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Late Weichselian – Holocene sedimentary palaeoenvironment and glacial activity in the high-Arctic van Keulenfjorden, Spitsbergen

Philipp Kempf (1,2), Matthias Forwick (2), Jan Sverre Laberg (2), and Tore O. Vorren (2)

(1) Renard Centre of Marine Geology (RCMG), Department of Geology and Soil Science, Ghent University, Krijgslaan 281 S8, 9000 Ghent, Belgium, (2) University of Tromsø, Department for Geology, Dramsveien 201, 9037 Tromsø, Norway

Swath-bathymetry, high-resolution seismics and sediment cores from the outer basin in van Keulenfjorden, Svalbard, were analysed and compiled with published data to investigate sedimentary processes and landforms with the purpose of reconstructing the glacier dynamics in the fjord during the late Weichselian and the Holocene. The fjord was covered with a grounded glacier during the last glacial. During the deglaciation between c. 11.8 and 11.3 cal. ka BP the retreat rates of the ice front accelerated from approx. 80 m a-1 to 190 m a-1. The maximum Holocene glacier extent occurred after two consecutive surges of the glacier Nathorstbreen between 2790 and 2610 cal. years BP, i.e. during a period with the coldest climatic conditions of the Holocene on Svalbard. This surge occurred more than 2500 years earlier than previously inferred for this and most other fjords on Svalbard, suggesting that glacier surges on Svalbard can occur under variable climatic conditions. The surge related sediments are – to our knowledge – the oldest deposits with evidence of glacial surges on Svalbard. Two more surges of Nathorstbreen are known. One at around 1890 AD and the other started in 2008 AD and terminated in 2011 AD. Whether Nathorstbreen surged between 2.6 ka BP and the end of the 19th century remains unknown.