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Glacigenic erosion, sediment generation and transport routes in Fennoscandia during Pleistocene – evidence from South Norway

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During the Northern Hemisphere glaciations ice sheets shaped the Fennoscandian landscape into its present form. Along the southwestern Fennoscandian coastline the prominent sub-marine Norwegian Channel has been the main transport route for Pleistocene glacigenic erosional products from SE Norway and SW Sweden to the Norwegian Sea. The Norwegian Channel reaches a maximum water depth of 700 m in the Skagerrak and has been occupied by repeated ice streams the last 1.1 million years. Glacigenic erosional products were also fed into the Norwegian Channel through the western Norwegian fjord systems during glacial stages. The main depocentre for the eroded products was the North Sea Fan complex at the mouth of the channel, where the sediments transported at the base of the Norwegian Channel Ice Stream were deposited as stacks of glacigenic debris flows. The Pleistocene part of the fan complex, reaches a maximum thickness of c. 1500 m and comprises nearly 40 000 km3 of sediments. Close to 85% of these sediments have however been deposited during the last 500 000 years, when ice-advances to the shelf edge occurred during each glacial stage. Our estimates show that only 20% of the 1.1 Ma North Sea Fan sediment volume could have been eroded from the channel itself, implying that erosion of the nearby land areas must have been significant. Assuming a North Sea Fan drainage area of between 165 000 km2 and 250 000 km2, we find that the landscape in the southwestern part of Fennoscandia has been lowered by 110-170 m since 1.1 Ma. This gives an average denudation rate of 10-15 cm/kyr. We suggest that most of this landscape denudation has taken place the last 0.5 million years.