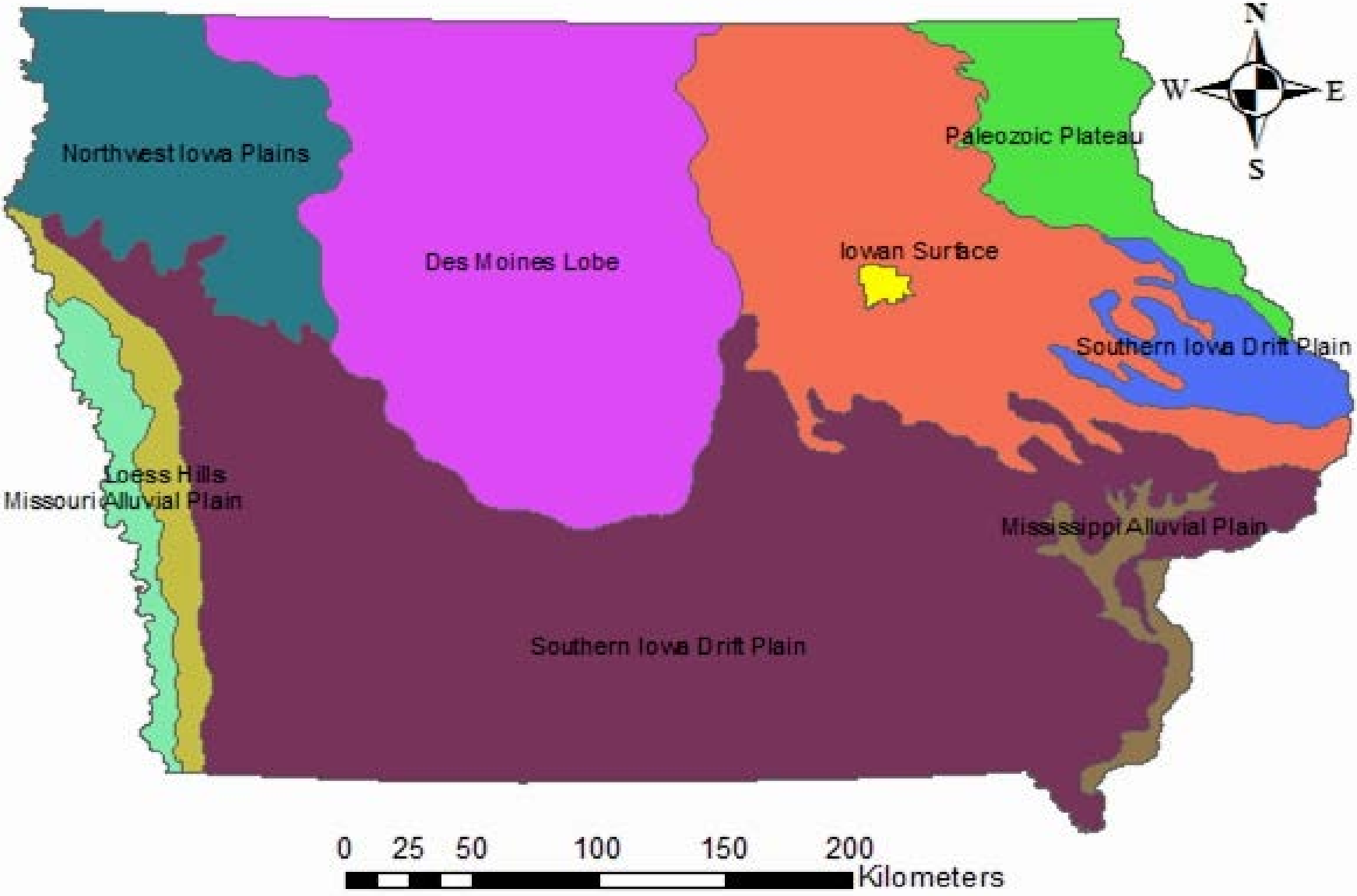
Glaciers

Why study glaciers?

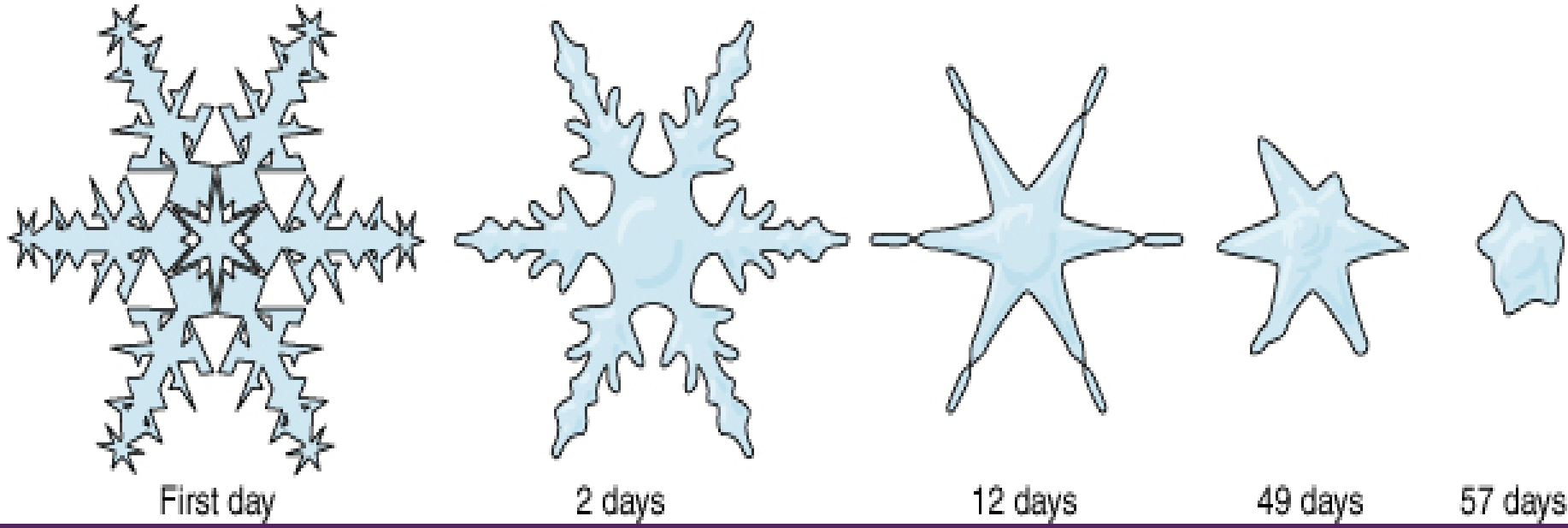
- Glaciers and climate change
- Iowa's surficial geology

Iowa Landforms



Ice Production

Snow to ice



Glaciers

- A body of ice, firn, and snow that is,
  - On land and
  - On the move!

