Geophysical Research Abstracts, Vol. 9, 06047, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06047

Retreat of the East Antarctic Ice Sheet since the LGM – when and how much : a perspective from "dipstick" cosmogenic exposure dating at the Framnes and Prince Charles Mountains , MacRobertson Land.

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Retreat of the East Antarctic Ice Sheet (EAIS) and its contribution to the $\sim$120 m sea level rise that occurred since the Last Glacial Maximum (LGM) around 19 ka has been studied using altitudinal transects of ^{10}Be and ^{26}Al exposure ages at the coastal site of the Framnes Mountains (62^0 E) and along the Prince Charles Mountains (70^0 E) flanking the Lambert Glacier–Amery Ice Shelf drainage graben in MacRobertson Land. The application of cosmogenic exposure dating of moraines, glacial deposits and bedrock surfaces from the last deglaciation has added a new dimension to such studies aimed at quantifying changes in past ice sheet surfaces.

At Framnes, the coastal EAIS thinned by no more than 350 m during the last 13 ka and the present ice sheet profile was attained at $\sim$7 ka, in contrast to the West Antarctic Ice Sheet which continues to retreat today. Along the Lambert graben, the extended concave profile of local LGM moraines observed from Mt Ruker, Stinear to Loewe Massif, a longitudinal distance of 500 km, reflects strong ice streaming of this extensive drainage system at this time. Exposure ages at and below LGM moraines indicate that downwasting in the coastal "ice stream" zone occurred between 18 and 12 ka, preceding the decrease in the interior inland, "ice sheet" zone by 3-6 ka. This early ice volume reduction in regions of strong ice streaming of the East Antarctic Ice Sheet indicates a heightened sensitivity to climate change and Antarctic warming at

and since the LGM.

Overall, in conjunction with regional marine sediment records (from Prydz Bay) and terrestrial geologic evidence (from Larsmann and Bunger Hills), our combined data sets suggest that (a) the extent of the EAIS at MacRobertson Land at LGM was far smaller than that indicated by contemporary ice sheet models and (b) that ice volume reduction since LGM added little meltwater to the global oceans. Moreover, the timing of this retreat shows that this region of the EAIS is unlikely to be the source of Meltwater Pulse 1A – a 20m rise in sea-level at about 14.5 ka. Stability of the ice margin since the mid-early Holocene provides support for the hypothesis that EAIS volume changes are controlled by growth and decay of Northern Hemisphere ice sheets and associated global sea level changes.