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Palaeo-ice streams on the west Greenland continental margin during the last glacial cycle

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The Greenland Ice Sheet is currently experiencing short-term mass-balance and dynamic changes at low elevations. These changes may reflect recent climate/ocean warming, or alternatively they may be part of the natural cycle of ice sheet growth and decay. Key to resolving this question is an understanding of long-term changes in Greenland Ice Sheet behaviour during the Late Pleistocene and the Holocene. However, our understanding of the long-term changes in the dynamic behaviour of the ice sheet is still poor, and major outstanding questions remain regarding past ice-sheet extent, and the timing and controls on initial ice retreat in many areas of Greenland. This is particularly the case on the west Greenland continental shelf bordering Baffin Bay. In this region, several major fast flowing outlets, including Jakobshavns Isbrae, currently drain the ice sheet. Marine geophysical and geological data collected in 2009 from the continental shelf and slope on the central west Greenland margin provide a detailed record of the landform and sediment record of these outlets during the last glacial cycle. Multibeam swath bathymetric data show the presence of streamlined bedforms focused along cross-shelf troughs. These streamlined bedforms record the former presence of major fast-flowing ice sheet outlets emanating from Disko Bugt (into which Jakobshavns Isbrae currently drains) and the Umanak fjord system. Geophysical and core evidence indicate that these outlets were grounded as far as the outer shelf/shelf edge. Major submarine fans are present at the mouths of the cross-shelf bathymetric troughs and cores and acoustic records from these fans show that they are composed of a variety of glacially-related mass flow sediments including turbidites and debris flow deposits. The landform-sediment record of these former ice sheet outlets will be discussed as will the results of radiocarbon dating investigations of the timing of ice sheet advance and retreat on the shelf. Dates indicate significantly later deglaciation of the ice sheet from the outer shelf than previous reconstructions have suggested.