

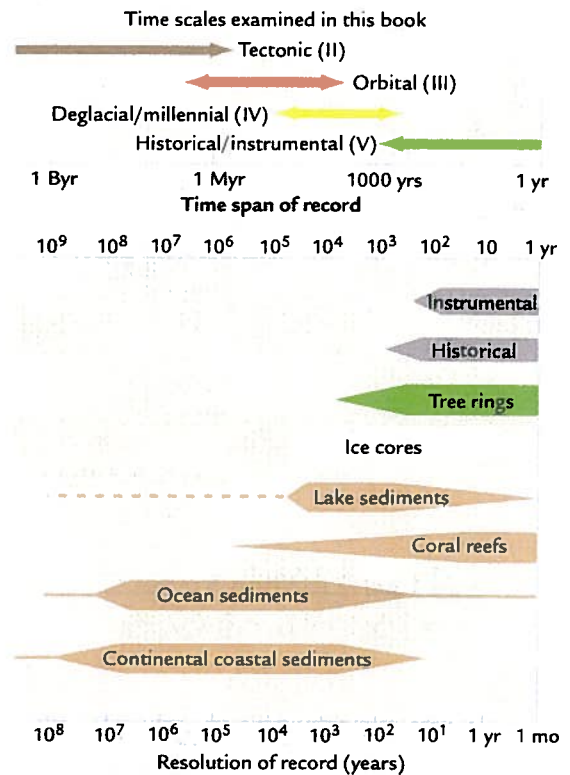
**Paleoclimatology**  
 5 Billion to 2000 Years Ago  
 FOR/GEOG 295 - 4 Sept. 2008

**Climate Archives:**

- Geological
- Biological: Fossils & Pollen
- Cryological: Ice Cores
  - $\delta^{18}O$
  - $\delta D\text{‰}$
- Historical: Documents, etc.
- Biological: Tree-Rings
- Instrumental

Proxy: Using one thing in place of another...

Always better if 2, independent proxies agree

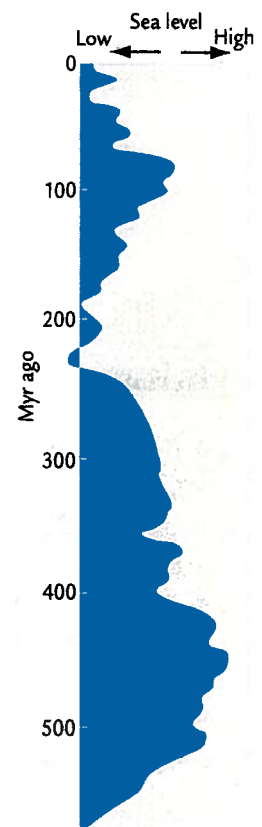


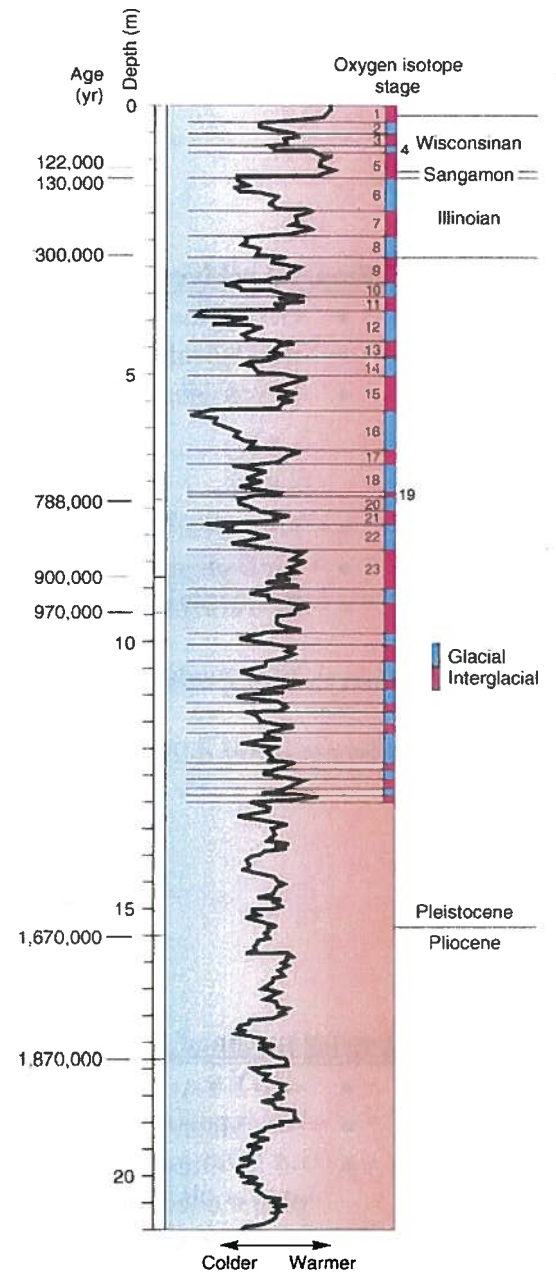
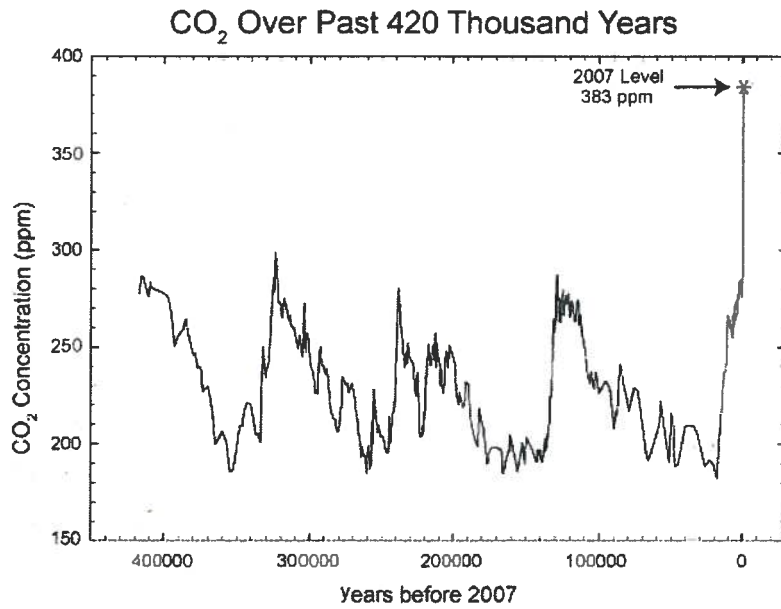
**A brief timeline of Earth's Evolution:**

- ~4+ BYA: All blown away
- ~4: Magnetic field forms & atm held in place – no O<sub>2</sub>
- ~3.8: Out-gassing continues but liquid earth possible as planet cools below 100°C
- ~3.5 BYA: First life forms release O<sub>2</sub>
- ~500 MYA: O<sub>2</sub> levels high enough for ozone layer & plants & animals can now colonize land

**The Last 500 Million Years:**

- Cretaceous
- Eocene
- Messinian Crisis





#### The Last 2 Million Years:

- Milankovitch Cycles

#### The Last 50,000 Years:

- Last Glacial Maximum
- Younger Dryas
- Anthropocene

#### References:

- R. Henson. *Rough Guide to Climate Change*.
- W. Ruddiman. *Earth's Climate: Past and Future*. 2008. W.H. Freeman.
- E.C. Pielou. *After the Ice Age: The Return of Life to Glaciated North America*. 1992. University of Chicago Press.
- Broecker & Kunzig. *Fixing Climate*. 2008. Hill & Wang.

