

## Chapter 5: Glaciers and Deserts

### I. Glaciers and Glaciation

Accumulation > Melting

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

### B. Types of glaciers

Present: 30% is desert, 10% glacier  
Past (Ice Age): 10% desert, 30 % glacier

1. Valley, or alpine glaciers-form in mountainous areas

2. Ice sheets, or continental      Pancake batter on a skillet

a. Large scale

b. e.g., Over Greenland      Antarctica

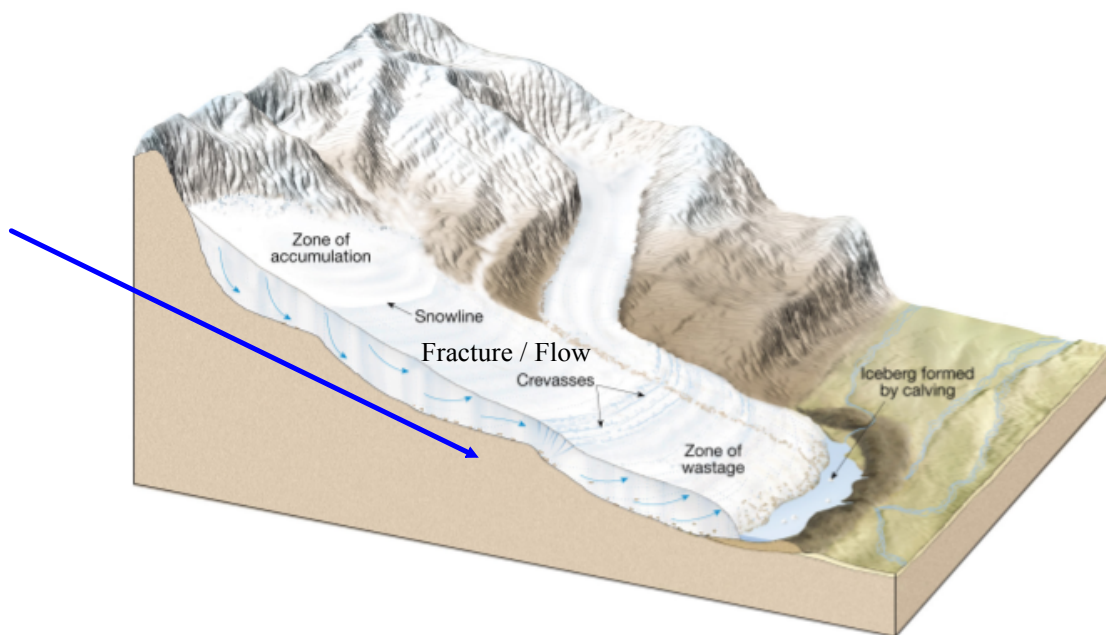
3. Other types

a. Ice caps

b. Piedmont glaciers

## C. Movement of glacial ice

1. Types of glacial movements
  - a. Flow pg 136 Striations - scratches, grooves cut in bedrock
  - b. Slipping along the ground
2. Zone of fracture
  - a. Uppermost 50 meters
  - b. Crevasses form in brittle ice
3. Zone of accumulation-the area where a glacier forms
4. Zone of wastage (ablation)-the area where there is a net loss due to melting

