Geophysical Research Abstracts,
Vol. 11, EGU2009-5895, 2009
EGU General Assembly 2009

Did the West Antarctic Ice Sheet collapse during late Pleistocene interglacials: A reassessment

R.P. Scherer
Northern Illinois University, Geolgoy & Environmental Geosciences, DeKalb, United States (reed@geol.niu.edu)

Ever since John Mercer's provocative paper, "West Antarctic ice sheet and CO2 Greenhouse effect: a threat of disaster" (Nature 271:321-325; 1978), researchers have grappled with questions regarding whether, when, how frequently, and, especially, how quickly the West Antarctic Ice Sheet has disintegrated and reformed during the Pliocene and Pleistocene (and whether and when it may again in the future). Oxygen isotope records, being global averages, are insufficient to answer these questions, because (1) the WAIS signal is relatively small, and (2) antiphased behavior between the poles of the precession cycle will tend to cancel part of the signal, as outlined by Raymo et. al. (Science 313, 492-495, 2006).

Previously, Antarctica lacked proximal, well-dated Pleistocene and Pliocene marine geologic records, so eustatic, mostly tropical sea-level records were used to infer past WAIS collapses. The first direct evidence of past Pleistocene WAIS collapse came from diatoms recovered from beneath the WAIS on the Whillans Ice Stream (UpB). Scherer (GPC, 4, 395-412, 1991) and Scherer et al. (Science, 281, 82-85, 1998) interpreted these results as most likely reflecting WAIS retreat during MIS-11, but could not rule out other interglacials, including MIS-5e, the penultimate interglacial discussed by Mercer. More recently, proximal evidence of WAIS retreat (or collapse) during early Pleistocene MIS-31 came from drilling at Cape Roberts (CRP-1) and the ANDRILL McMurdo Ice Shelf project (AND-1B) (Scherer et al., GRL, 35, doi:10.1029/2007GL032254, 2008).

These diatom results provide evidence of ice sheet retreat events, but no constraint on the rate of ice sheet "collapse," which is critical to assessing the threat of future collapse. These results provided impetus and constraints for new coupled climate/ice sheet models, which are yielding significant insights (Pollard and DeConto, Nature, in press).

The ANDRILL-MIS site contains no clear evidence of WAIS collapse events subsequent to MIS-31, but there is poor age control in the recovered diamictons. Furthermore, evidence of significant interglacials may have been lost in glacial erosion. A reassessment of diatom data from UpB indicates that the Pleistocene diatoms identified from beneath the WAIS are compatible with MIS-31 deposition as well as late Pleistocene marine deposition. This, once again, leaves the question of the configuration of the WAIS during MIS-11, MIS-5e and other late Pleistocene interglacials open for discussion.