C.E. Heinzel

Glacial Regimes (zones)

- Terms
  - Accumulation
  - Equilibrium line
  - Ablation

Zone of accumulation

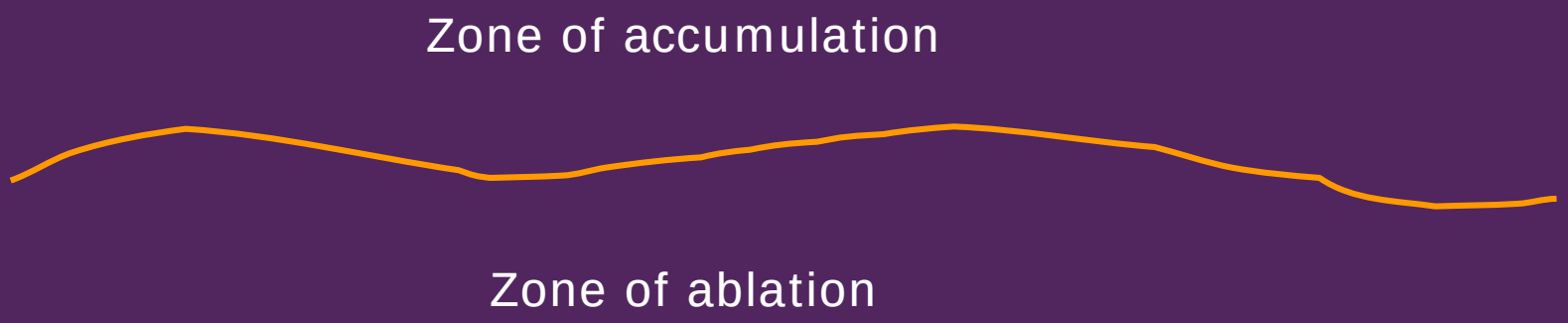
- Area of positive gain
- Highlands

Zone of Ablation

- Area of loss
- The ‘distal’ glacier area, ice is lost!
  - Melting
  - Sublimation
  - Erosion
  - Caving into water.

Equilibrium line

- A irregular line separating the two primary glacial zones



The Dinwoody Glacier , late summer, (Wind River Range, WY)

Glacial movement

- Accumulation >Abalation
- Accumulation < Abalation
- Accumulation = Abalation

Are you ready for an important concept?

Glaciers are dynamic

- Fact: Glacial movement and gravity
- Concept: Glacial margins and retreat
- Abalation > Accumulation.
  - Glaciers always flow **forward** or down gradient!

Basic types of Glaciers

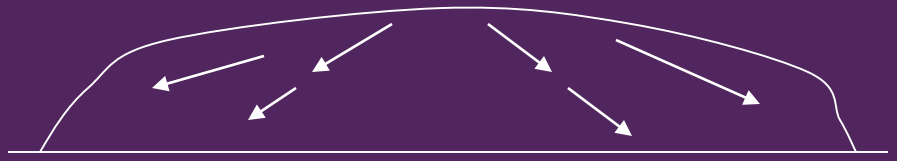
- Continental
- Alpine
- Piedmont

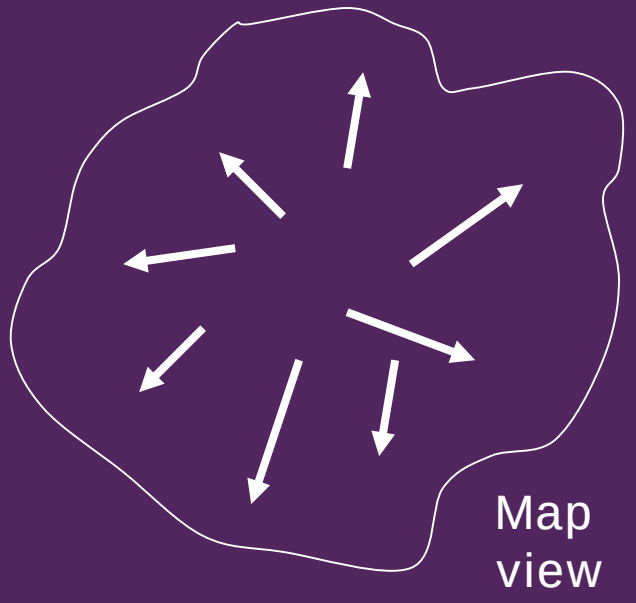
Ice sheets and caps

- Massive, unconfined, bodies of snow, firn, and ice
  - Ice sheets are larger than ice caps
- Extremely sensitive to climatic change

