223

PROVENANCE AND DEPOSITIONAL HISTORY BENEATH THE MCMURDO ICE SHELF IN WINDLESS BIGHT, ROSS SEA

R M McKay, P J Barrett Barrett, G B Dunbar

Victoria University of Wellington, Wellington, New Zealand

Sediment transport paths beneath the McMurdo Ice Shelf since the Last Glacial Maximum (LGM) are examined through petrographic and chemical analysis of sediment cores taken beneath Windless Bight. The two core sites come from a flat sea floor in over 900 m of water 5 and 12 km east of the ice shelf front. A third site may be cored in early 2006. The bedrock of the region is of two main types - the quartz-free Cenozoic McMurdo Volcanic Group (MVG) of Ross Island and volcanoes to the south and southwest, and the quartz-rich Cambro-Ordovician basement overlain by Beacon sandstone and Ferrar dolerite forming the Transantarctic Mountains (TAM) 100 km to the west.

Potential transport mechanisms for TAM sand include 1) transport in basal glacier ice from the TAM to the south of Minna Bluff, 2) sand blown onto the ice shelf surface, buried by snow and released by basal melting, and 3) sand released from sea ice and bergs in ice-free McMurdo Sound and carried beneath the shelf by currents. These today can carry sand only ~1 km under the shelf before the grains settle out.

LGM diamict from the lower core from Site 1 was deposited during periods of extensive grounded ice, and contains a significant amount of quartz and a chemical signature typical of TAM lithologies, suggesting a glacial transport path from the south. After the ice retreated, sedimentation was mostly of reworked local MVG. However, there is a progressive increase in the proportion of TAM sand at the Site 1, 5 km from the shelf edge, throughout the Holocene. This could be due either to retreat of the shelf edge, exposing the site to ice-bergs or sea ice with sand from the TAM, or to much stronger eastward current flows. Study of a 20-m-deep core from the ice shelf revealed only volcanic debris, ruling out quartz wind-blown across the ice shelf surface as a source.