What can ANDRILL tell us of long-term WAIS history?

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#http://www.andrill.org/support/references/appendixc.html

WAIS long-term history is written in the pages of Antarctica's marine sedimentary record. But reading these important books presents several challenges. First of all, more often than not, most of the pages are missing. Secondly, most of the books are buried in technologically and logistically inaccessible places. Third, we have an incomplete grasp of the various languages simultaneously printed on those exciting pages. Once recovered, the independent and collaborative toils of a diverse group of scientists, including sedimentologists, paleontologists, geochemists, and geophysicists unlock the secrets of the precious recovered pages.

A thick, detailed, and fantastic new volume has been discovered! We now enjoy a huge step forward following the inaugural drilling season of the ANDRILL (Antarctic Geological Drilling) McMurdo Ice Shelf project in the 2006 field season. ANDRILL-MIS (Core AND1B) recovered – by far – the best and most detailed record available from the Antarctic marginal sea, spanning most of the last 12 million years, with a particularly remarkable record of the last 5 Ma – a key interval in WAIS history.

AND-1B, recovered from beneath the northwest corner of the Ross Ice Shelf, south of Scott Base, contains a superb record of Antarctic continental shelf sediments. 1,285 m of core, with ~99% recovery, was retrieved from 900m of water beneath 80m of ice shelf. The upper c. 600m of core includes a detailed Pliocene and early Pleistocene sedimentary record, composed of alternating glacial diamictites and relatively pure diatomites, with episodic volcanic facies. The diatomites document extended periods of open marine conditions with reduced ice, in an area currently covered by an ice shelf. The diatomites reflect high biosiliceous productivity, and most reflect warmer than present conditions with variable sea ice and ice rafting. Many or most represent an absence of a large ice shelf, whereas diamictites reflect glacial advances. The late Pleistocene record consists overwhelmingly of massive glacial diamictites reflecting last glacial maximum and possibly earlier late Pleistocene grounding events.

Several key warmer than present events are well represented, including a brief but unusually warm early Pleistocene interglacial, strongly cyclic late Pliocene glacial-interglacial cycles, and a massive (>100m thick) early Pliocene diatomite that likely reflects significantly reduced ice, including West and likely parts of the East Antarctic ice sheet. Studies of transitions between diatomites (interglacials) and diamictites (glacials) are underway in an effort to constrain the rapidity and style of the changes between major climatic regimes.

Establishing the long-term development and evolution of the Antarctic ice shelves and ice sheets will provide critical constraints for models that seek to predict future ice sheet behavior.