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Contemporary rates and spatiotemporal variability of fluvial suspended sediment transport in the inner Nordfjord in western Norway

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It is generally assumed that fluvial suspended sediment transport is of significant importance in glacierized drainage basin systems. Contemporary suspended sediment transport has been studied and monitored since 2004 in selected drainage basins in the steep fjord landscape of the inner Nordfjord in western Norway. The size of the selected drainage basins ranges from 60.1 km2 to 79.5 km2, with the share of drainage basin areas being covered by glaciers ranging from 38 to 18%. The collected data indicate that there are significant intra- and inter-annual variations with respect to fluvial suspended sediment transport rates and suspended sediment yields. Three different periods with an increased frequency of major discharge events can be identified over the year, with these periods showing a significant inter-annual variability. High runoff in spring (April-June) is mainly caused by snowmelt whereas major discharge events in summer (July-August) are mostly due to thermally determined glacier melt. In autumn (September-November), major runoff events are associated with long-lasting or heavy rainfall events. Autumn and summer are with respect to fluvial suspended sediment transport more important periods than spring. The intensity of fluvial suspended sediment transport in autumn depends strongly on the number of heavy rainfall events that trigger transfers of sediments from slope systems into main stream channels through saturation overland flow and connected slope wash and debris flow events. The computed mean annual suspended sediment yields show a significant spatial variability and range from 16 t km-2y-1 to 31 t km-2y-1. Main controls of the detected spatial variability of mean annual and drainage basin wide suspended sediment yields are (i) the share of the drainage basin area being covered by glaciers, (ii) the efficiency of small proglacial lakes in trapping suspended sediments delivered by defined outlet glaciers, and (iii) the steepness and degree of vegetation cover of ice-free drainage basin areas with sedimentary covers. The calculated annual suspended sediment yields in the inner Nordfjord are altogether lower than annual suspended sediment yields found in many other glacierized drainage basin systems worldwide, and the fluvial sediment transport in the selected drainage basins of the inner Nordfjord is clearly supply-limited.