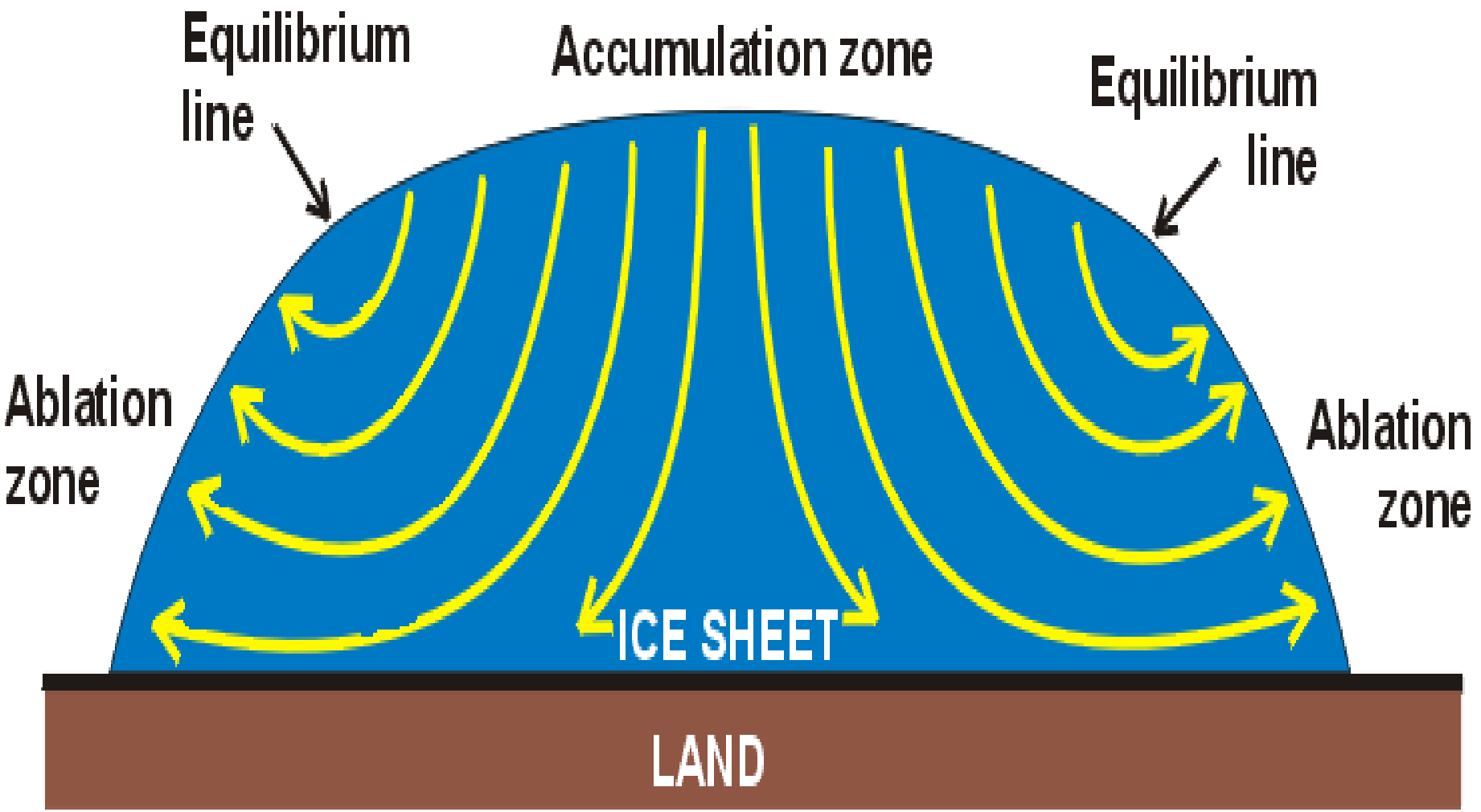
Morphologic classification of glaciers

1. Continuous sheets; Ice sheets (i.e. continental glaciers)



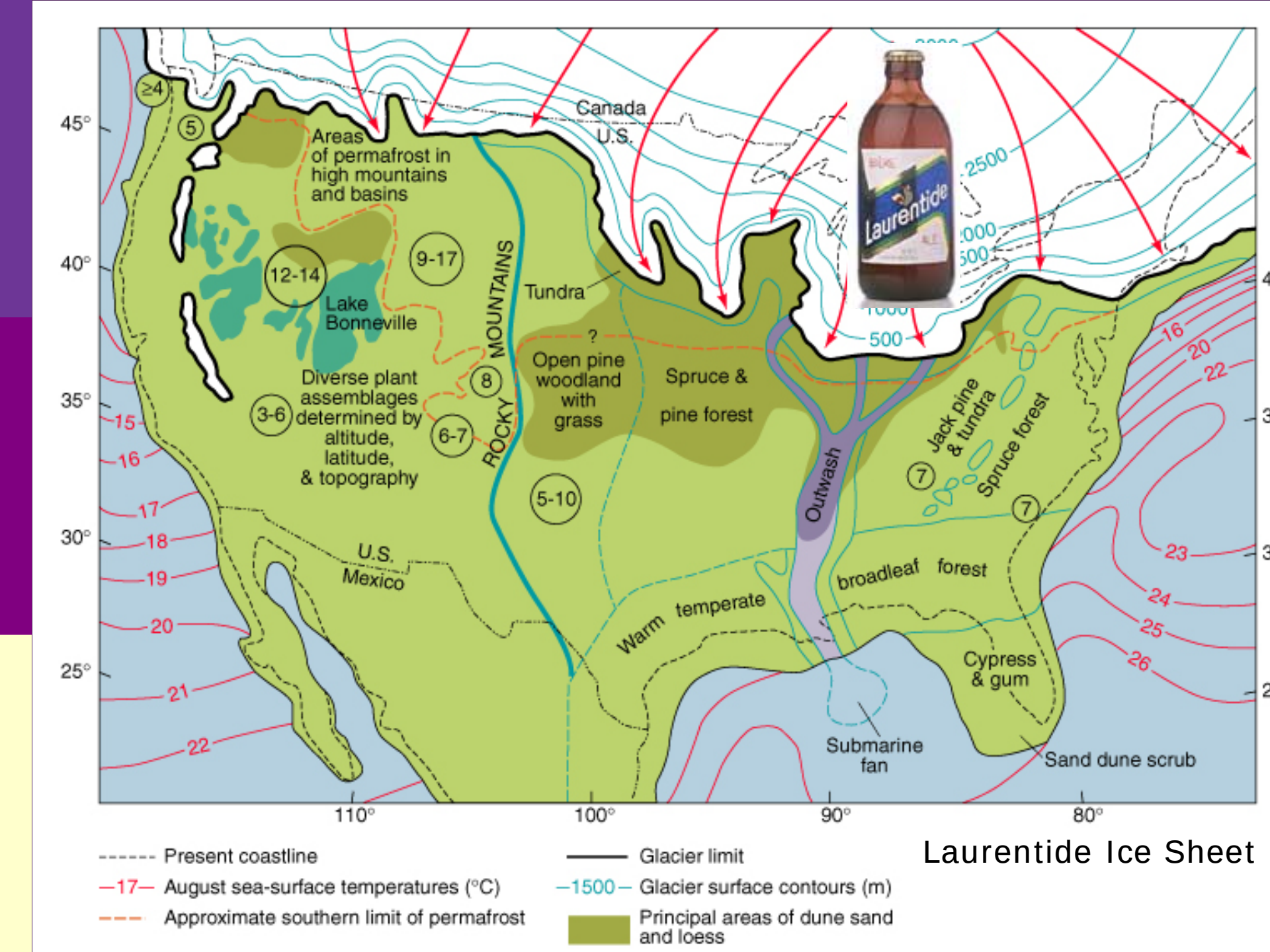


Ice caps are much smaller!!


