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The NE Greenland Ice Sheet during the last glacial - a dynamic retreat from the shelf edge triggered by ice melting?

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The dynamics of the north-eastern sector of the Greenland Ice Sheet during the last glacial are still poorly constrained and large uncertainties about its extent exist. We present new swath-bathymetry data and sub-bottom profiles acquired from the outer parts of a shelf-crossing trough. These data reveal glacial landforms suggesting that grounded ice extended to the shelf break. Thus, the hypothesis of a mid-shelf position of the ice sheet in this area during the last glacial maximum is rejected, instead other studies predicting an ice expansion to the shelf break is reinforced. The results presented here also add further details on the behavior of the ice sheet during the initial deglaciation. The outer trough studied was characterized by the formation of a complex pattern of moraine ridges and sediment wedges overlying mega-scale glacial lineations, providing evidence of repeated halts and readvances of the ice sheet during an early phase of its decay. This suggests that the early deglaciation was related to melting of the grounded ice due to temperature increase in the ocean, rather than being triggered by abrupt sea level rise. The latter should, according to established models, result in ice lift-off and a sea floor dominated by landforms formed during full-glacial conditions (mega-scale glacial lineations) and ice disintegration (iceberg plough-marks).