Rhenium as a tracer of oxidative weathering from the Andes to the lowland Amazon Basin

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Over long timescales (>10^5 yrs), the abundance of carbon dioxide (CO_2) in the atmosphere is determined by the balance of the major carbon sources and sinks. Among the major carbon sources, the oxidation of organic carbon contained within sedimentary rocks ("petrogenic" carbon, or OC_{petro}) is thought to result in CO_2 emission of similar magnitude to that released by volcanism. Despite this recognition, there are few data on the rates of OC_{petro} oxidation at Earth's surface. CO_2 release is difficult to track directly due to degassing and carbon cycling in the live biosphere. Rhenium (Re) has been proposed as a proxy for tracing OC_{petro} oxidation. Here we investigate the source, behavior and flux of dissolved and particulate rhenium (Re) in the Madre de Dios watershed (a major Andean tributary of the Amazon River), aiming to quantify the flux of CO_2 released by OC_{petro} oxidation.

The Madre de Dios watershed has a dominantly sedimentary lithology. Erosion rates, acid-hydrolysis weathering reactions, and sulphide oxidation rates have been well-characterized and shown to vary across the mountain to floodplain transition We seek to understand how mountain erosion controls Re release and whether dissolved Re and other redox sensitive element concentrations are modified during fluvial transit. In addition to quantifying OC_{petro} oxidation, this study will improve our understanding of the source and processes controlling Re in rivers, allowing us to apply trace metal proxies more widely, and potentially in the geological record.