Equilibrium line
Accumulation zone
Equilibrium line
Ablation zone
Ablation zone
ICE SHEET
LAND

C.E. Heinzel

The Greenland Ice Sheet



Laurentide Ice Sheet

Alpine glaciers

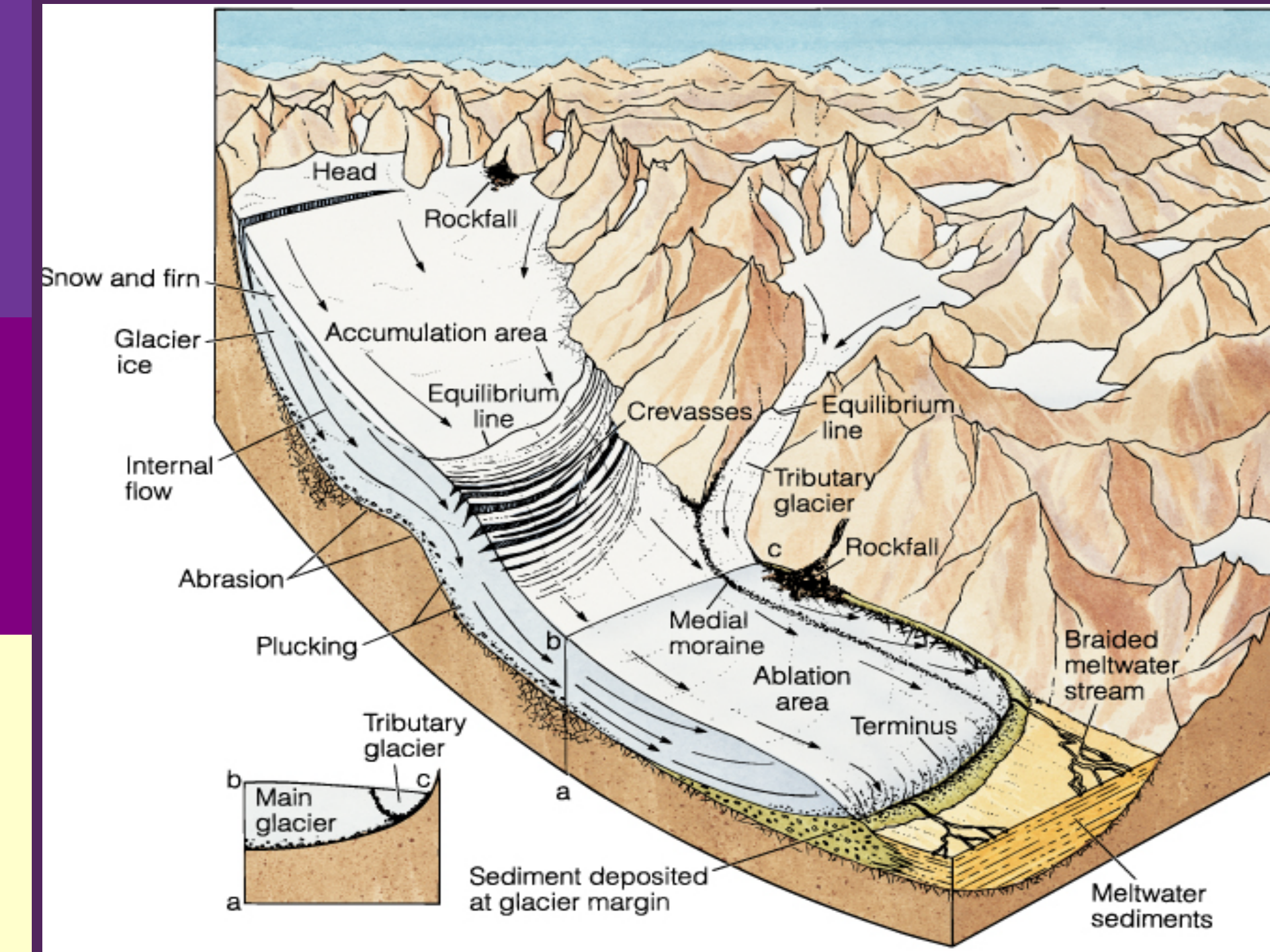
Confined by topographic features such as mountains or valleys.

a. Cirque glaciers
b. Valley glaciers

Cirque glaciers

C.E. Heinzel

C.E. Heinzel


Head
Rockfall
Snow and firn
Glacier ice
Accumulation area
Equilibrium line
Crevasses
Equilibrium line
Internal flow
Tributary glacier
c
Rockfall
Abrasion
Plucking
Medial moraine
b
Braided meltwater stream
Ablation area
Terminus
Tributary glacier
b
c
Main glacier
a
a
Sediment deposited at glacier margin
Meltwater sediments

Tributary glaciers, (Yentna Glacier Alaska)

