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Submarine push moraine formation during the early Fennoscandian Ice Sheet deglaciation

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The glacial history in the topographically confined paleo-ice stream drainage route of Vestfjorden, North Norway, was analysed based on multi-beam bathymetric data, high-resolution seismic records and 14C AMS-dated gravity cores. The inner part of the fjord is characterised by axial-parallel megascale lineations. In the central part of the fjord, a succession of transverse ridges form a zigzag like morphology. The ridges become wider and more prominent down-fjord and the largest, up to 40 m high forms the distal part of the Værøy morainal bank system. A second series of similar transverse, zigzag ridges occur in the Røst morainal bank system. They also increase in size down-fjord to terminate by a ~100 m high ridge. A mound, interpreted as a raft of sediment displaced from a similar-sized depression in the Røst morainal bank system, is located ca 8 km beyond the bank, indicating sediment drag and deformation. Seismic records show thrusted and folded sediment blocks within the ridges. The inner ridges of the Røst system terminate at the Værøy system, indicating that the latter is younger than the Røst system. The landforms are inferred to reflect basal processes and the transition from warm-based (inner fjord) to cold-based (outer fjord) conditions, i.e. fast flow followed by basal freeze-on, sediment deformation and morainal bank formation. The moraines formed during the final part of two paleo-ice sheet re-advances. 14C AMS dating indicates a maximum age of 13.7 14C ka BP (16.2 cal ka BP) for the Røst system whereas the Værøy system is inferred to be slightly older than 12.5 14C ka BP (14.5 cal ka BP). This demonstrates that the northern part of the Fennoscandian Ice Sheet behaved in a much more dynamic way during the early deglaciation than previously assumed.

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Further reading
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