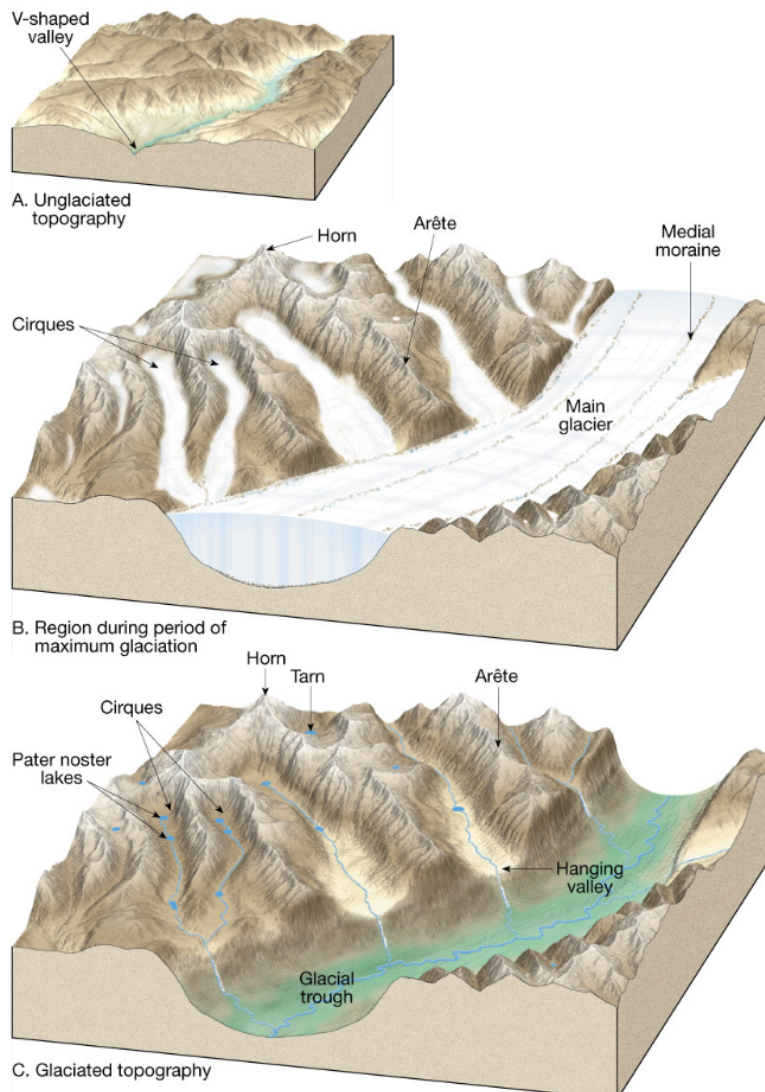


D. Glaciers erode by

1. Plucking-lifting of rock blocks
2. Abrasion
  - a. Rock flour (pulverized rock)    Loess
  - b. Striations (grooves in the bedrock)

E. **Erosional features of valley glaciers**

1. **Glacial trough**    Main glacier valley    U shaped
2. **Hanging valley**    smaller glaciers flow into the main trough
3. **Cirque**    bowl shaped depression that forms at the head of glacier
4. **Arête**    sharp ridge that forms when 2 cirques meet
5. **Horn**    pyramid shaped peak that forms when 3 cirques meet
6. **Fiord (Fjord)**    flooded by the ocean glacial trough



## F. Glacial deposits

### 1. Glacial drift

- a. All sediments of glacial origin
- b. Types of glacial drift

#### 1. Till

- a. Material that is deposited directly by the ice
- b. Glacial erratics (boulders embedded in till) pg 140

#### 2. Stratified drift

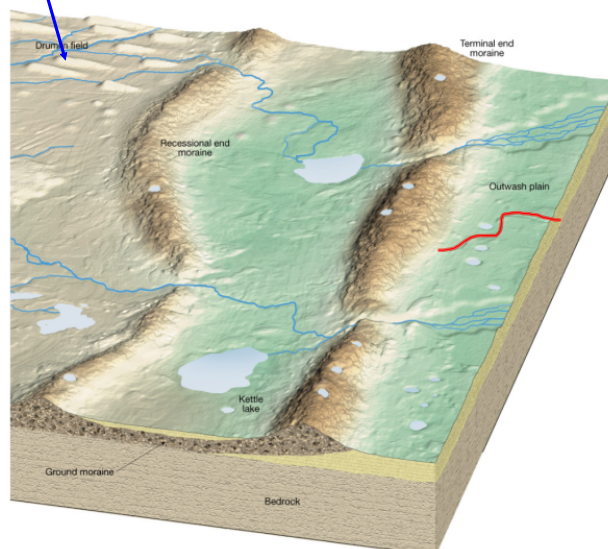
- a. Deposited by meltwater
- b. Sediment is sorted

