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Paleo-temperature from Ice Cores: a new method based on noble gas isotopes and borehole temperature.

A. Orsi and J. Severinghaus
UC San Diego, Scripps Institution of Oceanography, La Jolla, United States (aorsi@ucsd.edu)

We present here a novel method for reconstructing Holocene temperature from ice cores, combining borehole temperature measurements with isotopes from nitrogen, argon and krypton in air bubbles. Noble gas isotopes record temperature changes in the firn, and this signal can be integrated to produce a temperature history spanning decadal to centennial scale changes. The absolute temperature and long-term trend are not captured by this proxy, but borehole temperature measurement can provide this information. We performed a joined inversion of both data sets to produce a temperature history of the last 1000 years at WAIS Divide, Antarctica, which is independent of the traditional water isotope thermometer, and provides an interesting basis for comparison.
This records shows unequivocal evidence that the period 1400-1800 C.E. was colder than average in West Antarctica, broadly synchronous with the Northern Hemisphere cooling of the Little Ice Age (LIA). This result is consistent with the idea that the LIA was a global event, probably caused by a change in solar and volcanic forcing, and was not simply a seesaw-type redistribution of heat between the hemispheres as would be predicted by some ocean-circulation hypotheses.