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Cenozoic evolution of the northern Greenland ice sheet: A new prospect for IODP drilling

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The Greenland Ice Sheet (GrIS) is a major freshwater reservoir and a key component of the global climate system so understanding its past dynamic behaviour is crucial for underpinning climate model predictions. New data and results has been produced from late Quaternary records but the long-term history and dynamics of the GrIS is only sparsely understood. The Melville Bugt and Upernavik trough-mouth fans are constructed by a series of prograding units deposited by sediments that were eroded and transported by glaciers streaming into Baffin Bay. Seismic mapping indicate that due to favourable geological conditions, e.g. sustained basin subsidence, top-sets of the glaciated margin succession are extremely well preserved. A recent study reveals eleven major phases of ice stream advance over the northwest Greenland continental margin since the onset of shelf-based glaciation at around 2.8 Ma. The ice advances were interrupted by glacial retreats and sea-level rises, suggested by shelf strata onlaps, which appear to correlate with super-interglacial periods identified in the Siberian Arctic region. To address current knowledge gaps in the evolution and variability of the GrIS and its role in Earth's climate system a proposal has been made to drill along a transect crossing the northwest Greenland margin toward Baffin Bay. The strategy is to retrieve a composite stratigraphic succession representing the Late Cenozoic era from late Oligocene to Holocene. The proposed drill sites will specifically target high-accumulation-rate deposits associated with contourite drifts and potential interglacial deposits within the aggradational wedge. Key objectives are to test if the northern GrIS underwent near-complete deglaciations in the Pleistocene and assess recent models for the change in orbital cyclicities through the Mid-Pleistocene transition. Moreover, the proposal will examine ice-ocean-tectonic interactions and possible linkages between the general decrease in pCO_2 from the Oligocene and the onset of glacial growth in northwest Greenland.