

East Antarctic deglaciation and the link to global cooling since the Pliocene

SUGANUMA, Yusuke^{1*} ; MIURA, Hideki¹ ; ZONDERVAN, Albert³ ; OKUNO, Jun'ichi²

¹National Institute of Polar Research, ²JAMSTEC, ³GNS, Science

Reconstructing past variability of the Antarctic ice sheets is essential to understand their stability and to anticipate their contribution to sea level change as a result of future climate change in a high-CO₂ world. Recent studies have reported a significant decrease in thickness of the East Antarctic Ice Sheet (EAIS) during the last several million years. However, the geographical extent of this decrease and subsequent isostatic rebound remain uncertain and a topic of debate. In this study, we reconstruct magnitude and timing of ice sheet retreat at the Sor Rondane Mountains in Dronning Maud Land, East Antarctica, based on detailed geomorphological survey, cosmogenic exposure dating, and glacial isostatic adjustment modeling. Three distinct deglaciation phases since Pliocene for this sector of the EAIS are identified, based on rock weathering and ¹⁰Be surface exposure data. We estimate that during the Plio-Pleistocene the ice sheet thinned by at least 500 m. This thinning is attributed to the reorganization of Southern Ocean circulation associated with the global cooling into the Pleistocene, which reduced the transport of moisture from the Southern Ocean to the interior of EAIS. The data also show since the Last Glacial Maximum the ice surface has lowered less than ca.50 m and probably started after ca. 14 ka. This suggests that the EAIS in Dronning Maud Land is unlikely to have been a major contributor to postglacial sea-level rise and Meltwater pulse 1A.