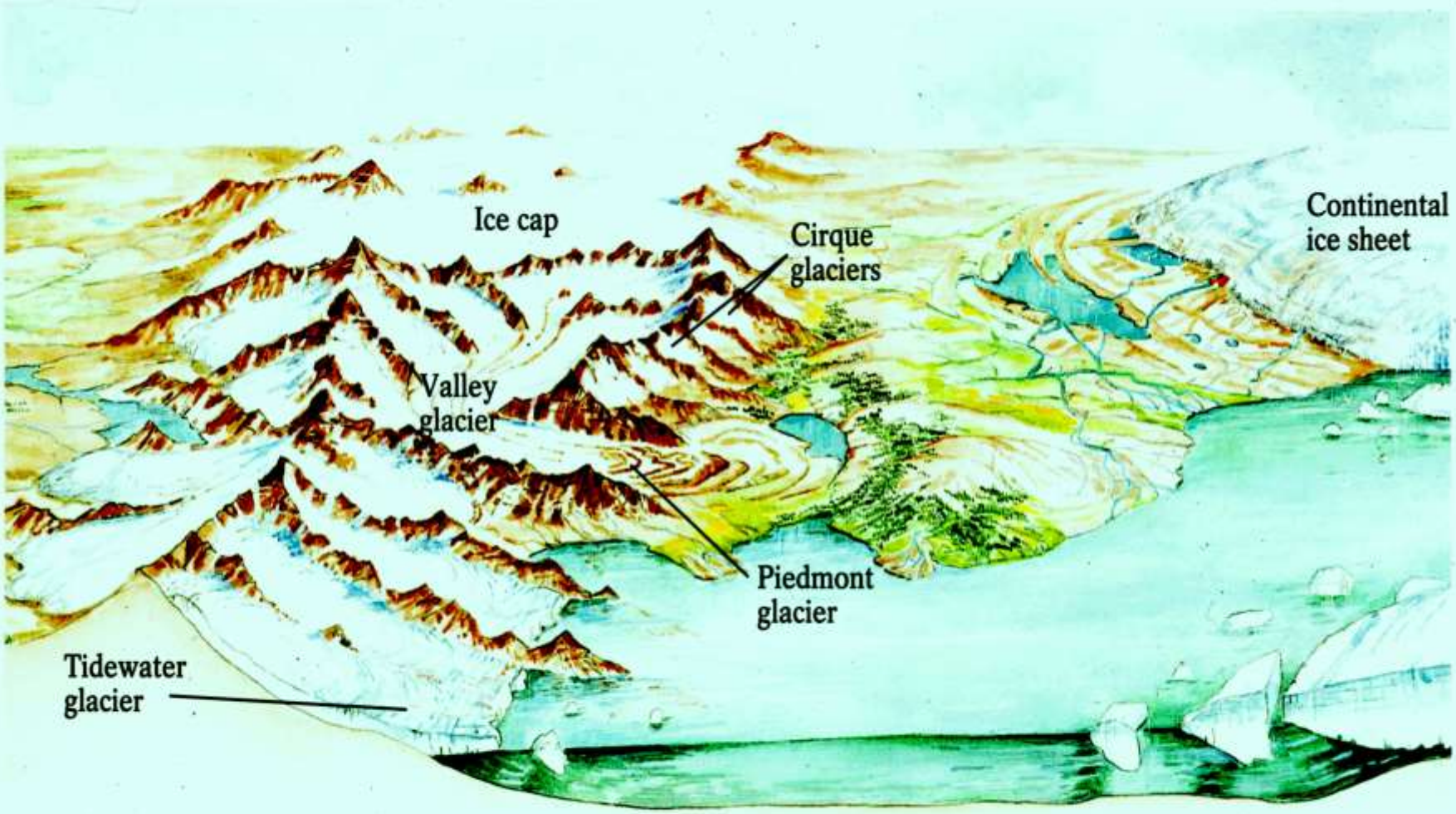
MIS 2 – Pinedale/ Wisconsinan Glaciation

- Last Ice Age
  - ~25,000 years ago at its peak.
  - MIS 2
    - Marine Isotope Stage 2
  - Also called Pinedale
  - Did not reach Omaha
- Previous Ice Age
  - ~150 ka
  - MIS 6
  - Also called Illinoian
  - Did reach Omaha



