Spatiotemporal variations in the ice mass of East Antarctica during the Holocene revealed by sea-level observations and GIA modelling

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The East Antarctic Ice Sheet (EAIS) has water equivalent to approximately 53 meters sea level (Fretwell et al., 2013) and serves as a critical region for understanding ice-sheet and climate interactions. Although the EAIS demonstrates a longer response time, studies employing geological data and model simulations provide significant perspectives on its behavior. However, the expansive geography and the logistical constraints have restricted research on past changes in the EAIS, leaving many aspects unexplored. Within the Indian Ocean sector of East Antarctica, the Lützow-Holm Bay and Prydz Bay are areas where various cosmogenic nuclide dates and sea-level data have been reported (e.g., Hodgson et al., 2016; Kawamata et al., 2020; Miura et al., 1998; Suganuma et al., 2022; Verleyen et al., 2017). Recent studies indicated that the large-scale ice sheet thinning occurred during 9 to 6 ka in Dronning Maud Land and Enderby Land of East Antarctica, delayed from the commonly used ice loading history of Glacial Isostatic Adjustment (GIA) modelling, specifically the ICE-6G model (Argus et al., 2014). After refining the ice loading history for this delay, it is necessary to compare calculated sea levels by GIA modelling with sea-level reconstructions to evaluate the validity of this refinement. The sea levels by GIA modelling are consistent with sea-level observations. The results suggest that the difference in sea-level changes during the Holocene is primarily due to the differences in the timing of ice mass loss in the east and west of the Indian Ocean sector of East Antarctica.

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