Millennial Timescales
Greenland Ice Core data

Ruddiman, 2001
Comparison of GRIP with GISP

Johnsen et al., 2001
FIGURE 5-5 Relationship between Summit GRIP ice core, Greenland, millennial climate events, iceberg discharges (lithic grains), and sea-surface temperatures [SST] [% N. pachyderma] in North Atlantic deep-sea core VM23-081. H1–H4 are Heinrich events numbers 1–4; YD is Younger Dryas cool interval. Courtesy of G. Bond with permission from the American Association for the Advancement of Science. From Bond and Lotti [1995].
Ruddiman, 2001
Fig. 8. Graph comparing the Summer Lake IRM record with the GISP2 $\delta^{18}O$ record. Heinrich events are indicated by $H_i$:
A Strong conveyor belt

B Weak conveyor belt

Warmer
Cooler

Ruddiman, 2001
Methane and D/O

Ruddiman, 2001
Holocene Millennial-Scale Oscillations?

Ruddiman, 2001
Temple Hill Moss, Scotland

- Ombrotrophic peat
  - Testate amoebae
  - Macrofossils
  - Humification
- ~7500 yr record
- 1100 yr oscillations
  - Major wet shifts

Langdon et al., 2003