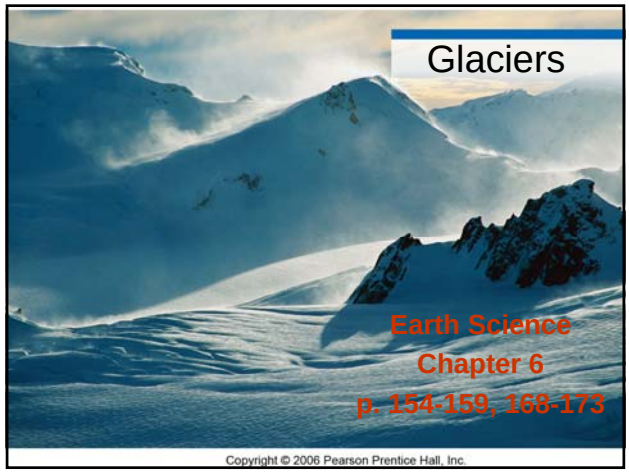
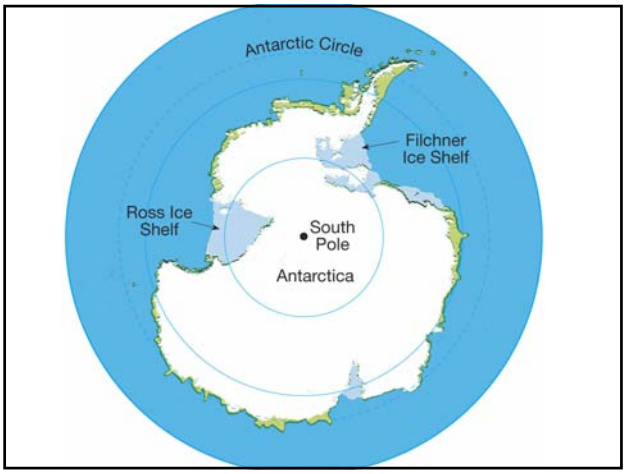
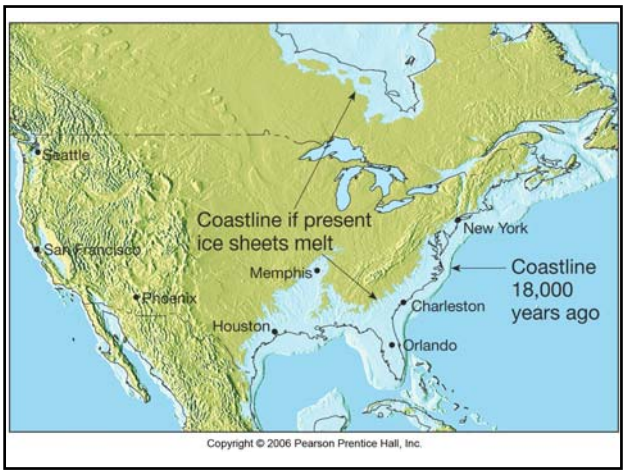
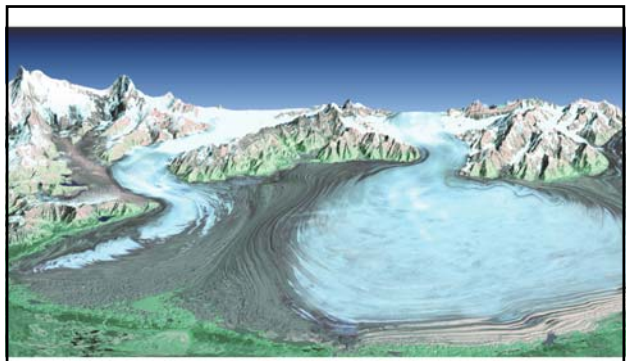
Glaciers, Ice Ages

