



Long-term sediment yield of the Austdalsbreen glacier, southwest Norway

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Long-term sediment yield of Austdalsbreen glacier, an eastern outlet glacier of Jostedalbreen ice cap in southwest Norway, was investigated by studies of sedimentation rates in the proglacial lakes Austdalsvatn and Styggevatn, along with subglacial topography radar survey and seismic surveys of the lake bed sediment. Sediment cores were taken from both lakes. Annual sedimentation throughout the cores was identified from high resolution photographs and X-ray scan analyses and was confirmed by three accelerator mass spectrometry (AMS) ¹⁴C datings. The seismic survey profiles revealed the distribution of these sediments. The impact of the subglacial topography on the sediment delivery from upstream, along with grain-size distribution and organic content analyses, were also taken into account in the interpretation of sediment cores. Possible impact of climate change on sediment delivery from the glacier was discussed by comparison of the average lake sedimentation rates during different periods of postglacial time. Around calibrated years 9000–8870 BP, Austdalsbreen glacier was subject to rapid retreat and calving. It was found that the glacier retreated rapidly from its maximum extension, which had totally covered the two lakes, in the 130 yrs in the early Holocene. About 1.4 million tons suspended load was delivered from the glacier during this short period, giving an average sediment yield of 400 t/yr km². Such a high sediment yield was found to be due to rapid calving, fast ice motion, abundance of meltwater, and larger areal extension and volume of the glacier at that time. The glacier probably disappeared from the catchment around 6000 BP. The glacier advanced after the 1100s, reaching its Little Ice Age maximum before retreating to its present position. About 3.5 million tons suspended load was delivered from the glacier during the 800 yrs from 1186 to 1986 AD, corresponding to an average sediment yield of 290 t/yr km², 30% lower than that of the early Holocene retreat. This difference is probably mostly due to the smaller volume of the modern glacier.

Keywords: long-term sediment yield, postglacial time, proglacial lake, sediment core, seismic survey