Behaviour of lithium isotopes during estuarine mixing of ice melt from the Greenland Ice Sheet and offshore waters

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Continental weathering and transport of dissolved elements from rivers to the ocean are major processes regulating atmospheric CO_2 and thus act to moderate climate. During glacial-interglacial cycles, changes in weathering processes due to changes in ice melt (fresh water runoff), rock exposure and temperature may affect the chemical composition of river water and the concentration of suspended particulate matter, as well as chemical weathering rates. For these reasons, improved knowledge of glacial weathering processes is essential.

The lithium isotopic composition (δ^7Li) of river water is only affected by the formation of secondary mineral phases. It is independent of catchment lithology and unaffected by biological processes. Thus, river water δ^7Li is an excellent tracer of weathering processes and, as the δ^7Li of foraminifera records the Li isotopic composition of seawater, information from the marine sedimentary record can potentially be used to assess past changes in weathering processes.

During mixing between river water and sea water, changes in the chemical and isotopic composition of some elements can occur, modifying the signal delivered to the ocean. To assess the effects of estuarine mixing on Li and Li isotopes, in a glacial system, we have analysed a series of water samples from Godthåbsfjorden (64° N, 51° W), West Greenland.

Samples were taken along a section from the inner parts of the fjord, close to the Greendland Ice Sheet, to the offshore parts close to Fyllas Banke [1], in both summer and winter. We will present Li and Li isotope data, together with analyses of other key parameters (major cations and anions, salinity, chlorophyll, dissolved oxygen, temperature, turbidity), and use these information to determine whether Li behaves as a conservative or non-conservative element in this glacial estuarine environment. We will evaluate the importance of estuarine mixing in determining the Li and Li isotopic signature of the weathering flux delivered to the ocean from glacial weathering systems.

[1] Arendt K.E. et al. (2010) *Mar. Ecol. Prog. Ser.* **401**, 49-62.