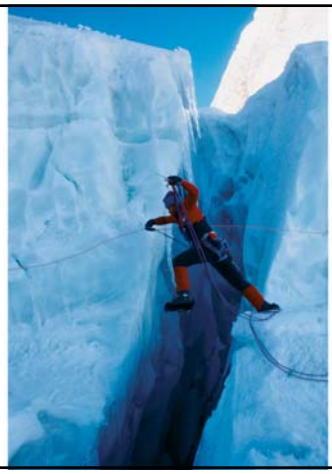


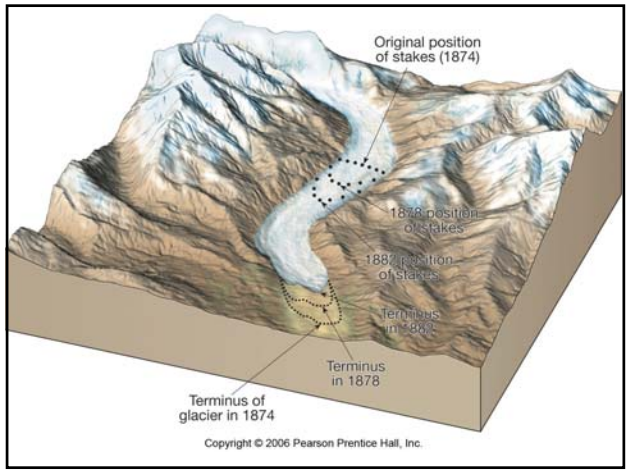


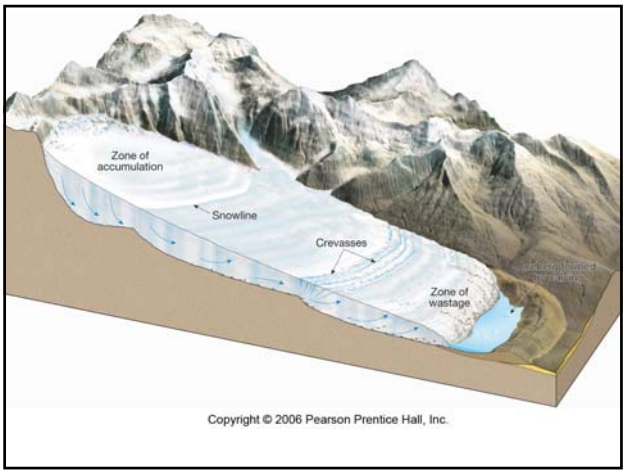


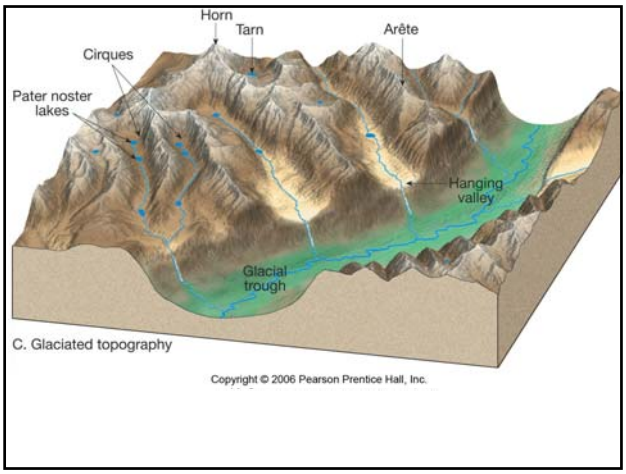


- Malaspina Glacier, Alaska

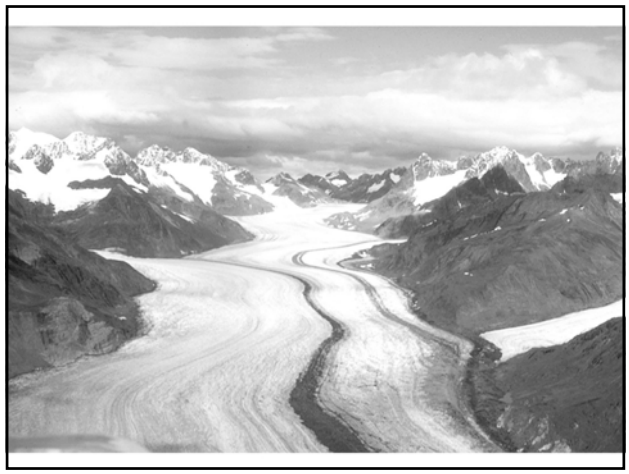


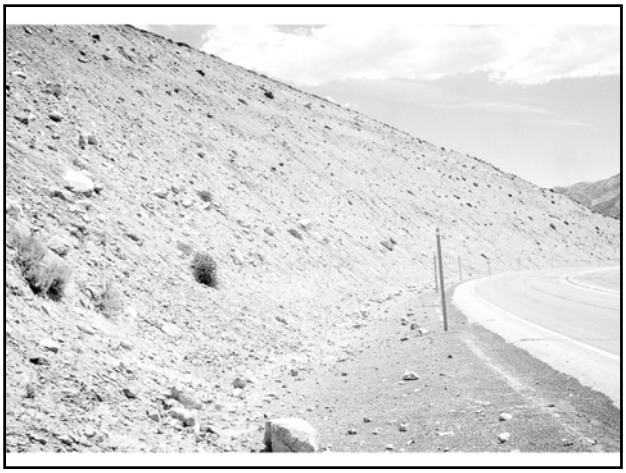


