



Dissolved rhenium in river waters: Insight into the chemical weathering of fossil organic carbon?

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The store of carbon in rock as fossil organic matter represents $\sim 15 \times 10^{21}$ g, which is almost 400 times the total amount of carbon present in the oceans and atmosphere. Oxidation of fossil organic carbon (FOC) during chemical weathering returns CO_2 that was sequestered from the atmosphere in the geological past, back into the contemporary carbon cycle. Despite this recognition, the natural rates of FOC weathering are poorly constrained in the modern environment, as are the precise controls on its variability. This is primarily due to the difficulty in tracking the dissolved and gaseous carbon produced during FOC weathering, where biology and carbonate weathering mask its influence at a catchment-scale. Here we investigate the use of rhenium (Re) as a tracer of FOC weathering, focusing on a series of mountain catchments in Taiwan. We present dual methodology for determining dissolved Re content in river waters by ICP-MS, using pre-concentration and matrix removal via anion exchange chemistry and by direct analysis through standard-addition. Precision (2sigma) and accuracy at the ppt level are found to be better than 7%. In the 16 sampled catchments, the dissolved Re concentrations span the entire range from the published literature. We investigate the source of dissolved Re in the catchments using measurements of bedrocks and river sediments, and the comparative behavior of Re to major dissolved phases. A preliminary estimate of the Re budget derived from the weathering of FOC is presented, and the implications for the rates of FOC weathering discussed.