Biogeochemical weathering and riverine nutrient export during glacier retreat

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The beds of glaciers and ice sheets are hot spots for biogeochemical weathering, displaying high specific water fluxes, elevated rates of physical erosion and supporting diverse microbial consortia, many of which are involved in chemical weathering of rock. Glaciers have also been shown to deliver life-sustaining nutrients to downstream ecosystems, including lithogenically-sourced nutrients such as Fe, P and Si, in addition to bioavailable dissolved organic matter. A major uncertainty at present is how nutrient export from glaciers will be impacted by future changes in ice melt, glacier shrinkage, shifts from marine terminating to land terminating glaciers and expanding proglacial zones. Disentangling the consequences of these changes upon regional biogeochemical cycling is a priority for understanding the future dynamics of food webs in downstream lakes, fjords and marine systems. Here, we examine new data derived from river water samples collected along latitudinal gradients of changing ice cover in Chilean Patagonia and the Greenland Ice Sheet to test the hypothesis that glacier retreat (and changes in glacier size) will be accompanied by substantial shifts in the chemical weathering regime in river catchments, and thus, in the export of nutrients (e.g. Fe) to the ocean.