Glacial Ice
Unit 3: Gradational Processes
Geography 12

Name:
Period:

What are glaciers? A large body of ice that forms when the accumulation of snow exceeds its ablation (melting).

How do they form? There are many possible causes of glacial formation. Here are a few:

1. Glacial ice forms when temperatures throughout the year are such that **accumulation** in winter is greater than **ablation** (melt) in summer. Latitude and altitude play similar roles in influencing temperatures. The farther away from the equator you go, the **colder** the average temperature and the higher you got the cooler the temperature.

2. Global cooling caused by gradual change in earth's orbit around the sun. Our journey around the sun changes ever so slightly. This cycle, which takes 97,000 years to complete, makes the earth's orbit more and more elliptical so that at mid-cycle the earth will be farthest from its heat source, the sun. The earth experiences a cooling trend during this time and conditions are ideal for glacial formation and possibily the onset of an ice age.

3. Another possible cause may be the second cycle experienced by the earth. Over a period of 41,000 years, the earth changes the tilt of its axis. The change is only slight, but during the time of maximum tilt the North Pole receives less sunlight, temperatures there begin to drop, and glacial ice accumulates year after year.

4. The amount of incoming solar radiation could be blocked long enough to allow for rapid accumulation of snow and ice. What natural event on earth could put enough dust into the atmosphere to block the sun's rays? Volcanic activity and/or the collision of a large asteroid. It is conceivable that many volcanic eruptions could occur simultaneously putting so much dust into the atmosphere that the prolonged cooling of the planet would trigger an **ice age**.

The formation of a glacier

Climate conditions needed for glacial ice to form:

1. temperatures must be cold enough for snow to accumulate
2. air must have the required moisture to produce more snow than will melt during the warm months.

Most glaciers begin in small hillside hallows where snow can accumulate. If the slope is facing north, it receives less warmth from the sun and the snow patch may survive the

summer. Year after year, more snow accumulates in the winter than melts in the summer and a **glacier** begins to form. As the snow pack grows, compaction removes most of the air from the snow. Periodic freezing and thawing creates a coarse, crystallized slush, which is a transition stage between snow and solid glacial ice. This semi-solid crystallized slush is called **firn**. Over time, the firn is compacted even further and solid glacial ice begins to form. With every snowfall more snow accumulates and the glacier increases in size and weight.

Glaciers can be classified as **Alpine or valley glaciers** and **Continental glaciers**.

Alpine or valley glaciers:

- Follow _____ as they move from mountains into lowland areas.
- Small _____ move down small river valleys and join together with other tributary glaciers to create a main river of ice.
- Moving force behind glacial advance is _____
- Glaciers advance when accumulation of snow and ice is greater than _____
- Sides and bottom layers of ice move the _____ as these are the regions where ice is directly in contact with the ground.
- Top and middle sections moved the _____ and this is evidenced by the glacial _____

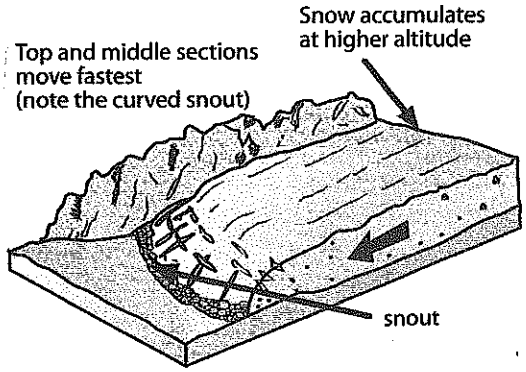

Figure 13.1 Moving river of ice

Continental glaciers:

- When valley glaciers no longer confine to river valleys and spread out to create large _____ known as continental glaciers.
- Cover flat, lowland regions
- Move very slowly and advance as a result of valley glaciers advancing and pushing the sheet forward.
- Leave behind scoured bedrock and _____
- When glaciers _____ they can leave behind rich deposits of soil and many lakes.

Erosional action of glaciers:

1. Plucking

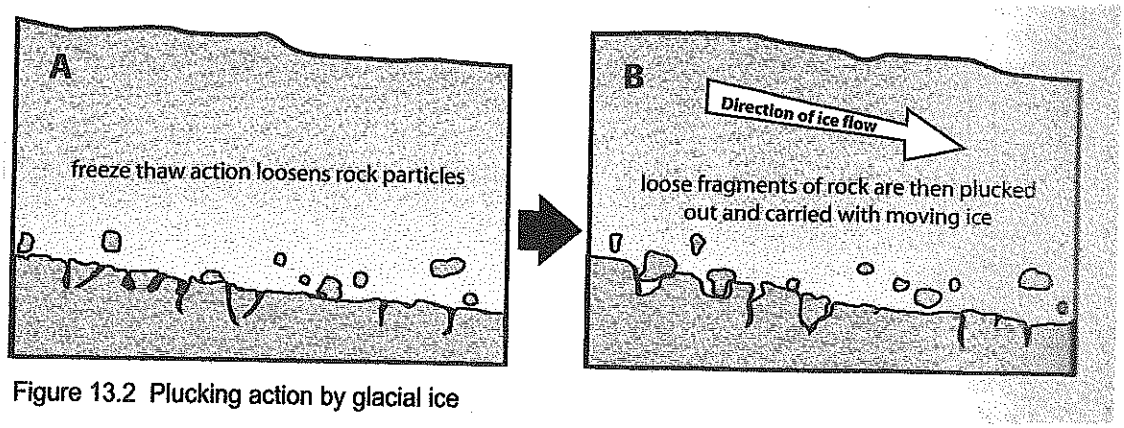

Figure 13.2 Plucking action by glacial ice

2. Abrasion

- Rock and debris are attached to the glacial ice. As the glacier moves, debris load gouges, scrapes and polishes rock surfaces.
- Continuous abrasion may create fine, powdery rock material called _____

Glacial Depositional features: as glaciers slowly move along surfaces they pick up rock and rock debris and deposit material as they retreat or melt.

Drift:

Till: refers to deposits left behind when glacial ice

_____

Sand, gravel, and boulders may be mixed with

_____

Outwash: refers to deposits left behind by running glacial

_____.

Heaviest materials are deposited first.

Erosional and depositional features of alpine glaciers: on the diagram below label the following features. On a separate sheet of paper describe how each feature is formed. Use Physical Geography text pgs. 164-168.

- Cirque
- Tarn
- Arête
- Col
- Lateral Moraine
- Medial Moraine
- Terminal Moraine
- Recessional Moraine
- Truncated Spurs
- Hanging Valleys
- U-shaped Valley