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Seafloor geomorphology of the Storfjorden Trough outer continental shelf

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High resolution geophysical data are used to investigate the pattern and dynamics of former ice flow in the Storfjorden Trough. This glacial marine sedimentary system is located in the northwestern Barents Sea and was occupied by an ice stream during the last glaciation. This ice stream drained ice from southern Svalbard to the north and Spitsbergen banken to the south. This represents a relatively short distance (some kilometers only) from the source of ice to the calving area, meaning that the system likely responded rapidly to climatic changes. Furthermore, this glacial system was close to the Fram Strait, the northern oceanic gateway connecting the Norwegian-Greenland Sea with the Arctic Ocean; a region which plays a fundamental role in controlling the oceanographic and climatic conditions of the Atlantic sector of the Northern Hemisphere. In studying this system, we hope to be able to provide a high resolution record of the last advance and retreat of the NW Barents Sea ice sheet.

A new swath-bathymetric and chirp survey dataset reveals four geomorphic features: small linear furrows, curved furrows, large parallel furrows and a large lobate sediment ridge. The small linear furrows are interpreted to be mega-scale glacial lineations, indicating the presence and paleo-ice flow direction of an ice stream. The curved furrows are interpreted to be iceberg plough marks, whilst the large parallel furrows are interpreted to be plough marks from multi-keeled icebergs. Two seafloor horizons were extracted from 3D seismic cubes in the outer shelf of Bjønøya Trough, show similar patterns of single and multi-keeled iceberg ploughmarks. Finally, analysis of chirp data reveals that the lobate sediment ridge is in fact a wider sediment deposit which continues onto Spitsbergen Banken and is incised by multi-keeled icebergs. A channel identified below the iceberg ploughmarks and traced out to the continental shelf edge is interpreted as a meltwater channel. The glacial geomorphology therefore indicates spatial and temporal variations in the ice sheet dynamics especially during deglaciation.