



A re-evaluation of the late Pliocene - Pleistocene behavior of the Scoresby Sund sector of the Greenland Ice Sheet

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A major conclusion of Ocean Drilling Program Leg 162, drilling the western Svalbard and eastern Greenland continental margins, was that the Svalbard – Barents Sea Ice Sheet reached the shelf edge during peak glaciations much more frequently than the Greenland Ice Sheet during the late Pliocene – Pleistocene period. Both areas have a continental margin dominated by large, across-shelf oriented troughs terminating at the shelf edge. In front of these troughs, large depocenters of glacial sediments, Trough-Mouth-Fans (TMFs), are located. Ice streams drained the ice sheets through these troughs during glacials, eroding and transporting large quantities of sediments to the shelf edge from where they subsequently were remobilized as glacial debris flows. The deposits of the latter have a characteristic lens-shaped morphology in cross-section. In order to tie the stratigraphy of ODP Site 987, located on the very distal part of the Scoresby Sund TMF on the east Greenland continental margin, to the more proximal parts where most of the glacial sediments have been deposited, a regional seismic line was acquired. The seismic line reveals that lithological unit IIA of site 987, interpreted to be debris flow deposits, corresponds to an acoustically transparent unit. The overlying lithological unit I, found to be dominated by hemipelagic sediments comprising varying amounts of ice-rafted debris, is acoustically laminated. Tracing this unit south-westwards shows a transition from an acoustically laminated facies to stacked sub-units of transparent lenses of glacial debris flows, very similar to the signature of other TMFs. This shows that ODP Site 987 was located too distal to sample the glacial debris-flow deposits that dominate the deposits of the last ~2.58Ma on the more proximal part of the fan. From this we conclude that at least the Scoresby Sund sector of the East Greenland Ice Sheet had a much more dynamic behavior during the late Pleistocene – Pleistocene period than previously realized. These fluctuations were most likely responses to the pronounced climatic fluctuations characterizing this period. The new observations have important implications for assessing the behavior of the Greenland Ice Sheet to future climate.