THE SEDIMENTOLOGY OF HOLOCENE PRYDZ BAY: SEDIMENTARY PATTERNS AND PROCESSES

by

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STATEMENT

All analyses, arguments, and conclusions presented in this work are original, except where acknowledged in the customary manner.

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AUTHORITY OF ACCESS

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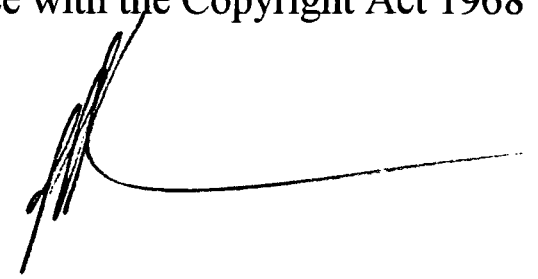

Dennis Franklin

QUOTES

"On the whole, I'd rather be in Philadelphia"

W. C. Fields, last words.

"No problem is too big to run away from"

Snoopy the Dog

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

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ABSTRACT

Material being deposited in Prydz Bay is glaciogenic, aeolian, and biogenic. Terrigenous material is entrained by basal glacial erosion and introduced to the sea via iceberg rafting, meltout, and rollover in the periphery of Prydz Bay where iceberg drift tracks are determined by ocean currents. It accounts for the deposition of about 8 Mt a^{-1}.

Aeolian processes transport debris from coastal oases into the marine environment in the summer or onto fast sea-ice during the winter. Sea-ice breaks out and releases the debris into the water column as it melts within a few hundred kilometres of the source, accounting for approximately 1 Mt a^{-1} of sediment.

The skeletons of phytoplankton settle to the sea floor directly or via the faecal pellets of predacious zooplankton. Although production is geographically uniform, the deposition of the resultant ooze depends on bottom currents concentrating the fine material in deep water basins (eg. Amery Depression). Approximately 0.75 Mt of such material is deposited annually.

The deposition of the remains of calcareous organisms is important in water depths above 400 m, mainly on the shelf break, due to a shallow Calcite Compensation Depth and Lysocline. Approximately 0.5 Mt of calcite is deposited annually.

Sediments are reworked by iceberg turbation between 200 and 720 m water depth producing iceberg turbate, an admixture of the current sediment supply and underlying relict tills. Elsewhere, the sediment is a Siliceous Mud and Ooze (SMO) which broadly represents the contemporary sediment supply.

Sedimentation rates are at the lower end of the range of Antarctic rates: between 0.08 mm a^{-1} and 0.16 mm a^{-1}. Were the sediments sourced from the Lambert Glacier, sedimentation rates would be an order of magnitude higher,

indicating that the source of the glacial constituent is smaller, probably the glaciers along the coast. As such, sedimentary changes in Prydz Bay during the Holocene are indicative of small scale climate change rather than any large scale change required to affect the Lambert Glacier catchment.

The sub-surface sedimentology offshore from the Sørsdal Glacier indicates that a significant marine influence existed in the area during the last glacial maximum, and the Lambert Glacier was not grounded in the Svenner Channel during this period. The sub-surface geology of Heidemann Valley in the Vestfold Hills also suggests that ice extent during the last glacial maximum was not as extensive as previously thought, with glacial ice not extending as far as the coast.