



Footprint and development of the Pleistocene Eurasian Ice Sheets

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Since the development of the ice age theory large amount of evidence has documented the capacity glacial ice have to erode and transport material. In this study we present a compilation, based on new and published data, of volumes and ages of major depocentres covering the marine margin of the Eurasian Ice Sheets (EurIS). We estimate that a total volume of $\sim 1.0 \times 10^6 \text{ km}^3$ ($\sim 2.0 \times 10^{15}$ tons) of sediments have been deposited in the defined $\sim 2 \times 10^6 \text{ km}^2$ large marine depositional area which border the region of the large Pleistocene EurIS. More than half of the total sediment volume (55%) has been deposited along the Western Barents Sea–Svalbard margin, primarily in the several kilometres thick Storfjorden and Bjørnøya Trough Mouth Fans (TMFs). Only 10% of the total glacial sediment volume seems to have been transported into the Arctic Ocean, i.e. along the northern rim of the EurIS, leaving one third of the total Pleistocene sediments to have been deposited on the Norwegian and UK margins. The Mid Pleistocene Transition (MPT; ca 1.2–0.8 Ma) is reflected by a dramatic increase in the growth of TMFs and prograding wedges. The North Sea and Bjørnøya TMFs received a sediment volume after the MPT that was four and six times larger than the volumes deposited during the earlier parts of the Pleistocene. The amount of sediments delivered to the NW Barents–Svalbard margin decreased during the 0.5–0.0 Ma time period, whereas the North Sea TMF and the Mid-Norwegian margin prograding wedge received 85% and 40% of its total sediment volume during the same time period. From the compilation we suggest the following development: (1) ~ 2.5 Ma; a significant increase in the amount of sediments delivered to the marine realm support ice sheet growth and enhanced glacial erosion, (2) MPT; Continued expansion of the EurIS and more pronounced ice stream activity give a dramatic increase in transport of glacial erosion products to the ice margins, (3) The 0.5–0 Ma time period is characterised by repeated ice stream activity and an EurIS which reached the shelf edge repeatedly. In such environments the North Sea TMF and the Mid-Norwegian prograding wedge had their most significant growth during the entire Pleistocene period. A drop in delivery of sediments to the western Barents Sea margin (Storfjorden and Bjørnøya TMFs) and the fan systems along the West Svalbard margin in the 0.5–0 Ma time period may also partly reflect changes in substrata exposed to glacial erosion, reducing the ice erosion intensity.