Ice Cap Glaciers

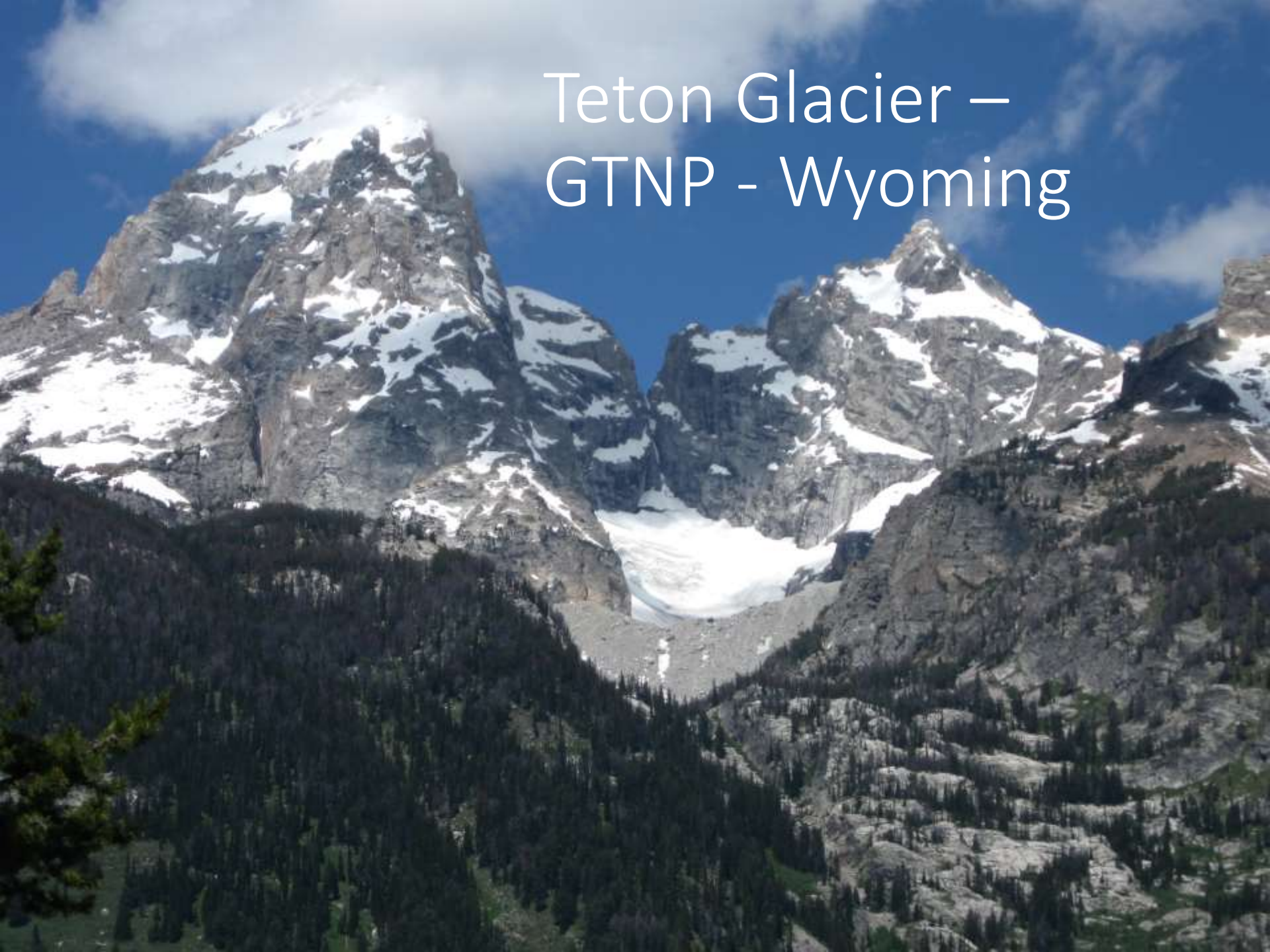
- Smaller than ice sheets
- Typically are the source for numerous **alpine** glaciers below.
- Juneau Ice Field = ice cap


Ice cap
Cirque glaciers
Continental ice sheet
Valley glacier
Piedmont glacier
Tidewater glacier

Alpine Glaciers are in Valleys

GTNP – Western U.S. Mountain Range

Himalayan Range – Northern Pakistan


Teton Glacier –
GTNP - Wyoming

K2 Peak and K2 Glacier

Photos by Jack Shroder

K2 Glacier – Debris covered

New Zealand – Mt Cook

Cliff & valley glaciers