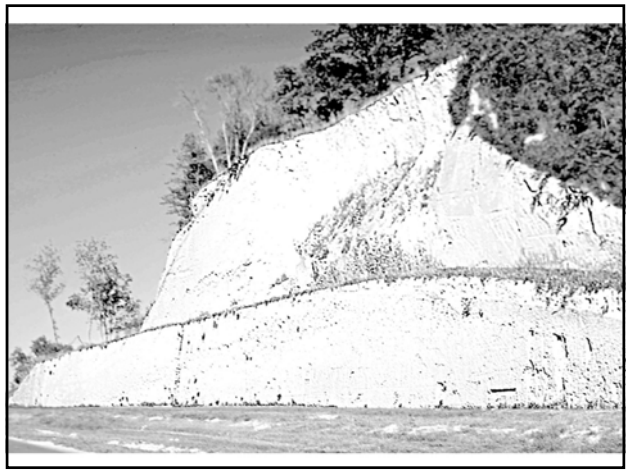


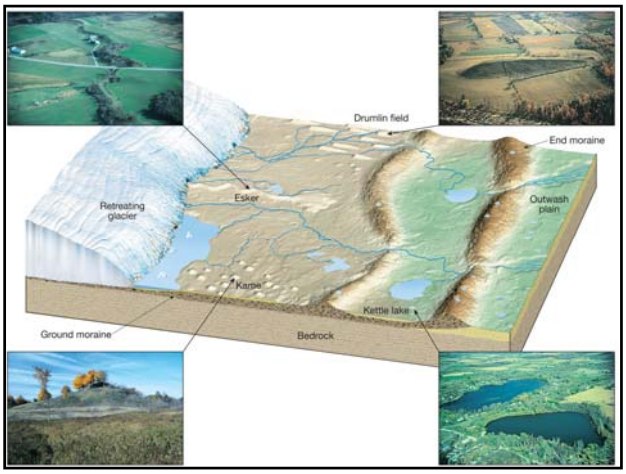


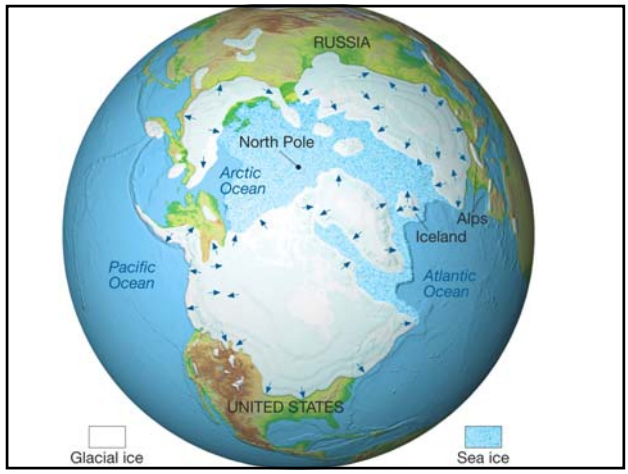

Hanging
valley

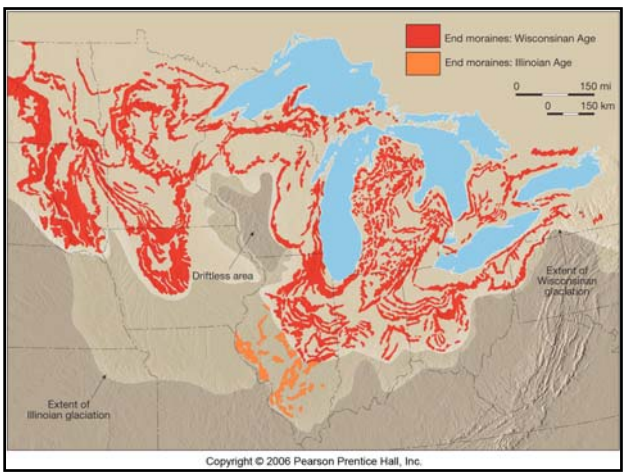












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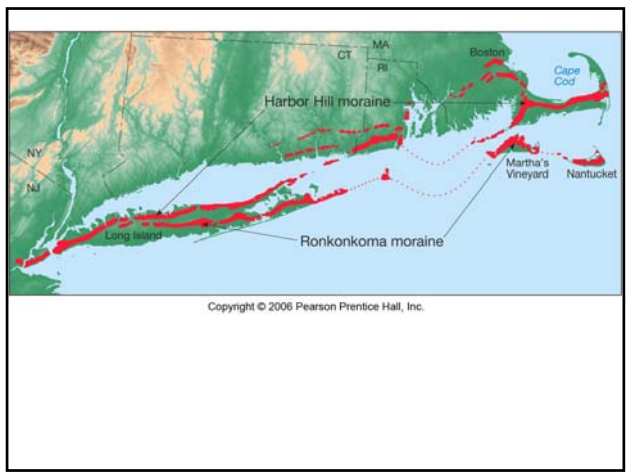

