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Chemical Weathering in the Kasai River Basin: Coupling between Inorganic and Organic Carbon Cycling

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Chemical weathering of silicate minerals is a major CO2 sink in the ocean-atmosphere system, as cations and alkalinity generated from silicate mineral dissolution promote carbonate burial in the ocean. It is therefore important to accurately quantify the cation and alkalinity fluxes sourced from silicate weathering to constrain its climatic impacts. The common assumption that carbonate alkalinity dominates the total alkalinity budget may be flawed in tropical river systems, where the contribution from dissolved organic carbon (DOC) may be substantial. A fraction of DOC exists as organic acids, which has been demonstrated to promote mineral dissolution through surface complexation reactions. However, organic acids also lower subsurface pH, which in turn affect the speciation of aluminum and potentially increase the saturation state of silicate minerals. The overall influence of organic carbon cycling on chemical weathering on the catchment scale remains poorly constrained.

In this work, we attempt to illustrate the effect of organic carbon cycling on chemical weathering and associated inorganic carbon fluxes across a weathering intensity gradient in the Kasaï River Basin (DR Congo). Leveraging seasonal, concurrent measurements of multiple hydrochemical parameters, an end-member mixing model is used to constrain the contribution of different processes to the carbon budget.