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Sediment stratigraphy records the deglacial history of Jakobshavn Isbræ, West Greenland

Kelly Hogan (1), Julian Dowdeswell (1), Colm Ó Cofaigh (2), Justin Dix (3), and Carol Cotterill (4)

(1) Scott Polar Research Institute, University of Cambridge, Cambridge, U.K., (2) Department of Geography, Durham University, Durham, U.K., (3) National Oceanography Centre, University of Southampton, Southampton, U.K., (4) British Geological Survey, Edinburgh, U.K.

Jakobshavn Isbræ is one of the largest and most important ice streams draining the Greenland Ice Sheet (GIS). During the retreat of the GIS from its position on the continental shelf at the Last Glacial Maximum the grounded margin of the isbræ halted close to the entrance to Jakobshavn Isfjord for around 1000 years at c. 8.8 ka. During this time large volumes of glacier-related sediments were released into the eastern Disko Bugt and deposited in a series of deep, narrow basins on the inner continental shelf.

Here we present three types of seismic data along with evidence from sediment cores and describe deglacial sediment accumulation in front of Jakobshavn Isbræ. The distribution and character of the sediments show that there is a complex interplay between proximity of the ice-margin, bedrock topography and climate as controlling factors on the sedimentary evolution of this area. A comprehensive survey of 3.5 kHz TOPAS data acquired in 2009 allows us to calculate total Quaternary sediment volumes in Disko Bugt for the first time. The deglacial sediments, which are >200 m thick in places, are dominated by stratified sequences although mass-flow deposits are common in younger units and may represent instabilities at the ice margin as the ice sheet retreated into the fjord. Individual mass-flow deposits, which can downcut into stratified sediments, are mapped and volumes are quantified; the damming of these units by bedrock highs indicates that the steep bathymetry of Disko Bugt was an important control on sedimentary architecture. Indeed, channels and sediment lobes visible on the seafloor from swath-bathymetry data attest to the fact that slope failures and sediment gravity flows have remained an important sedimentary process in this area. In places, the sediments are also deformed most likely as a result of high deglacial sedimentation rates and water/gas escape.