C.E. Heinzel

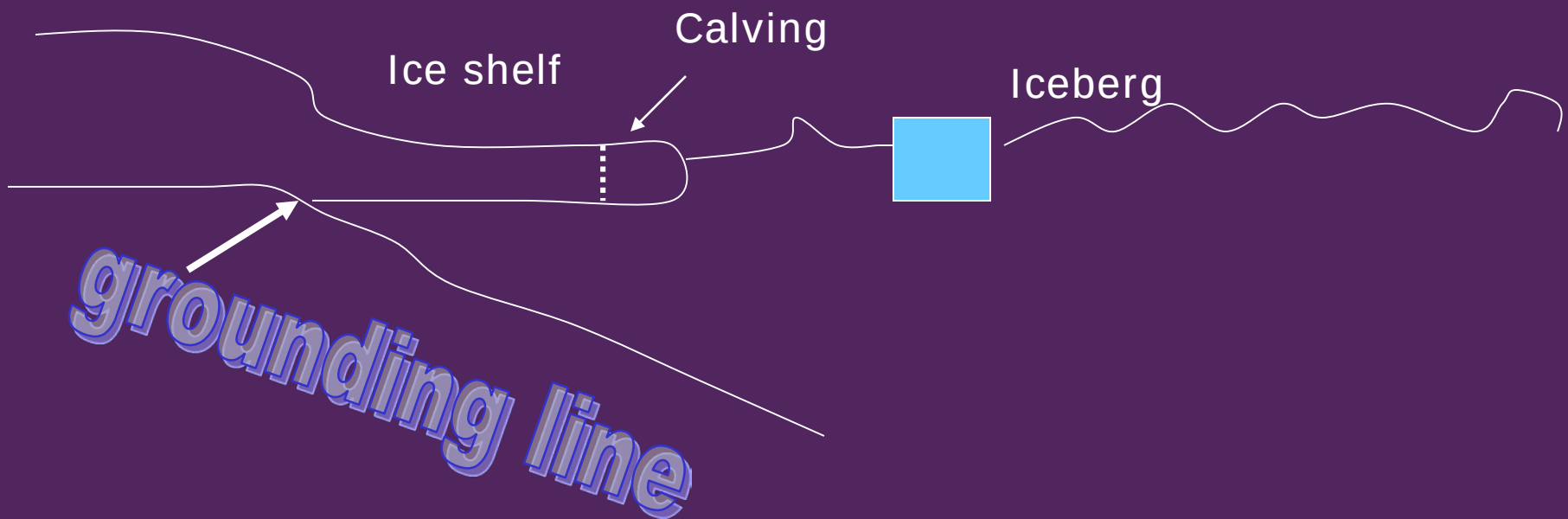
Piedmont glaciers

Piedmont
glacier
Sea
ice

C.E. Heinzel

Glacial calving

Calving is when glacial ice from an ice shelf breaks off into the water forming an iceberg.



C.E. Heinzel

Glacial products

- Deposition
- Erosion

Concept

- Glacial are conveyor belts that transport mass amounts of sediment.

Glacial Eratics

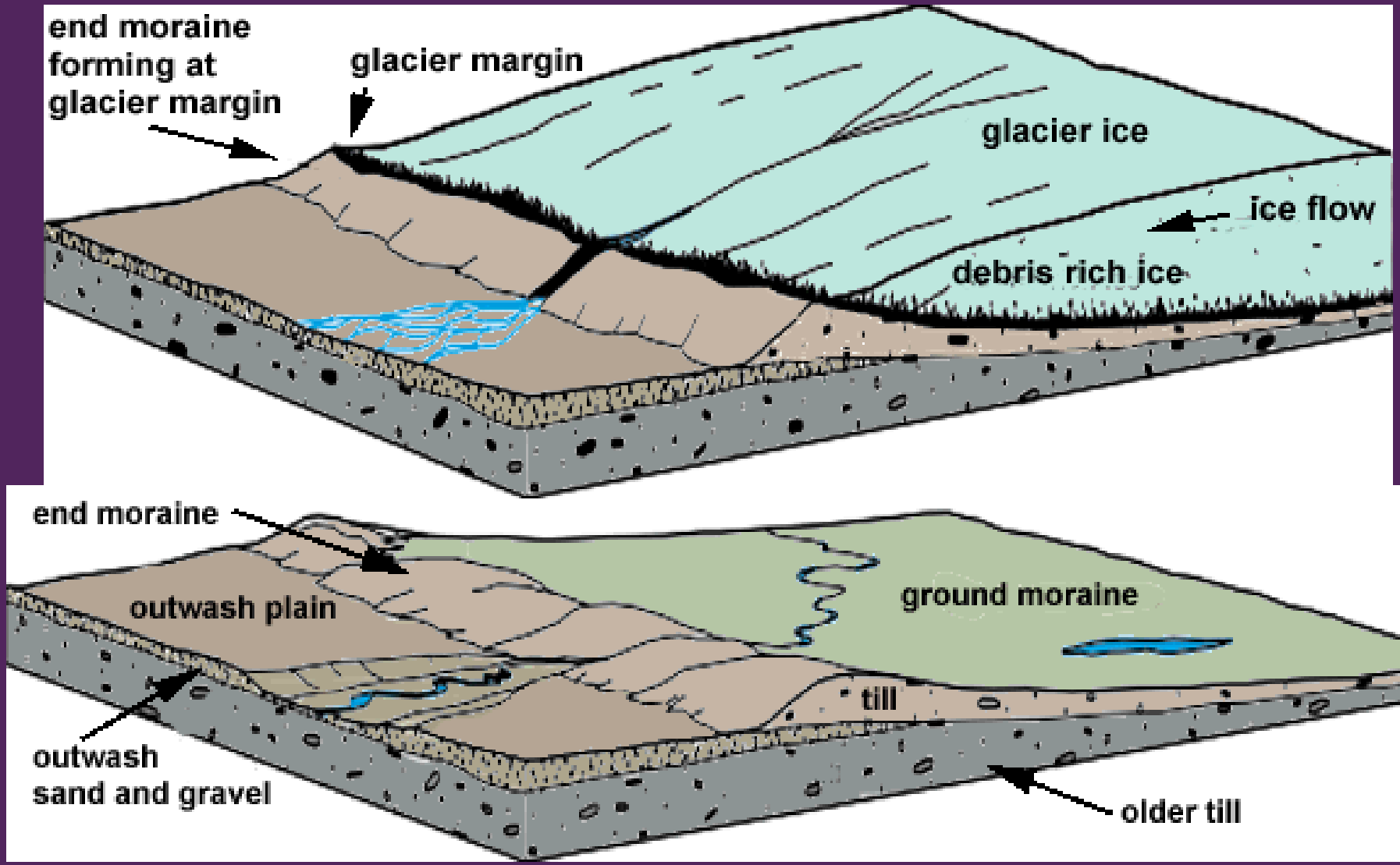
Wow!