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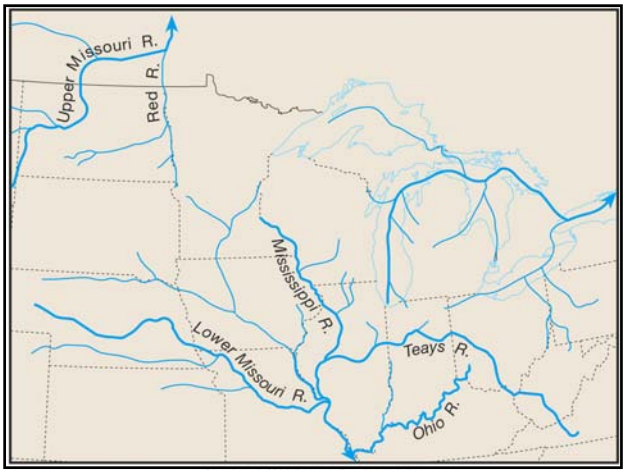

- Deranged drainage after ice melts

Pluvial Lakes of Southwest

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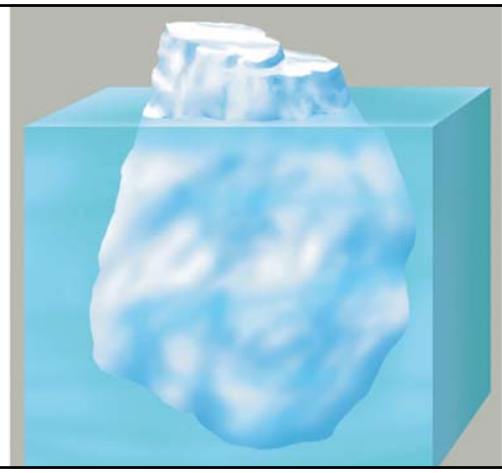
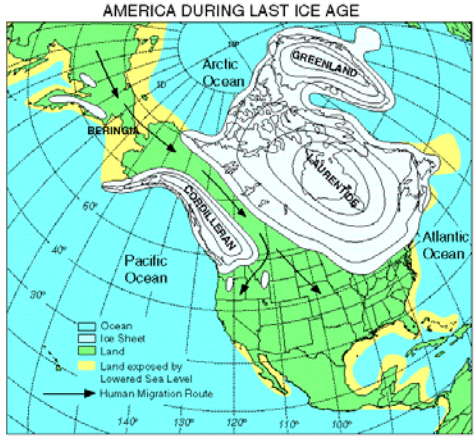


