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Late Weichselian and Holocene sedimentary environments and ice rafting in Isfjorden, Spitsbergen

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Spitsbergen fjords act as archives that allow the reconstruction of past climatic changes in the European Arctic with high temporal resolution. We analysed one sediment core from central Isfjorden with the purpose of reconstructing the glacial activity in central Spitsbergen during the Late Weichselian and the Holocene. A basal till was deposited prior to 12,700 cal. BP (calendar years before the present). Proximal glacimarine conditions with sediment input from multiple sources prevailed during the Younger Dryas and probably already during the Allerød. Intense iceberg rafting occurred during the final glacier withdrawal from the fjord. The ice fronts had retreated to the heads of the tributary fjords and bays approx. 11,200 cal. BP. Tidewater glaciers apparently existed throughout the entire Holocene. The glacial activity was generally low during the early Holocene, between 11,200 and 10,200 cal. BP and shorter periods of increased sea-ice formation probably occurred. During the Holocene thermal optimum on Spitsbergen (c. 10,000-8800 cal. BP), the formation of sea ice was significantly reduced and ice-rafted debris (IRD) was almost exclusively iceberg derived. The onset of a regional cooling around 8800 cal. BP is reflected by increased IRD flux and increased formation of sea ice. The flux of iceberg-rafted debris increased during the following c. 1000 years. Comparatively high IRD fluxes of mainly iceberg-derived material characterise the period between c. 7800 and 3700 cal. BP. Decreases in IRD flux and iceberg rafting around 3700 cal. BP are related to the ongoing cooling. They are suggested to reflect the increased formation of more shore-fast sea ice and/or more permanent sea-ice cover that generally reduced the drift of sea ice and icebergs. In consequence, icebergs were forced to release large amounts of their debris close to the calving fronts.