



Late Cenozoic evolution of high-gradient trough mouth fans and canyons on the glaciated north-Norwegian continental margin – palaeoclimatic implications and sediment yield

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On the north-Norwegian continental margin high-gradient trough mouth fans contain information about the glacial history encompassing ice sheet behavior and extent, as well as the rates of sedimentation and erosion. In this study, we analyzed 2D- and 3D-seismic data, and reconstructed the Late Cenozoic evolution of this part of the Norwegian margin. The studied sedimentary succession is up to 1.3 km thick and can be subdivided into four seismic units, named S1 (oldest) to S4. Unit S1 is comprised of sediments from a pre-Quaternary phase when the Andfjorden and Malangsdjupet palaeo-canyons were active. Stacked, low-angle westward-prograding clinoforms are inferred to represent the onset of glacially influenced sedimentation, i.e. marking the onset of Quaternary glaciations at ~2.7 to 1.5 Ma (unit S2). The identification of glacigenic debris flows within this unit indicates that glaciers reached the shelf break at least once during this period. Between ~1.5 to 0.7 Ma the glaciations intensified, and high-angle clinoform progradation (unit S3) testify to glaciers reaching the shelf break repeatedly. Fast-flowing ice streams overlying cross-shelf troughs were probably established, depositing subglacial deformation till at the outer shelf that was later reworked by debris flows and turbidity currents. During the last ~0.7 Ma ice streams continued to traverse the troughs, as evidenced by mega-scale glacial lineations on palaeo-surfaces within unit S4 and the modern sea floor. A relatively high sedimentation rate characterized the early glacial phase (unit S2: 0.20 m/kyr), while lower rates are found for the glacial intensification phase (unit S3: 0.15 m/kyr) and the full-glacial phase (0.14 m/kyr). The total average erosion and erosion rate during the last ~2.7 Ma for the estimated catchment area is 53-136 m and 0.020-0.050 m/kyr, respectively. These results, which are minimum estimates, will be compared with previous studies on glacial erosion and sedimentation rates from nearby areas.