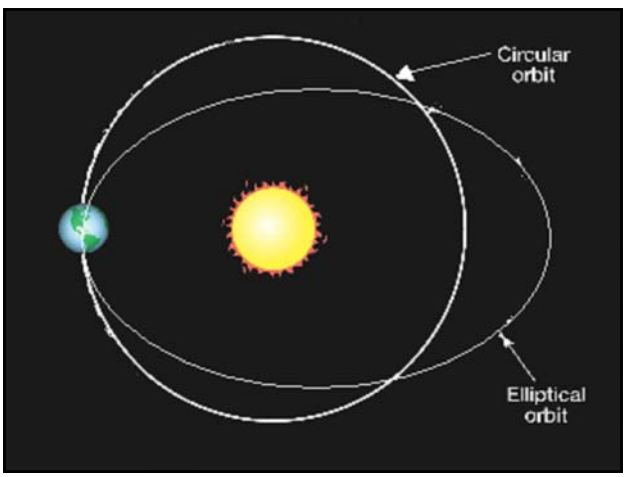
AMERICA DURING LAST ICE AGE

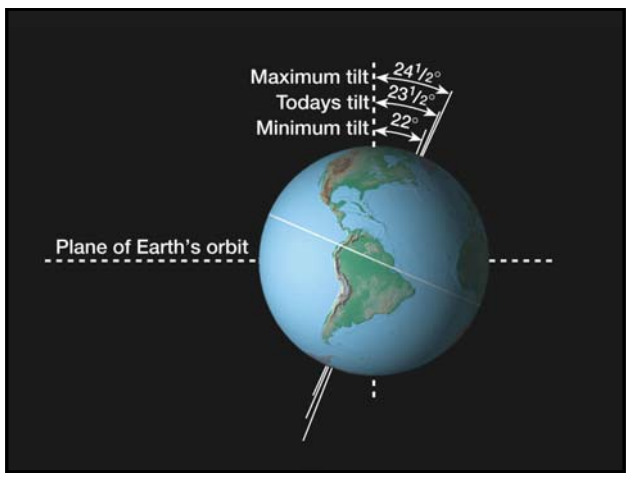


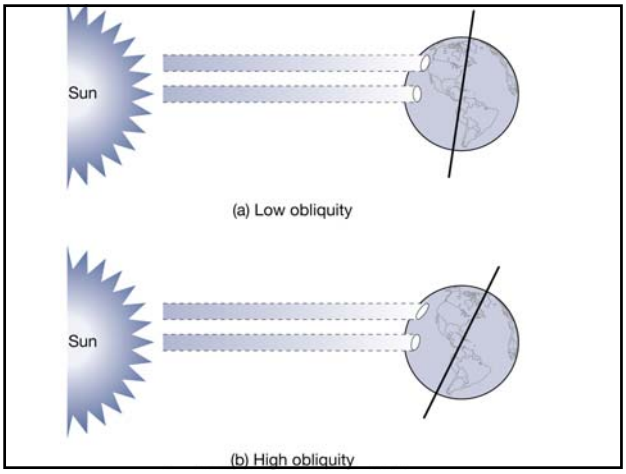
http://www.atmos.washington.edu/~dennis/Our_Changing_Climate.html

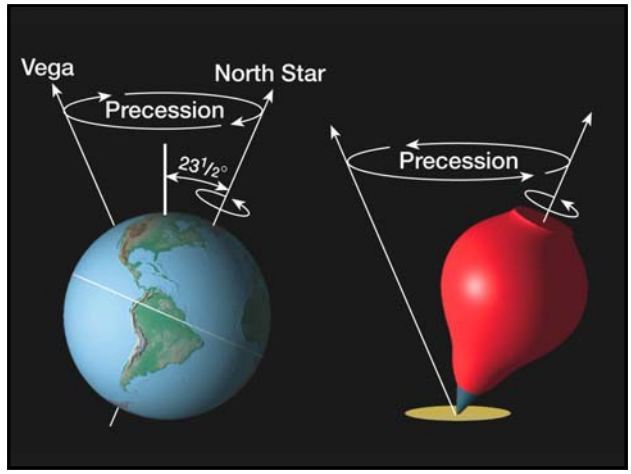
Location of 300 MY Continental Glaciation

