Temperature Change Through Time, 0-6 Mybp

- Climatic cycling over the last 5 My
- ICEHOUSE
- WARM
- COLD
- ~10°C

Oxygen Isotope Ratio

Time (millions of years)

- Miocene
- Pliocene
- Pleistocene

Ice mainly in Antarctica

Start northern ice ages

Begin 41,000-yr cycles

Begin 100,000-yr cycles

Warmer

Now

Colder

0 1 2 3 4 5 6
$\delta^{18}O_{\text{ice}} = 0.67T - 13.7$

i.e. 1°C change in air T for every 1.5 part-per-thousand change in $\delta^{18}O_{\text{ice}}$

1. DIRECTION of climate change
   (is it getting warmer or cooler?)

Trend A - decrease in temperature since
10 ka at a rate of .000024 del 18-oxygen per year (p=.01)
Variation in MAGNITUDE of Greenland temperature, last 5,000 years

Late 20th century warming is not unique, nor is it the most pronounced in the history of civilization, i.e. over the last 5 thousand years.
The Temperature Trend since 1998 is Cooling