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Holocene ice-ocean interactions: Køge Bugt, southeast Greenland

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We present results from a 174 cm marine sediment core collected from Køge Bugt (Ikeq) in central southeast Greenland. An age model was constructed from five ^{14}C dates and five ^{210}Pb determinations; this demonstrates that the core is composed of sediments that were deposited without interruption over the last ∼9.1 cal. ka. Holocene oceanographic conditions were reconstructed from measurements of the sortable silt mean and from benthic foraminifera assemblage data. Assessment of the sortable silt data demonstrates that they provide a valuable proxy for reconstructing palaeo-current vigour in marine environments dominated by iceberg-rafted debris (IRD) sedimentation. Holocene oceanic conditions in Køge Bugt were characterised by a tripartite history. Warm oceanic conditions occurred in the early-Holocene, this was accompanied by enhanced current-sorting of silt particles; we attribute this to incursion of the core waters of the Irminger Current in Køge Bugt. A period of cooling occurred during the mid-Holocene, this was followed by the establishment of cold, Polar oceanic conditions in the late-Holocene. Holocene glacier activity in Køge Bugt was reconstructed from measures of IRD abundance. We argue that coarse sediment in the core was derived exclusively from icebergs that calved from local outlet glaciers. Consequently, continuous IRD sedimentation demonstrates that glaciers in Køge Bugt remained in tidewater settings throughout the last 9.1 ka. Bed topography data show that the glacial troughs inland of the present-day ice margin are small (≤5 km — Morlighem et al., 2014). Consequently, glaciers cannot have retreated more than 5 km at any point in the record; this is despite climatic and oceanographic conditions during the early-Holocene that were at least as warm as the present-day. This behaviour is attributed to the specific geometry of the area. The glaciers that drain into Køge Bugt flow over relatively steep beds; this allows them to achieve new stable configurations quickly during phases of retreat. Finally, we suggest that the specific physiography of Køge Bugt will restrict the retreat of large outlet glaciers here in future. It is likely that these glaciers will remain in tidewater settings, at least in the short-term, despite the predicted continuation of climatic and oceanic warming.