



The quantitative role of chemical weathering, solute fluxes and chemical denudation in four different catchments in Iceland, Swedish Lapland and Finnish Lapland

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Water balance, atmospheric solute inputs, water chemistry, solute and sediment fluxes as well as denudation rates have been investigated over several years in different cold environments. The studies have been carried out in four selected catchments (<30 km²) in East Iceland, northernmost Swedish Lapland and northern Finnish Lapland. Monitoring programmes have been in operation since five (Iceland and Finland) to seven (Sweden) years. The main focus is on analysing the role of the factors morpho-climate, vegetation cover, regolith thickness, ground frost, lithology, relief and human impact for solute and sediment fluxes and denudation rates in the four study areas. Direct comparison of the data collected in the different cold environments provides information on the varying quantitative importance of chemical weathering and denudation and contributes to getting more understanding of the spatial differentiation of cold environments and its dependency on environmental factors and human impact. The two catchments in sub-Arctic oceanic East Iceland are characterized by steep alpine relief and a partly destroyed vegetation cover. Mechanical denudation dominates over chemical denudation in both catchments. Austdalur (Basalt) is showing slightly lower chemical denudation rates than Hrafnadalur (Rhyolite). Atmospheric solute inputs are high in both catchments. The less steep Latnjavagge in Arctic-oceanic Swedish Lapland (Mica Schist) shows lower chemical denudation rates but chemical denudation dominates slightly over mechanical denudation in this catchment. Kidisjoki in sub-Arctic Finnish Lapland (Gneisses) is situated in the low-relief area of the Baltic Shield

and shows very low chemical and mechanical denudation rates. Chemical denudation dominates over mechanical denudation. Chemical denudation rates range from 3.1 t km⁻²yr⁻¹ in Kidisjoki to 9.0 t km⁻²yr⁻¹ in East Iceland. Only in the steep catchments with partly destroyed vegetation cover in East Iceland mechanical denudation dominates significantly over chemical denudation. Altogether, chemical weathering and denudation appear to be comparably significant in cold environments. Spatial variation of chemical denudation rates within the different catchments is mainly determined by spatially varying regolith thicknesses, spatially and temporally varying ground frost, and by exposition.