Till

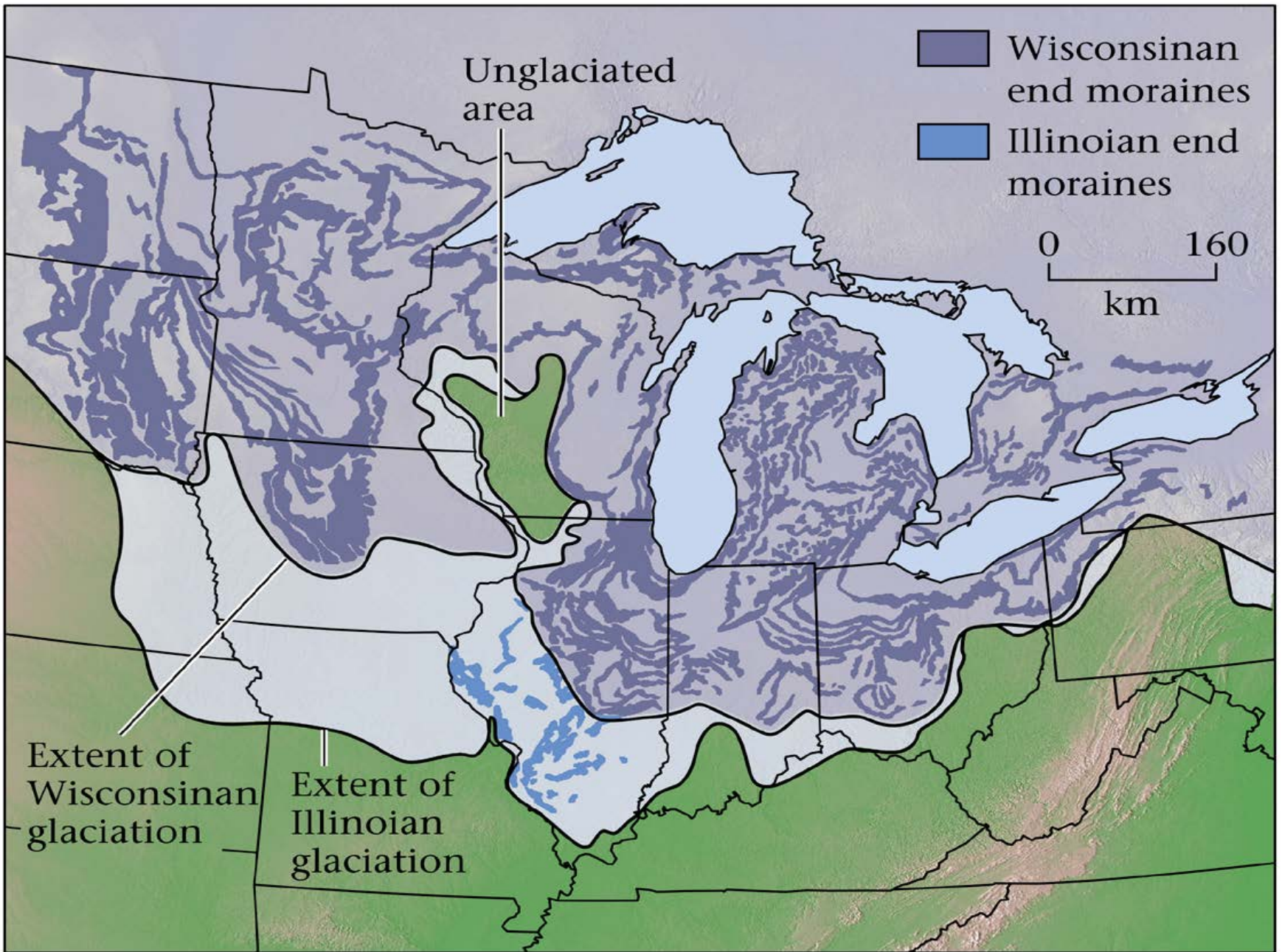
Depositional Landforms

- Moraines
- Eskers
- Drumlins (Depositional/Erosional)

Moraines


end moraine
forming at
glacier margin
glacier margin
glacier ice
ice flow
debris rich ice
end moraine
outwash plain
ground moraine
till
outwash
sand and gravel
older till