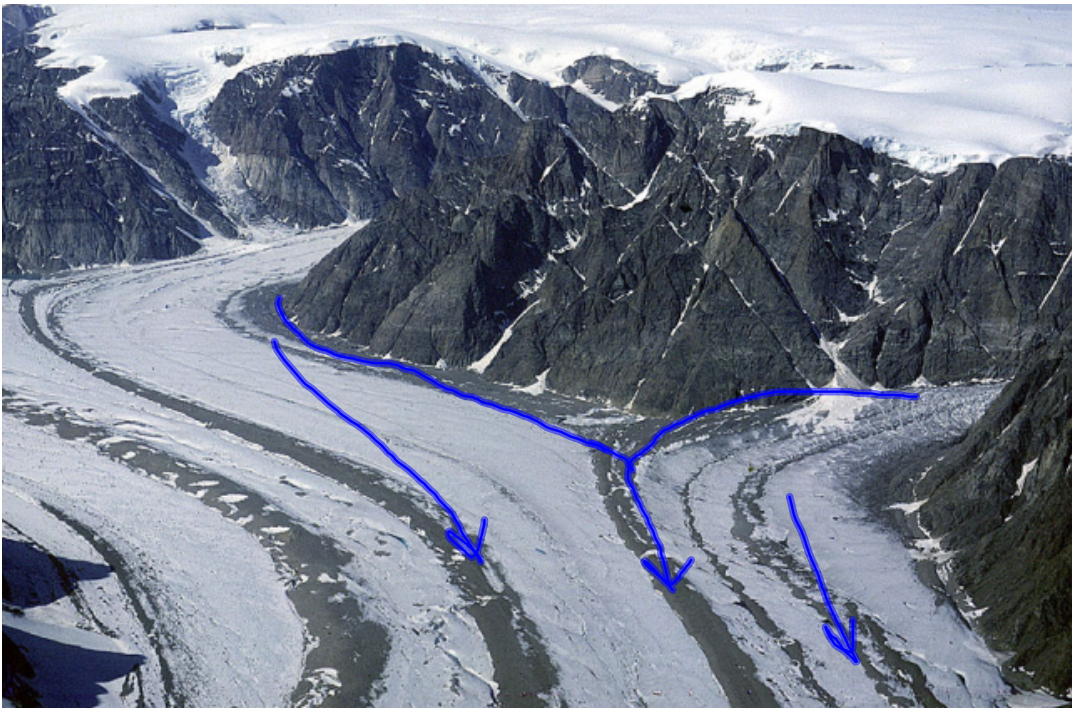
### 2. Depositional features

#### a. Moraines

1. Layers or ridges of till
2. Types
  - a. Lateral form on the side of the glaciers
  - b. Medial form in the middle of the glacier when two lateral moraines meet pg 141
  - c. End (Terminal Moraine) forms at the end of a glacier  
Recessional Moraines - mark the continued retreat of glacier
  - d. Ground forms under a glacier

- b. Outwash plain, or valley train layered sediments deposited by meltwater
- c. Kettles Ice berg becomes embedded in till, melts to form a lake
- d. Drumlins groups of hills formed when till is deformed under a moving glacier
- e. Eskers sediments deposited by a stream under a glacier snake-like
- f. Kames symmetrical piles of gravel





## G. Glaciers of the past

### 1. Ice Age

- a. Began 2 to 3 million years ago
- b. Division of geological time is called the Pleistocene epoch
- c. Ice covered 30 percent of Earth's land area

### 2. Indirect effects of Ice Age glaciers

- a. Migration of animals and plants
- b. Rebounding upward of the crust
- c. Worldwide change in sea level
- d. Climatic changes

