CHANGES IN GLACIAL-MARINE SEDIMENTATION IN CORE HU77-159, FROBISHER BAY, BAFFIN ISLAND, N.W.T: A RECORD OF PROXIMAL, DISTAL, AND ICE-RAFTING GLACIAL-MARINE ENVIRONMENTS

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ABSTRACT

Core HU77-159 from Frobisher Bay, Baffin Island, Canada records the sedimentologic and biologic conditions associated with three distinct glacial-marine sediment types that can be correlated to a $^{14}$C dated terrestrial glacial chronology. The chronology of events recorded at the core site is controlled by five $^{14}$C dates and by paleomagnetic studies. During the Hall glacial advance in Frobisher Bay at shortly before 10,760+ yr B.P., proximal glacial-marine conditions are recorded in HU77-159. The proximal glacial-marine sediments consist of clay, rich in detrital carbonate and other clay-sized minerals, which suggest erosion of bedrock, a low rate of sand influx, but increased quartz grain angularity, and a characteristic low diversity Elphidium excavatum forma clavata foraminiferal assemblage. Distal glacial-marine sediments are found directly above and below the proximal sediments, and these record conditions prior to and after the Hall advance. Ice-distal glacial-marine sediments are typically silty clays, with moderate CaCO$_3$ percentages, sand influx, and grain angularity. Benthic foraminifera in ice-distal glacial-marine sediments, are more abundant and diverse than in the ice-proximal environment reflecting an improved environment. In the upper portion of HU77-159, ice-rafted glacial-marine sediments have been deposited since the removal of glacier ice from Frobisher Bay. Ice-rafted sediments are noticeably sandier than the lower units and contain maxima of sand influx and grain angularity. Benthic foraminifera in the ice-rafting environment are the most abundant and diverse assemblages in

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the last 12,000 yr. Marine sedimentological processes have been dominant in middle Frobisher Bay at depths of 500–600 m throughout the Holocene.

INTRODUCTION

In the last two decades research into the character of glacial-marine sedimentation has increased enormously. When Carey and Ahmad (1961) wrote their now classic paper, the major source of information on glacial-marine sediments were descriptions from Pre-Quaternary outcrops. However, with the exploration of polar coastal and deep-sea regions over the last two decades, the data base on glacial-marine sediments is now a much firmer footing (Andrews and Matsch, 1983). The major cause for acceleration in our knowledge has been the acquisition of ship-based information, primarily grab samples, acoustic seismic stratigraphy, and gravity and piston cores.

The literature on glacial-marine sedimentation includes descriptions and models from many areas of the world. Coastal Alaska has been the foci for many studies (Ovenshine, 1970; Molnia, 1981; Powell, 1981) as has the continental shelf of Antarctica (Anderson and others, 1979, 1980; Anderson and Kurtz, 1979; Kellogg and others, 1979; Drewry and Cooper, 1981). Some important papers have also been generated from studies in Spitsbergen (Boltunov, 1970; Elverhøi and others, 1980; Elverhøi and Bomstad, 1980). However, when we examine the presently glaciated margins of the world and those that were glaciated during the late Quaternary, it is evident that the areas of Greenland and the Eastern Canadian Arctic are poorly known in terms of glacial-marine sediments and sedimentation (see Kravitz, 1982, and this volume). Models of glacial-marine sedimentation in shallow offshore waters have been developed by our colleagues to help explain the vertical and lateral variations in raised glacial-marine facies (Nelson, 1978, 1980, 1981; Mode, 1980; Brigham, 1980; Mode and others, this volume) but virtually nothing is known of the character of glacial-marine sediments in the fjords or on the continental shelf. Gilbert (1982) has recently documented some oceanographic and sedimentologic characteristics of the glacial-marine proximal zone fronting the Coronation Glacier, eastern Baffin Island, and Aksu (1980) and Fillion and others (1981) have documented variations in deep-sea glacial-marine sediments and rate of ice-rafted detritus input into cores from...