Location of 300 MY Continental Glaciation with continents located 300 mya

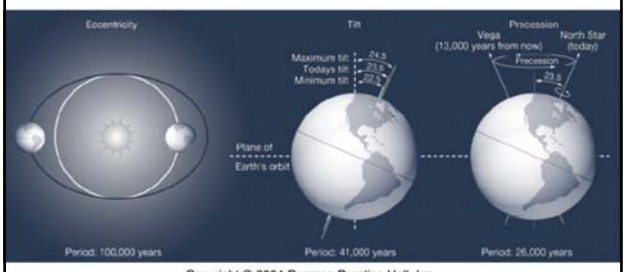


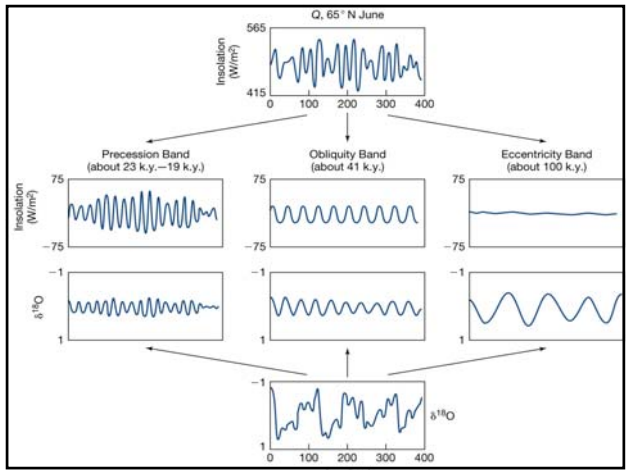


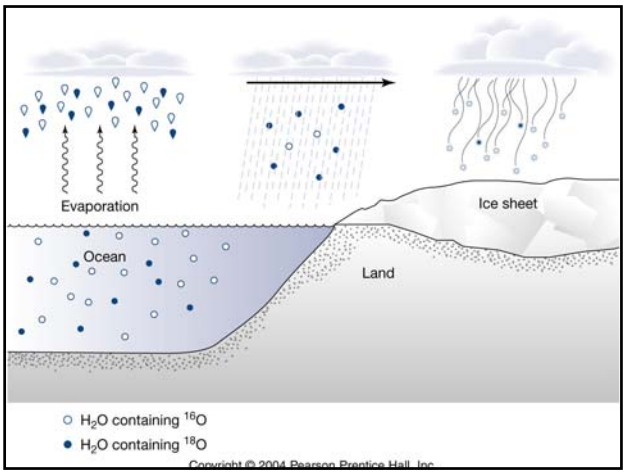




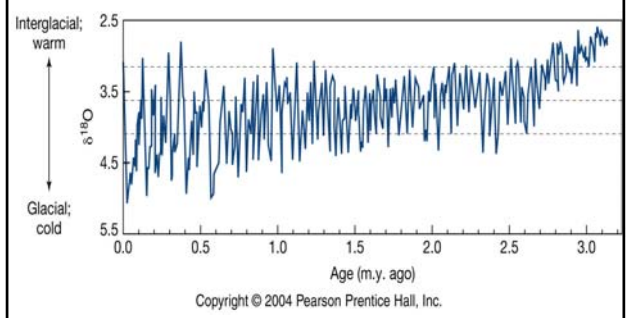
Milankovitch cycles

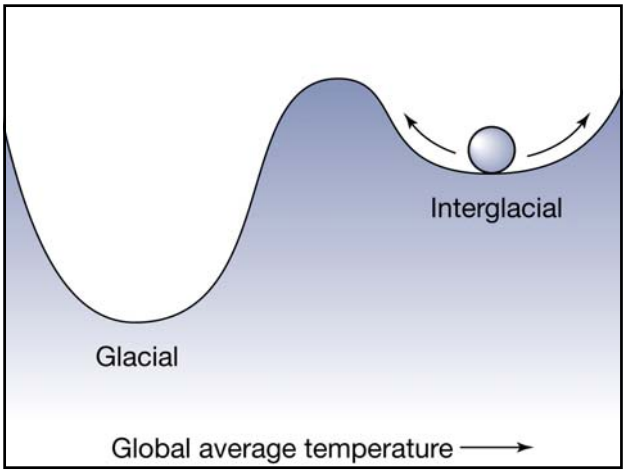






Temperature record from O-18

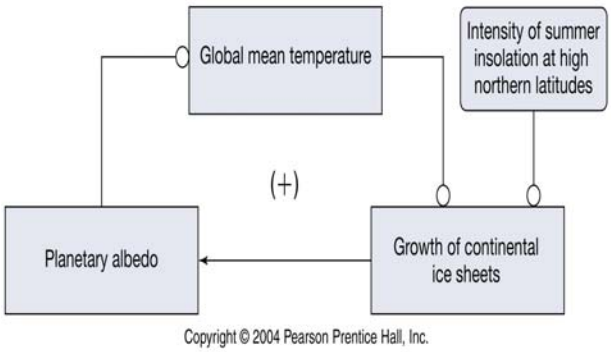




Positive Climate Feedback Loops

- Ice albedo decreases temperature, increases ice. Reduced ice increases temperature

