Silicate vs carbonate weathering: isotopic co-variability in the Fraser River, Canada

K.K. Bitterwolf1*, B. Peucker-Ehrenbrink2, A. Eisenhauer3, D.P. Santiago Ramos4, J.A. Higgins4, and A. Paytan1

1University of California, Santa Cruz, Santa Cruz, CA 95064, USA (*correspondence: kimberleybitterwolf@gmail.com)
2Woods Hole Oceanographic Institution, Woods Hole, MA, USA
3GEOMAR Helmholtz Centre For Ocean Research Kiel, Germany
4Princeton University, Princeton, NJ, USA

Constraining the chemical composition of paleo-oceans inherently informs paleoclimate models by elucidating changes in the atmospheric composition and geologic make-up of Earth’s surface. Major ion and isotopic compositions of seawater have varied widely over geologic time, and often in synchronous fashion [1]. However, the underlying mechanisms are not well understood. To improve our understanding, we aim to quantify runoff contributions from silicate and carbonate weathering - two of the major input fluxes of solutes to the global ocean. This goal is being accomplished by examining isotopic co-variation in the dissolved load of the Fraser River (British Columbia, Canada) during periods of more silicate- vs. more carbonate-dominated runoff. The Fraser serves as a natural laboratory for the investigation of these two weathering contributions due to its seasonally-distinct sourcing of runoff, which shifts from predominantly young igneous rocks during base flow to radiogenic (Paleozoic-Precambrian) sediments during the freshet [2]. Five isotope systems relevant to weathering contributions were selected (δ7Li, δ26Mg, δ44/40Ca, 87Sr/86Sr, δ88/86Sr) and analyzed in samples from 2010 – 2012, which were collected as a part of an ongoing time series study of the river’s main stem. The results will be used to construct an index of isotopic co-variation during periods of stronger contributions from young igneous bedrock vs. radiogenic sediments, including carbonates.