

## Records of Climate Change

1. Records
  - a. Weather Records
  - b. Cultural Records
2. Proxies
  - a. Tree Rings
  - b. Lake Sediments
  - c. Oxygen Isotopes

## Causes of Climate Change

1. Glaciation Needs
  - a. Full Reasoning is not known
  - b. Theory of Glaciation needs to include:
    - i. Interglacial periods – periods of warm climate separating periods of glacial advancements.
    - ii. Glacial episodes in the Paleozoic (200-300 mya) and Precambrian time (700 mya).
    - iii. Earth's average global is 14°C, in the geologic past it was 22°C – Glaciation requires a temp. of about 10°C.
    - iv. Continental glaciers originate in polar or elevated land.
    - v. Sufficient precipitation needs to occur.
2. Continent Distribution
  - a. Need to have land masses near the poles
3. Oceanic Circulation
  - a. A decrease or increase in the strength of circulation patterns could alter climates
4. Earth's orbital changes controls its climate
  - a. Milankovitch cycles
    - i. Eccentricity
      1. Measure of the noncircularity of Earth's orbit
      2. Cycle is about 100,000 years
    - ii. Inclination
      1. The changes in the axial tilt (22° to 24.5°) of the Earth
      2. The greater the tilt the greater the contrast between summer and winter temperatures
      3. Cycle is about 41,000 years
    - iii. Precession
      1. The wobble of the Earth as it spins on its axis
      2. Cycle is about 26,000 years
    - iv. Main effect of cycles is to change the contrast in the temperature of the summer and winter.
    - v. Glaciation would occur when the summer temperature is closer to the winter temperature, but winter temperatures are not colder than usual.
    - vi. Rather the mild summers melt less ice than is received in the winter.