



## **Spatiotemporal variability of mechanical denudation in the inner Nordfjord in western Norway**

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It is generally assumed that mechanical denudation is of significant importance in glacierized drainage basin systems. Mechanical denudation rates have been studied since 2004 in selected drainage basins in the steep and partly glacierized fjord landscape of the inner Nordfjord in western Norway. The work includes high-resolution and year-round geomorphic process monitoring with the analysis of fluvial suspended sediment and bedload transport, the application of fingerprinting techniques, and the comparison of computed contemporary mechanical denudation rates with longer-term denudation rates calculated from the geophysical analysis of Holocene sediment fill in lake systems. The size of the selected drainage basins ranged from 60.1 km<sup>2</sup> to 79.5 km<sup>2</sup>, with the share of drainage basin areas being currently covered by glaciers ranging from 38% to 18%.

It is found that there are significant intra- and inter-annual variations with respect to contemporary fluvial mechanical denudation with these variations being mostly controlled by meteorological events and by sediment availability. Present-day annual rates of fluvial mechanical denudation show a high spatial variability and range from 18.6 tkm<sup>-2</sup>yr<sup>-1</sup> to 44.6 tkm<sup>-2</sup>yr<sup>-1</sup> across different drainage basins of the inner Nordfjord. Main controls of the detected spatial variability of contemporary mechanical denudation are (i) the share of the drainage basin area being covered by glaciers, (ii) the efficiency of small proglacial lakes and anastomosing stream stretches in trapping material, and (iii) the steepness and the degree of vegetation cover of ice-free drainage basin surface areas with sedimentary covers. Because of supply-limited conditions, the intensity of fluvial mechanical denudation is altogether much more related to the availability of sediments than to channel discharge. Contemporary mechanical denudation rates are in the same order of magnitude than the Holocene mechanical denudation rate of the area.

Mechanical denudation in the inner Nordfjord is lower than in many other partly glacierized landscapes worldwide which is mainly due to the high resistance of the predominant gneisses towards glacial erosion and weathering, the altogether only small amounts of sediments being available, the stable and nearly closed vegetation cover in ice-free surface areas with sedimentary covers, and the efficiency of sediment storage in proglacial lakes and anastomosing stream channel stretches.