Proposed explanations for the Pleistocene climate record:

- What drives the observed climate variations ($10^1$-$10^3$ yrs)?
- Discussion of Severinghaus and Brook (1999)
4/5/18: Abrupt climate change in the Pleistocene

Key Concepts

- Stable isotopic fractionation: thermal and gravitational effects
- Abrupt climate change
Review: Conceptual model: Milankovitch hypothesis

- Orbital variations affect total and seasonal distribution of irradiance
  - Eccentricity: ~100ky cycle
  - Obliquity: ~41ky cycle
  - Precession: ~19ky cycle
- Ice-albedo feedback amplifies influence of small insolation changes

What features of the paleoceanographic record still need explaining?

Paillard (1998, 2004); Ruddiman (2006); Cane et al (2006); Huybers (2009)
Sensor: Ice sheets

Observations: gas concentrations in pore spaces of ice cores

Gas bubble closure depth ~ 50-70m at this site

Summary: Introduction to ice core records of abrupt climate change

- Ice core archives contain a wealth of chronological and climate proxy data that span the late Pleistocene. Uncertainties are in the local/regional vs. global interpretation of the data; and modeling of ice flow to provide a chronology for earliest periods of record.

- Proxy measures of both the thermal and gravitational gradients can be used to determine how quickly surface temperature changes happened.

- How fast can the climate change?
  - Next: Discussion of Severinghaus and Brook (1999)
  - Next week: Neoproterozoic climates (A.J. Kaufman)
  - Next week: class meets at PLS 1164 (check with Prof Kaufman on office hours)
  - Next week: work on HW9 (due 4/19/18)