# Subglacial weathering controls silicon isotope composition of Greenland Ice Sheet meltwaters

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The global silicon (Si) cycle is linked to the drawdown of atmospheric carbon dioxide through silicate weathering and biological production by siliceous algae. Consequently, more focus is being applied to quantifying Si fluxes to the ocean. Recent studies have shown that Greenland Ice Sheet (GrIS) may play a much more significant role in global Si cycles than previously thought with dissolved and labile amorphous silica fluxes greater than previous estimates. These findings have subsequently led to questions surrounding the long term impact of glaciations upon the global Si cycle. Ice sheets have not previously been considered in past ocean Si isotope budgets due to the assumption of insignificant Si fluxes.

Here, we present the isotopic composition of exported silica ($\delta^{30}Si$) from two contrasting glacial catchments of the GrIS; Leverett Glacier and Kiattuut Sermiat. The $\delta^{30}Si$ composition of dissolved Si from the larger Leverett Glacier is anomalously low compared to terrestrial and glacial rivers previously measured. Additionally both catchments present a significant temporal shift in dissolved $\delta^{30}Si$ in response to changing hydrological pathways. We combine these data with a hydrogeochemical dataset to investigate the role of subglacial weathering on isotopic composition. Preliminary analysis indicates contrasting weathering regimes in the catchments, which impact upon the $\delta^{30}Si$ composition of labile Si exported downstream. Enhanced silicate weathering occurs within larger ice sheet systems, with extended water residence times, resulting in the lowest dissolved $\delta^{30}Si$ measured in running waters.

Subglacial weathering exerts a significant influence on the $\delta^{30}Si$ of meltwaters exported to oceans, which likely impacts the global Si cycle, especially during glacial cycles and meltwater pulse events. This may have a large impact on the palaeoceanographic interpretation of biogenic silica isotope records from oceanic sediments. We assess that chemical weathering under large ice sheets must be considered when examining global elemental cycles.