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Quantifying subglacial sediment transport of a marine ice stream during the Late Glacial Maximum, Fennoscandian Ice Sheet

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By means of high-resolution seismic and core data we have quantified the flux of sediment transported subglacially by the Norwegian Channel Ice Stream (NCIS) at the end of the Last Glacial Maximum (LGM). This was achieved by mapping the volume of sediment deposited during the last NCIS phase on the North Sea Fan, a glacial fan located on the continental slope at the outlet of the Norwegian Channel, northern North Sea. The North Sea Fan is dominated by glacigenic debris flows sourced from subglacial till brought to the shelf break by the NCIS, which drained a major part of the southwestern Fennoscandian Ice Sheet. 800 km3 of sediment was brought to the shelf edge by the NCIS between 20.0 and 19.0 cal. ka BP, which gives an annual flux of 8000 m3 pr. metre width of the ice stream front. This equates to a total of 1.1 Gt of sediment per year and is comparable to the present sediment flux from the worlds largest rivers. To explain the extreme sediment flux the NCIS must have flowed with high velocity (several kilometres/year) and/or the subglacial sediment transport must have occurred in a thick layer (several metres). We will discuss the sediment flux calculations in light of these variables.