Late Weichselian ice-sheet dynamics and deglaciation history of the northern Svalbard margin

Oscar Fransner

* The work presents new marine geological and geophysical results based on airgun, subbottom acoustic and high-resolution swath bathymetric data together with sediment cores from the northern Svalbard margin, north of Nordaustlandet. The results have been integrated with 14C dating in order to interpret the glacial landforms and reconstruct the glacial-postglacial sediment record of the area. This work has been done in order to increase the understanding of the timing, extent and rates of decay of the Late Weichselian Svalbard-Barents Sea Ice Sheet (SBIS).
* Although Kvitøya and Albertini Troughs were occupied by streaming ice during Quaternary, Albertini Trough lacks trough mouth fan (TMF) and has a trough mouth which is withdrawn into the shelf edge. However, Kvitøya Trough has a TMF which has an estimated volume of 1000 km3. The different shelf edge and slope morphology could indicate that Kvitøya Trough was of higher importance for the drainage of the SBIS during the LGM. However, the absence of TMF off Albertini Trough as well as the withdrawn shelf edge is suggested to mainly depend on the down-faulted bedrock below Albertini TM, which gives a large sediment accommodation space there (c.f. Geissler and Jokat, 2004) (Fig. 1).
* IBCAO depth-contours indicate that the Quaternary ice streaming in Albertini Trough originated from Albertinibukta and Duvefjorden (Fig. 2). These ice flows were likely separated by crystalline bedrock until north of Karl XII-Øya, where the ice flows merged (Fig. 2).
* The landform records in Rijpfjorden and Duvefjorden suggest northwards ice flows during the LGM. However, the higher elongation ratios of the Duvefjorden landforms together with the deeper fjord basin there indicate a larger and/or more focused ice flow there compared to in Rijpfjorden. Sedimentary rocks of easier erodibility are more common in Duvefjorden, which probably is the main reason to the different ice flow dynamics between the fjords (Fig. 2).
* De Geer moraines in Rijpfjorden indicate a relatively slow retreat of a grounded glacier in areas <210 m. Deeper areas of Rijpfjorden and Duvefjorden lack retreat-related landforms, suggesting floating glacier fronts affected by calving. 14C ages indicate that inner Rijpfjorden and central Duvefjorden were deglaciated before c. 10.6 cal. ka BP and 11.0 cal. ka BP, respectively.

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Figure 1. (a) Build-up of Kvitøya TMF. The relatively steep slope triggers debris flows that bypass the slope. (b) Albertini Trough lacks a TMF. The main reason to the absence of TMF is likely that the glacigenic sediments that reached the Albertini Trough mouth were deposited in the large accommodation space formed by downfaulted bedrock (c.f. Geissler and Jokat, 2004).

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Figure 2. LGM ice flows on the continental shelf north of Nordaustlandet. Relative ice volume is suggested based on the thickness of the arrows. The terrestrial map is modified from online Svalbardkartet by Norsk Polarinstitutt. The bathymetric background maps are from IBCAO version 3.0 (Jakobsson et al., 2012).

**References**

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