Variations in composition and bioavailability of dissolved organic matter in glacially-fed river catchments in Chilean Patagonia

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Very little is known about the export and composition of riverine dissolved organic matter (DOM) in Chilean Patagonia. This pristine region has been largely untouched by human development but is now undergoing rapid rates of deglaciation. Despite mounting evidence that glaciers play an important role in the global carbon cycle, there is insufficient data to assess the biogeochmical impact of glacial retreat in this region. Elsewhere, glacial runoff has been highlighted as a critical source of nutrients (e.g. N, P, Si, Fe) to marine ecosystems, enhancing primary production. In addition, glaciers across the northern hemisphere are known to release highly labile DOM to downstream heterotrophs and stimulate secondary production. In Patagonia, glacial melt dominates freshwater fluxes to the ocean and therefore likely influences nutrient export. The ecological and economic importance of Chilean fjords, and their unknown sensitivity to changes in upstream nutrient supply, necessitates a better understanding of riverine DOM composition.

Here we present the first data from Chilean Patagonian that assesses compositional variation in DOM for rivers from catchments spanning a range of glacial coverage. We combine molecular level analysis (FT-ICR-MS) and fluorescence characterization of DOM with simple incubation experiments to test whether compositional differences translate into controls on bioavailability. We show that humic substances dominate the flux of DOM but its bioavailability appears related to proteinaceous material and nitrogen-rich molecular families. However, overall DOM bioavailability is lower than in other glacially influenced systems and it does not systematically vary with catchment glacial cover. We hypothesise that this is related to an overall lower nitrogen content. We also argue that compared to other glaciated regions, distinct glacial signatures are less apparent in Patagonia due to other confounding influences on DOM composition (e.g. dense vegetation, lake ecosystems).