



Provenance of Late Quaternary glacio-marine sediments under the McMurdo Ice Shelf, Antarctica

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Sea floor sediments beneath the McMurdo Ice Shelf in a 900-m-deep depression behind Ross Island, Antarctica, have been cored through access holes at two sites, and provide a record of sedimentation from the Last Glacial Maximum (LGM) to the present day. The first site was located 5 km and the second one 12 km from the ice shelf edge; water depth at both sites was about 920 m. At Site 1, 31 cm of mud and lesser sand deposited over the last 22Ka (age model based on ^{14}C ages on bulk total organic carbon) overlies a 30-cm-thick diamicton deposited during the Last Glacial Maximum. At Site 2, the entire core is mud deposited over the last 12Ka (Barrett et al., 2005).

Geochemical analyses of bulk sediment and the mud fraction by XRF, analyses of sand-size heavy minerals and standard petrographic analyses of the sand fraction, have been carried out on samples from both sites to track variations in sediment provenance through the late Quaternary, and provide a possible basis for indicating movements of the ice shelf front. All three sets of analyses show that the sediments are a mix of local Neogene McMurdo Volcanic Group rocks (MVG) and Transantarctic Mountains (TAM) source rocks to the south and west.

Provenance for the diamicton at Site 1 indicates a strong TAM signal, suggesting that the site during the LGM was over-ridden by ice sourced from the TAM, most likely from the south. The overlying mud is dominated by a MVG signal, representing reworking of local volcanoes by sub-ice shelf currents. An increase in TAM grains in the upper 7 cm at Site 1 may represent the break-out of the ice shelf in McMurdo

Sound, the grains being transported from the mountains of western McMurdo Sound via drifting sea ice and subice shelf currents to Site 1. Site 2, 7 km more distant from the shelf edge, is dominated by a MVG signal with little variation, suggesting that the McMurdo Ice Shelf calving line has not retreated past that site during the Holocene.

Reference: Barrett, P.J. , L. Carter, D. Damiani, G.B. Dunbar, E. Dunker, G. Giorgetti, M.A. Harper, R.M. McKay, F. Niessen, U. Nixdorf, A.R. Pyne, C. Riesselmann, N. Robinson, C. Hollis and P. Strong, 2005. Oceanography and sedimentation beneath the McMurdo Ice Shelf in Windless Bight, Antarctica. Antarctic Data Series 25, Antarctic Research Centre, Victoria University of Wellington, 92 pp, 5 appendices. www.geo.vuw.ac.nz/antarctic