

Results from the WAIS Divide ice core and prospects for a 1.5 Ma ice core site

Jeffrey P. Severinghaus¹

¹*Scripps Institution of Oceanography*

The WAIS Divide ice core was completed on Dec. 31, 2011 at a depth of 3405 m, about 50 m above the bedrock (the bed was not penetrated for biological stewardship reasons). Initial results show that the record extends to 68 ka with unprecedented resolution of the abrupt climate change events of the last glacial period. The high accumulation rate during the glacial period (~15 cm/yr) causes the gas-age-ice-age difference to be only 300-400 yr during most of this time with an estimated error of less than 100 yr. Interhemispheric synchronization thus allows the detailed timing of Antarctic AIM events and Greenland DO events to be examined rigorously for the first time. A layer counted timescale was completed to ~30 ka and is consistent with the Hulu cave record at that point, but is slightly older than GICC05. Stable water isotopes imply that warming in west Antarctica began around 22 ka, somewhat earlier than seen in east Antarctic records.

The international community has set a long-term goal of recovering an ice core record over the past 1.5 million years, a time period over which the climate changed from glacial cycles with a 41 kyr period to the present quasi-100 kyr period. Because intact ice of this age will be difficult to find, rapid access drilling in a reconnaissance mode will be helpful prior to actual coring. A rapid access ice drilling tool (RAID) is in the design phase in the US program, and will employ conventional rock coring and mineral exploration technology to simultaneously recover bedrock cores for geological mapping of the Antarctic interior while allowing borehole optical logging to establish the ice chronology. First deployment using South Pole as a base is estimated for 2016-2017 season. Site selection for a 1.5 Ma ice core could be complete by 2019.