

Large-scale morphological evidence for past ice-stream flow on the mid-Norwegian continental margin

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Abstract: The Norwegian continental margin has been affected by several cycles of growth and decay of the Fennoscandinavian Ice Sheet. Evidence for this former ice-sheet activity is found in the seismic stratigraphy of the shelf and slope, and in the morphology of sea-floor sediments. The regional bathymetry of the mid-Norwegian shelf (63°N to 68°N) comprises a series of cross-shelf troughs, separated by shallower banks. In Trænadjupet and Suladjupet, streamlined, elongate sedimentary bedforms (known as mega-scale lineations) are found, aligned along trough long-axes. Spacing between ridge-tops is 400–500 m, and ridge width and height are about 250 m and less than 10 m, respectively. Streamlined bedforms are not present on the intervening shallow banks, and terminate abruptly at the trough margins, marking the former boundary of fast glacier flow. On northwestern Trænabanken and on either side of Trænadjupet, lateral ridges are inferred to mark the shear margin of ice streams in Sklinnadjupet and Trænadjupet. The Skjoldryggen Moraine records the seaward limit of Late Weichselian ice-sheet growth, and ridges inshore result from deposition in still-stands during ice retreat. The streamlined bedforms in Trænadjupet and Suladjupet are similar in morphology and scale to streamlined Antarctic bedforms, linked to the former presence of fast-flowing ice streams on the continental shelves of Antarctica. Several geomorphological criteria, identified as diagnostic of past ice-stream flow, are observed in our geophysical studies of the mid-Norwegian shelf. Using these criteria, we identify several fast-flowing ice streams on the western margin of the former Fennoscandinavian Ice Sheet. Numerical ice-sheet model predictions of fast-flowing ice coincide closely with the inferred locations of past ice streams based on the distribution of such suites of diagnostic bedforms.