End moraines



Eskers

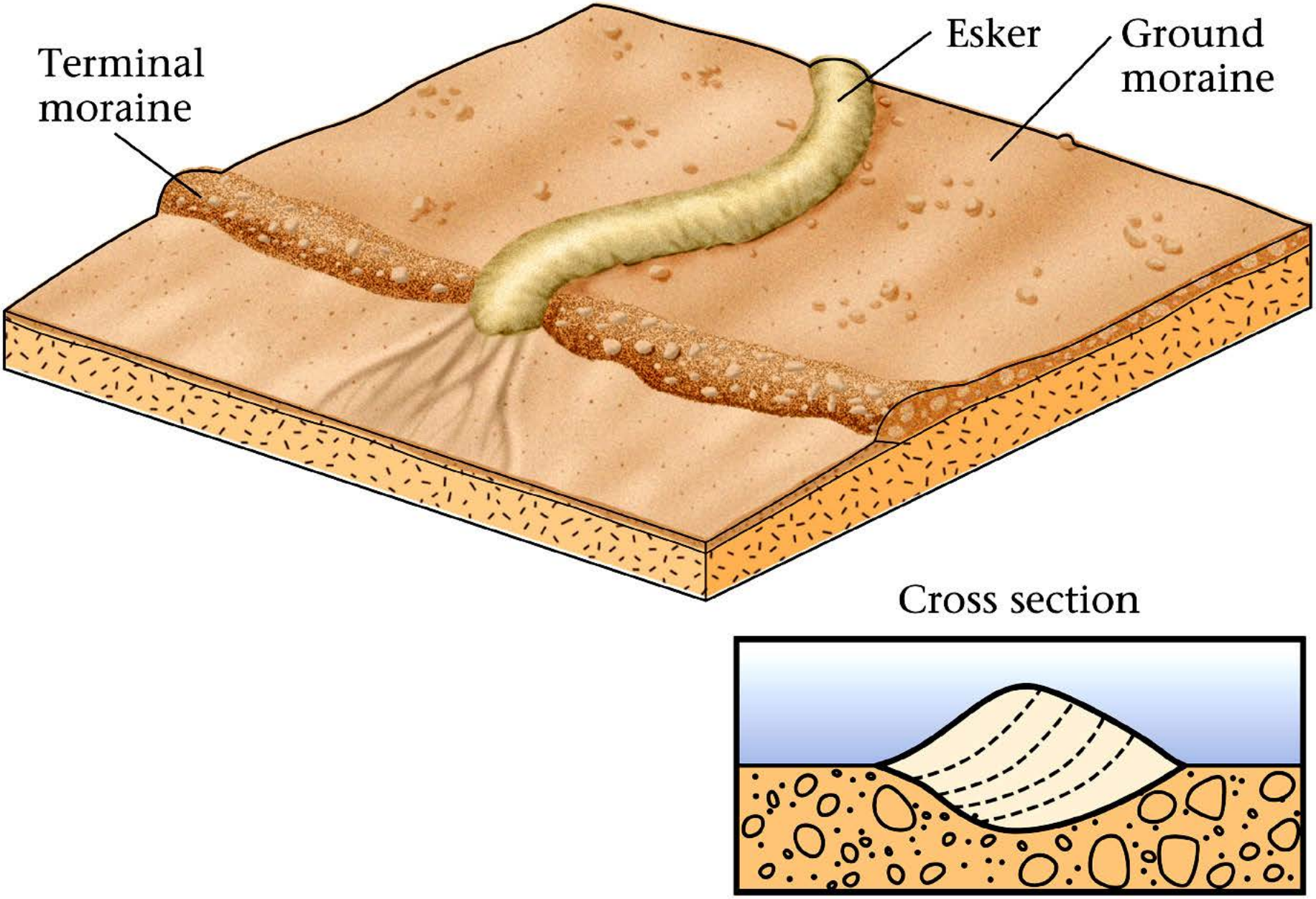


FIGURE 22.31

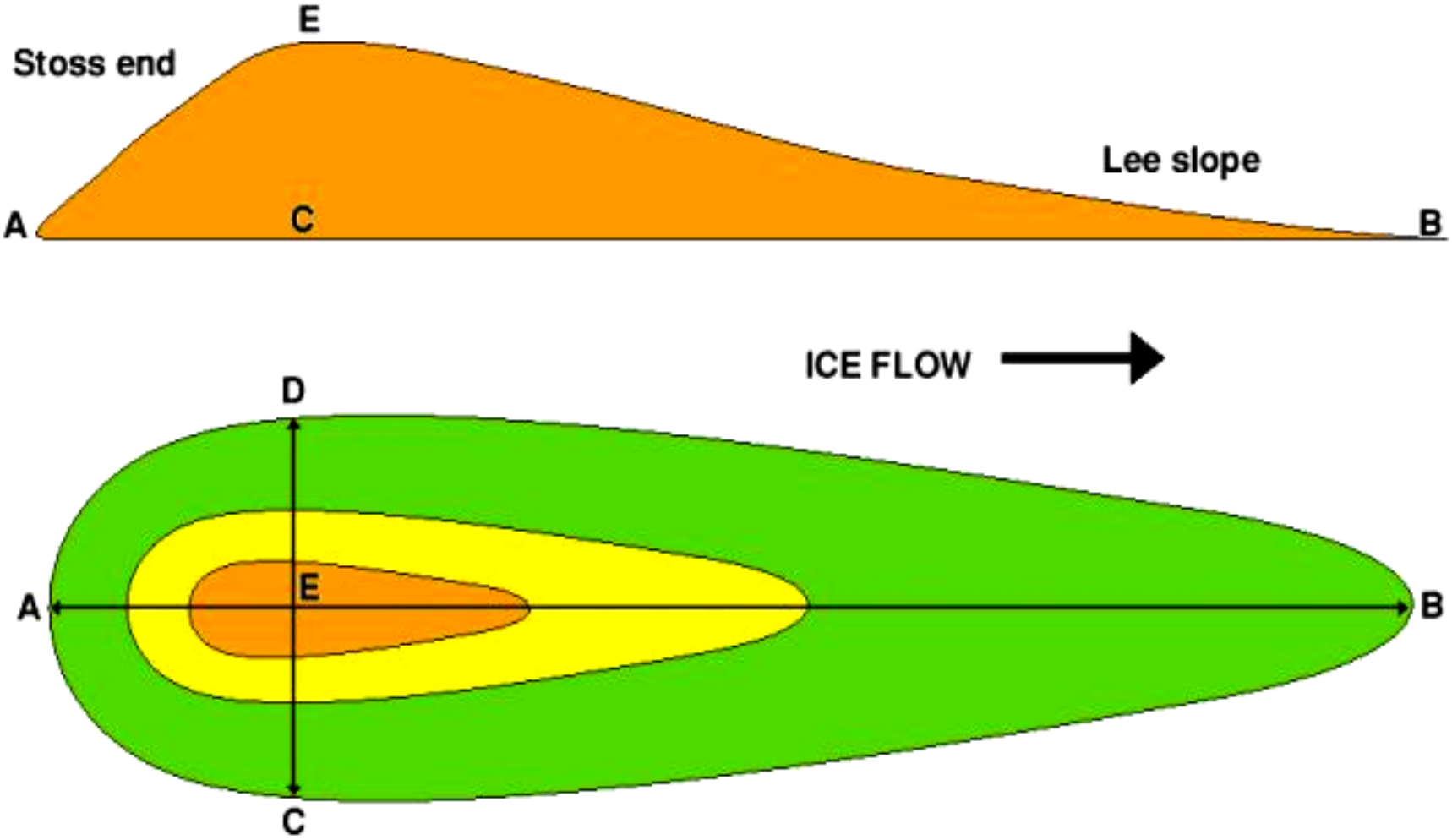
Earth: Portrait of a Planet, 2nd Edition
Copyright (c) W.W. Norton & Company

