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Ice sheet configurations during MIS 4 and MIS 2 on Nordaustlandet, Svalbard

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Earth system models profit from data that constrain last ice sheet configurations and timing of deglaciation in order to predict future changes of the ocean circulation. As model-data comparison for key abrupt climate changes in the past become available further understanding of former ice sheet configurations is needed as ice sheet extent and configuration have an impact on freshwater routing.

The present-day understanding of the ice sheet extension of the Svalbard-Barents Sea ice sheet has been greatly improved by marine bathymetry and lithostratigraphic data supporting the idea of a multi-domed ice sheet with a time-transgressive behaviour in various parts of the Svalbard-Barents Sea. This conference contribution attempts to determine the ice sheet configuration and style on Nordaustlandet, the northernmost island of the European sector reaching into the Arctic Ocean, based on terrestrial data. The timing of deglaciation was investigated by application of 26-Al and 10-Be cosmogenic exposure ages of glacially scoured bedrock. Past glacial ice cover on Nordaustlandet has been thick in lowlands and fjords with erosive behaviour during the Late Weichselian/MIS 2. Though, 26-Al/10-Be ratios of erratic boulders on higher plateaus and hills in distance from the fjord and valley systems indicate no complex exposure history. Boulders in these regions were exposed after a more extensive glaciation in mid-Weichselian/MIS 4. Glacial ice streams were confined to the fjord systems during MIS 2, while glaciers were more extended in MIS 4 and covered also plateaus and hills in certain distance to fjord and valley systems. Only cold based ice residues resisted on higher plateaus and hills during MIS 3 in certain areas and melted in MIS 2.

The Svalbard Barents Sea ice sheet system was dependent on precipitation distribution causing an extended glaciation in the NW part during MIS 4. Precipitation access might have been more limited during MIS 2 when this region was in the lee of the extended ice dome covering Fennoscandinavia and sea ice coverage might have been extended.