Deglaciation history of Dronning Maud Land (East Antarctica) constrained by glacial geomorphology and ^{10}Be exposure dating: implication for Plio-Pleistocene climate evolution of the Antarctic cryosphere

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A reconstruction of past variability of the Antarctic ice sheet is essential to understand its stability and anticipate its contribution to sea level change with future climate change in a high-CO_2 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 the precise magnitude and timing of ice sheet retreat at the Sør Rondane Mountains in Dronning Maud Land, East Antarctica, based on detailed geomorphological survey, cosmogenic exposure dating, and glacial isostatic adjustment (GIA) modeling. Three distinct phases of deglaciation for this sector of the EAIS since Pliocene are identified based on rock weathering and ^{10}Be surface exposure data. The ice sheet thinning in this region during the Plio-Pleistocene is estimated to be ca. >535 m. This thinning is thought to be caused by the reorganization of Southern Ocean circulation associated with the global cooling into the Pleistocene, resulting in a reduction of the moisture transport from the Southern Ocean to the interior of EAIS. Our data show that the ice surface lowering since LGM is small (< 50 m) and probably started after ca. 14 ka, suggesting that the EAIS in Dronning Maud land is unlikely to be a major contributor to postglacial sea-level rise and Meltwater Pulse 1A.