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Controls on the geochemical evolution of a shallow proglacial groundwater system, Skeiðarársandur, SE Iceland

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High rates of chemical denudation and high solute fluxes are associated with glaciated environments despite low temperatures and short water-rock contact times, however there has been little work into the contributions from groundwater discharge which can be a significant route of meltwater discharge particularly in areas with large outwash plain aquifers. Due to high rock:water ratios and contact times solute acquisition could potentially be enhanced in the groundwater discharge component. Understanding of the controls on the geochemical evolution of groundwater and the interactions of groundwater behaviour and geochemistry is necessary to ultimately constrain calculations of the flux of solutes from these environments. This study investigates sources of solute and processes of solute acquisition in the proglacial groundwater system of a contemporary basaltic outwash plain in south-east Iceland (Skeiðarársandur).

Solute acquisition processes are dominated by the carbonation of both silicates and carbonates. However, coupled sulphide oxidation and carbonate dissolution is also an important process particularly within enclosed groundwater-fed kettle holes, which also form an important ecological niche on the outwash plain. In contrast to other glaciated regions, the highly reactive basaltic glass lithologies on Skeiðarársandur produce solute loads derived dominantly from silicate weathering with the proportion of carbonate weathering appearing to increase and sulphide oxidation decrease with distance from the glacier margin. There is also evidence of coupled sulphide ox-

idation and silicate dissolution across Skeiðarársandur. Proglacial groundwater composition is also influenced by mixing with geothermal water derived from the subglacial Grímsvötn geothermal area. Variations in chemical parameters with groundwater depth are superimposed on isotopically homogenised groundwater from different recharge sources even in areas of groundwater discharge where groundwater mixing occurs. The geochemical evolution of the proglacial groundwater system is therefore interrelated with flow-path length and pattern, lithological variation, and vegetation distribution.