



Threshold Behavior of a Marine-Based Sector of the East Antarctic Ice Sheet in Response to Early Pliocene Ocean Warming

Melissa Hansen (1), Sandra Passchier (1), Boo-Keun Khim (2), and Trevor Williams (3)

(1) Montclair State University, Earth and Environmental Studies, Upper Montclair, United States (passchiers@mail.montclair.edu), (2) Department of Oceanography Division of Earth Environmental System, Pusan National University Busan 609-735, Korea, (3) Lamont Doherty Earth Observatory of Columbia University, PO Box 1000, 61 Route 9W, Palisades, New York 10964, USA

We investigate the stability of the East Antarctic Ice Sheet (EAIS) on the Wilkes Land continental margin, Antarctica, utilizing a high-resolution record of ice-rafted debris (IRD) mass accumulation rates (MAR) from Integrated Ocean Drilling Program (IODP) Site U1359. The relationship between orbital variations in the IRD record and climate drivers was evaluated to capture changes in the dynamics of a marine-based ice sheet in response to early Pliocene warming. Three IRD MAR excursions were observed in the early Pliocene and confirmed via Scanning Electron Microscope (SEM) microtextural analysis of sand grains. Time series analysis of the IRD MAR reveals obliquity paced expansions of the ice sheet to the outer shelf prior to ~ 4.6 Ma. A decline in the obliquity and a transition into a dominant precession response of IRD MAR occurs at ~ 4.6 Ma along with a decline in the amplitude of IRD MAR maxima to low background levels between ~ 4.0 and ~ 3.5 Ma. We speculate that as SST began to peak above 3°C in the early Pliocene warm period, the ice shelves thinned leading to a greater susceptibility to precession forced high-latitude climate variability and the onset of persistent retreat of the marine-based portion of the EAIS.