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UNH Scientist Helps Show Collapse of Antarctic Ice Shelf is "Unprecedented"

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Aug. 3, 2005

DURHAM, N.H. -- A paper to be published in the August 4 issue of the journal *Nature* asserts that the recent collapse of the Larsen B Ice Shelf in the Weddell Sea of Antarctica is "unprecedented" in recent times. The ice shelf – the third largest in the Antarctic – has undergone catastrophic decay in recent years. A total of about 3, 250 square kilometers of the shelf area disintegrated in a five-day period in the winter of 2002. Over the last five years the ice mass has lost some 5,700 square kilometers and is currently 40 percent the size it was previously when stable.

Using marine sediment cores from the ocean floor formerly covered by the ice shelf, scientists found no evidence for "episodes of open marine conditions" indicating that the ice shelf has been in existence for last 8,000 years – a period of time referred to as the Holocene Epoch.

"Our unique observation, that for the first time the Larsen B is involved in collapse, indicates that the current warming trend in the NW Weddell Sea has exceeded past warm episodes in its magnitude," states the paper, whose lead author is Eugene Domack of Hamilton College.

University of New Hampshire scientist Michael Prentice, one of the article's authors, is an expert in the paleoceanographic technique used to extract past ocean properties from the seafloor sediment. The technique involves analyzing the chemical composition of the remains of tiny, one-celled animals called Foraminifera or "forams." The technique, according to Prentice, is technically challenging in polar regions but highly accurate at giving a clear picture of past water temperatures and salinity levels.

Says Prentice, "Some of the forams in the cores lived and died in the surface water adjacent to the ice shelf before settling to the seafloor to be incorporated into the sediment that we recovered. A pristine record of ocean surface water can be had from analyzing them." Prentice calls forams the "workhorse" in the field of paleoclimatology.

The method involves dissolving the carbonate shells of the tiny forams and, using a mass spectrometer, measuring the oxygen isotopes contained within the carbon dioxide gas that comes from the shells. Because the ratio of oxygen isotopes in the shells is controlled by the water conditions at the time the forams were living, forams from layers of accumulating sediment give a clear record of water conditions from the present back deep into the past.

"We got a pretty good fix on what the longer history of ice shelf extent and melting has been," Prentice says. This fix, in turn, gives scientists a context for judging the significance of the current collapse. Prentice adds, "These data are the first good isotopic record adjacent to a crumbling ice shelf."

And that isotope record, he says, suggests that there has been a progressive slow melting/thinning of the ice shelf over the last 8,000 years. "This is due in part to climate warming. But melting over the last 8,000 years was never close to what it is today, and so the current collapse and glacier surge that it has unleashed are unprecedented." He adds, "The Larsen B is considered a harbinger for the massive ice shelves to its south, which, for now, dam the large majority of the world's ice. "