FIGURE 22.31

Earth: Portrait of a Planet, 2nd Edition
Copyright (c) W.W. Norton & Company

Drumlins

Drumlin shape



E
P
E
P

Reservoir
Pine
Hill
Hill Pond
Turkey
Hill
Streeter
Pond
Mooteland

Erosion Processes

- Abrasion
  - Concept
- Plucking
  - Concept

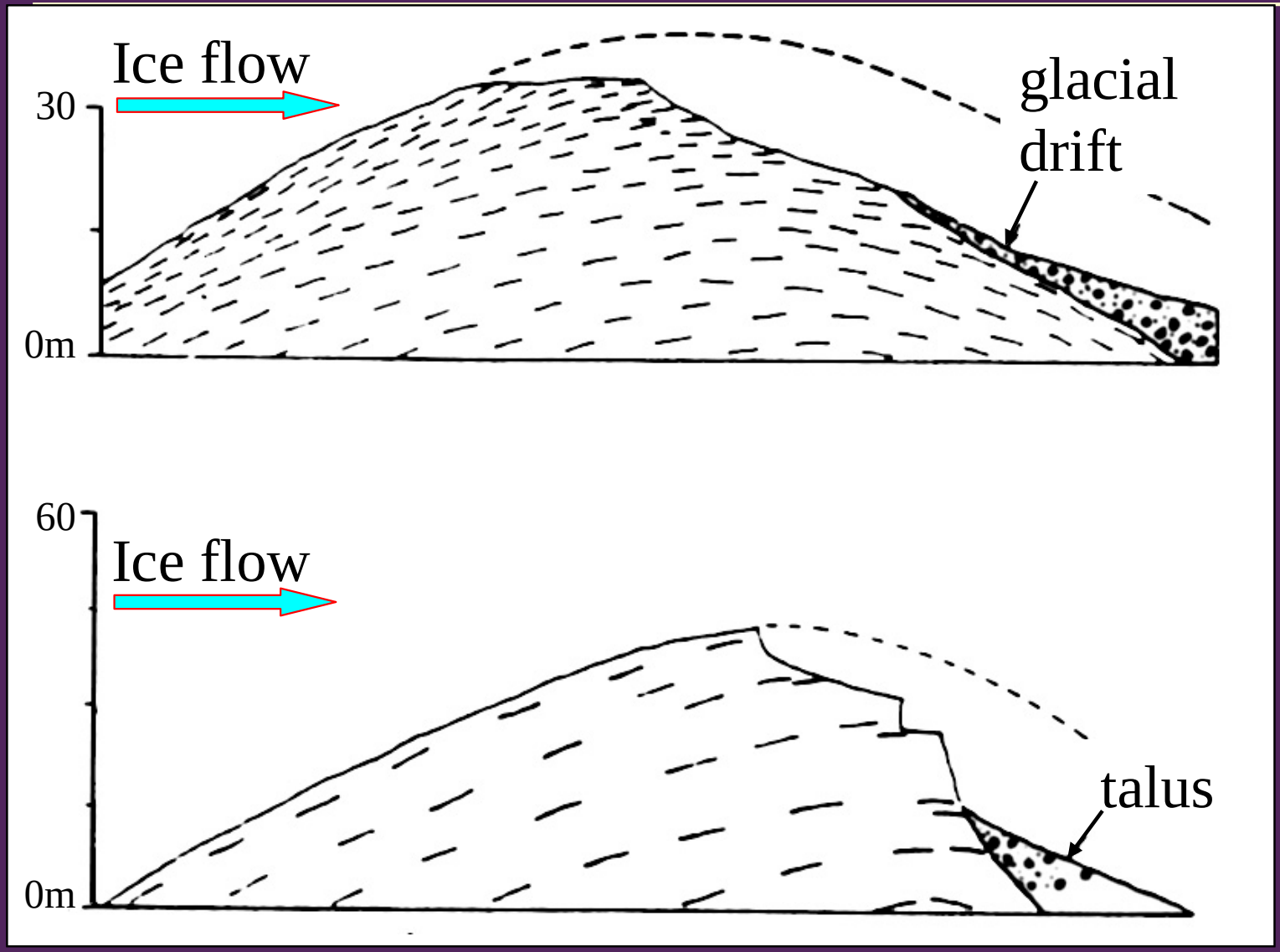
Coarse-grained Abrasion

- Striations

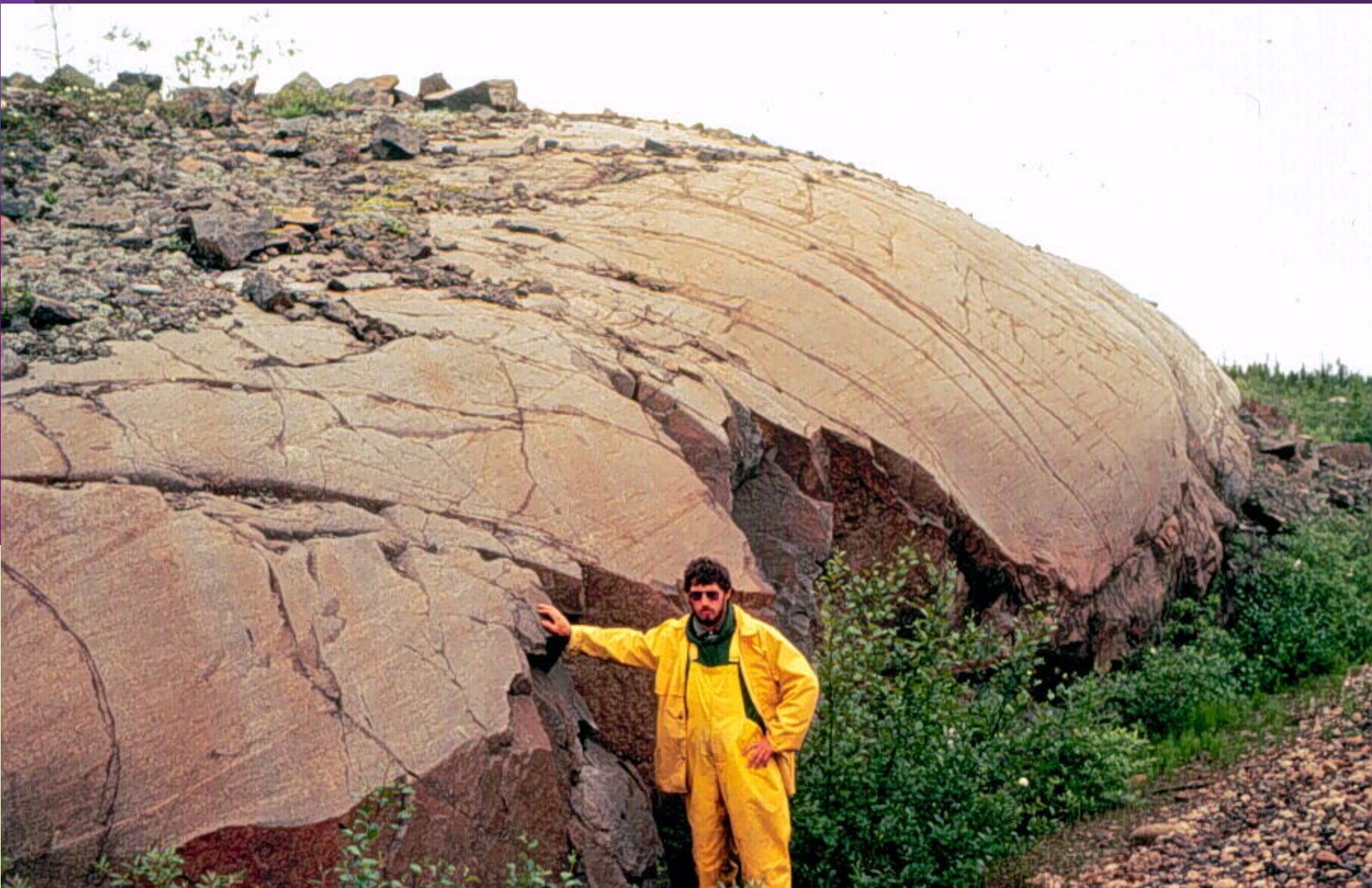
Fine-grained abrasion

- Glacial Polish

Plucking



Roches Moutonnees



Future Glaciations?