

THE GEOLOGICAL RECORD OF NEOGENE ICE SHEET CHANGE IN THE LAMBERT-AMERY ICE SHELF SYSTEM AND CLIMATE PROCESSES CONTROLLING ICE BEHAVIOUR

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The record of Neogene ice behaviour in the Lambert – Amery system derived from Prydz Bay and the Prince Charles Mountains is one of a progressive cooling trend but also a reduced ability of the ice stream to advance to the shelf edge. In the late Miocene, the Lambert Amery system built a shelf edge across Prydz Bay but in the early Pliocene, ice from the Ingrid Christensen Coast became more important, deflecting inland drainage to the west. During the early Pleistocene, ice volumes reached a maximum that has not been exceeded since and after the mid Pleistocene, advances to the shelf edge became less frequent, with the ice stream grounding only just seaward of the present Amery Ice Shelf edge during the LGM.

These trends reflect several processes. The first is the progressive over-deepening of the inner shelf and inner parts of major outlet glaciers. This is a unidirectional rather than cyclic effect and has meant that major outlet glaciers have become progressively less important in delivering sediment to the shelf edge. The second major process is seaward migration of the zone of maximum accumulation as the ice sheet grew and the orographic uplift of moisture laden air was pushed seaward. The third process involves a long term trend similar to oscillations in climate known as the Southern Annular Mode. The polar high pressure system grew over the continent and the band of low pressure systems that circle the continent were forced northward. The size and strength of the polar high controlled how far storm tracks penetrated the interior and so the distribution of snowfall. Finally, the change from 41 ka cycles to 100 ka cycles during the mid Pleistocene also reduced the positive feedback between the Lambert Glacier response time and the length of the sea level cycle.