



Geochemical and isotopic signatures of ice shelves and ice shelf circulation in marine sediments

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Ice shelves are a key component of the ice sheet drainage network. Most ice lost from the present day Antarctic ice sheet occurs via ice shelves, so ice shelf processes (e.g. calving and basal melt) modulate ice sheet mass balance.

Knowledge of the past distribution and geometry of ice shelves will help understand their sensitivity to climate forcing, and the response of ice sheets to changes and loss of ice shelves. However, detecting the presence or absence of past ice shelves in the sedimentary record is challenging. In this study, we compare concentrations of elemental and isotopic tracers in modern sediments in open water in Prydz Bay to those being deposited underneath the Amery Ice Shelf at ten sites across the region.

Our results suggest that sub-ice shelf and open water sediments differ in their acid-extractable elemental concentrations. Also, meteoric Be-10 concentrations are on average lower in sub-ice shelf settings than they are in open water environments. However, the Be-10 concentration is modulated by sub-ice shelf ocean circulation, so that there is overlap between the sediment concentrations in these two environments. In combination, we suggest that these tracers can be used as proxies to reconstruct former ice shelf geometries and sub-shelf circulation.