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Morphology and sedimentology of glacigenic submarine fans on the west Greenland continental margin

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Along the West Greenland continental margin adjoining Baffin Bay, bathymetric data show a series of large submarine fans located at the mouths of cross-shelf troughs. Two of these fans, the Uummannaq Fan and the Disko Fan are trough-mouth fans built largely of debris delivered from ice sheet outlets of the Greenland Ice Sheet during past glacial maxima. On the Uummannaq Fan glacigenic debris flow deposits occur on the upper slope and extend to at least 1800 m water depth in front of the trough-mouth. The debris flow deposits are related to the remobilisation of subglacial debris that was delivered onto the upper slope at times when an ice stream was positioned at the shelf edge. In contrast, sedimentary facies from the northern sector of the fan are characterised by hemipelagic and ice-rafted sediments and turbidites; glacigenic debris flows are notably absent in cores from this region. Further south along the Greenland continental margin the surface of the Disko Fan is prominently channelised and associated sediments are acoustically stratified. Although glacigenic debris flow deposits do occur on the upper Disko Fan, sediments recovered in cores from elsewhere on the fan record the influence of turbidity current and meltwater sedimentation. The channelised form of the Disko fan contrasts markedly with that of the Uummannaq Fan and, more widely, with trough mouth fans from the Polar North Atlantic. Collectively these data highlight the variability of glacimarine depositional processes operating on trough-mouth fans on high-latitude continental slopes and show that glacigenic debris flows are but one of a number of mechanisms by which such large glacially-influenced depocentres form.