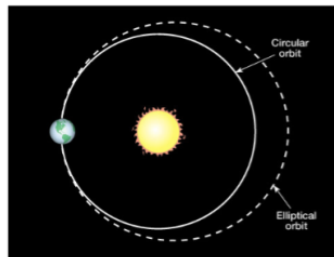
## H. Causes of glaciation

### 1. Successful theory must account for

- a. Cooling of Earth, as well as
- b. Short-term climatic changes

### 2. Proposed possible causes

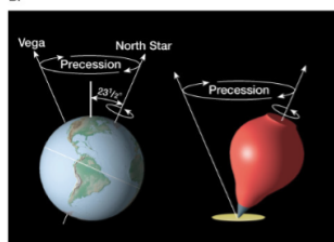
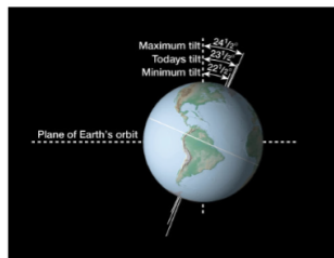
- a. Plate tectonics
  1. Continents were arranged differently
  2. Changes in oceanic circulation



### b. Variations in Earth's orbit

#### 1. Milankovitch hypothesis

- a. Shape (eccentricity) of Earth's orbit varies 100,000 years
- b. Angle of Earth's axis (obliquity) changes 40,000 years
- c. Axis wobbles (precession) 23,000 years



C.



## II. Deserts and Wind

### A. Geologic processes in arid climates

#### 1. Weathering

- a. Not as effective as in humid regions
- b. Mechanical weathering forms unaltered rock and mineral fragments
- c. Some chemical weathering does occur
  1. Clay forms
  2. Thin soil forms

#### 2. Role of water in arid climates

- a. Streams are dry most of the time
- b. Desert streams are said to be ephemeral
  1. Flow only during periods of rainfall
  2. Different names are used for desert streams
    - a. e.g., Wash
    - b. e.g., Arroyo
- c. Desert rainfall
  1. Rain often occurs as heavy showers
  2. Causes flash floods
- d. Poorly integrated drainage
- e. Most erosional work in a desert is done by running water



A.



B.

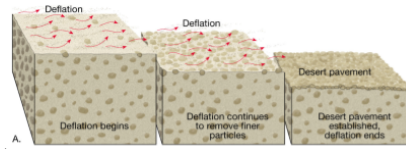


B. Evolution of a desert landscape

1. Uplifted crustal blocks
2. Interior drainage into basins produces
  - a. Alluvial fans and bajadas
  - b. Playas and playa lakes

C. Wind erosion

1. By deflation
  - a. Lifting of loose material
  - b. Produces
    1. Blowouts
    2. Desert pavement
2. By abrasion



D. Types of wind deposits

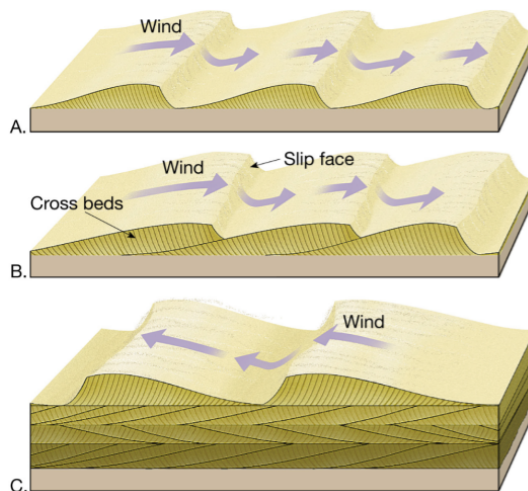
1. Loess
  - a. Deposits of windblown silt
  - b. Extensive blanket deposits
  - c. Primary sources are
    1. Deserts
    2. Glacial stratified drift



2. Sand dunes
  - a. Mounds and ridges of sand formed from the wind's bed load
  - b. Characteristic features
    1. Slip face-the leeward slope of the dune
    2. Cross beds-sloping layers of sand in the dune

Erg - Sand Dune Deserts 10%

Reg - Rocky Desert 90%



c. Types of sand dunes

1. Barchan dunes
2. Transverse dunes
3. Longitudinal dunes
4. Parabolic dunes
5. Star dunes