Ice-albedo feedback loop

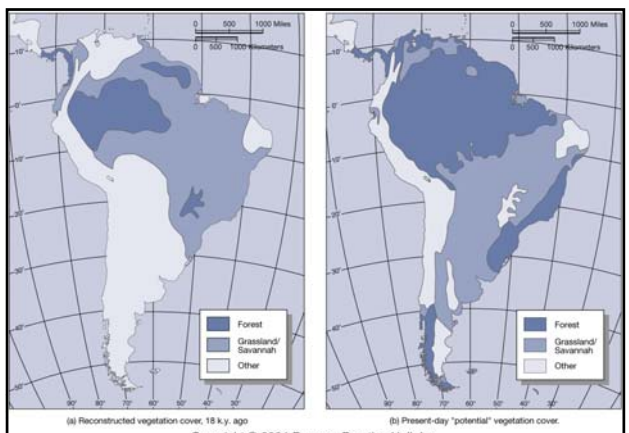


Positive Climate Feedback Loops

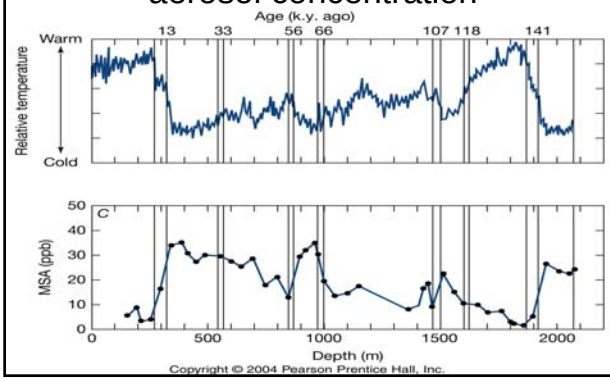
- Ice albedo decreases temperature, increases ice. Reduced ice increases temperature
- Glacial periods result in larger arid areas, increasing delivery of iron nutrients to sea, lowering CO_2 levels, and temperature
- Lowering sea level will expose reefs to weathering. Reaction consumes CO_2 , lowering temperature. Rising sea level has opposite effect

Negative Climate Feedback Loop

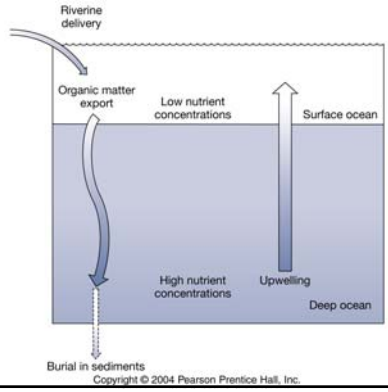
- Forest die out during glacial ages, reducing mechanism to remove CO_2 from atmosphere, increasing temperature



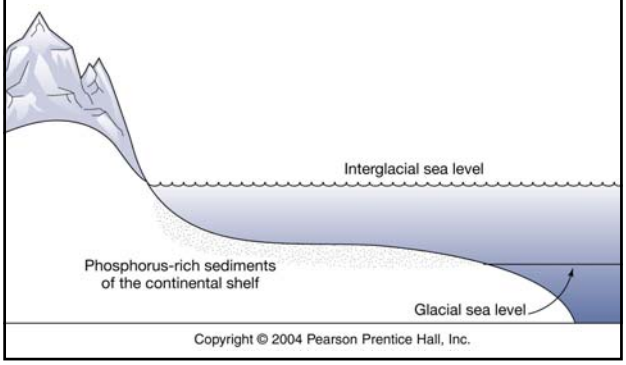
Temperature compared to sulfur aerosol concentration



Nutrient cycle



Nutrients related to sea level change



Past Glacial Ages

- Pliocene-Pleistocene
  - Ice in Antarctica starting about 40 m.y.a.
  - Widespread N. Hemisphere ice about 3 mya
  - Advances every 40,000 to 100,000 years
- Karoo Ice Ages
  - 260 to 350 mya
  - Lasted 90 million years
  - Wegener's evidence of continental movement

Past Glacial Ages

- Andean-Saharan Ice Ages
  - 430 to 460 mya
  - Lasted 30 million years
- Cryogenian
  - 630 to 850 mya
  - Lasted 200 million years
  - Periods of all Earth covered with glacier
- Huronian
  - Over 2 billion years ago
  - Lasted 300 to 400 million years