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River particles in biogeochemical cycles

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Global biogeochemical cycles and their implications for Earth surface conditions and habitability of our planet are commonly investigated through marine mass balances. While dissolved riverine fluxes are the dominant input terms in most of these mass balances, associated particles are rarely considered – despite being ~ 5 times larger in mass. Even small changes (< 1 wt%) in the composition of these particles would have major implications for ocean chemistry, but a reliable quantification of these particulate fluxes and their reactivity are lacking. We investigate the composition and flux of these global riverine particles as well as their fate in the ocean.

Specifically, we have established a database of river sediment composition (*GloRiSe* https://doi.org/10.5281/zenodo.4447435), and developed a statistical model to quantify riverine fluxes of detrital carbonates to the ocean. Results (total pre-human flux = 4 Tmol C/y, reduced by 25 % through humans) point to a significance in the marine mass balances of inorganic carbon, calcium, strontium and alkalinity. Accounting for these fluxes might help solving long-standing problems in the assessment of the corresponding biogeochemical cycles.

However, questions remain about the fate of these detrital carbonates and other river-derived particles in the coastal ocean, which we address through a non-traditional diagenetic box model that is based on organic and inorganic matter degradation kinetics coupled through evolving solution chemistry. Using such a model, we aim to explore potential implications of the physical erosion of (weathered) terrestrial materials for ocean biogeochemistry.

Middelburg, J. J., Soetaert, K., & Hagens, M. (2020). Ocean Alkalinity, Buffering and Biogeochemical Processes. *Reviews of Geophysics*, *58*(3). https://doi.org/10.1029/2019RG000681

DePaolo, D. J. (2004). Calcium isotopic variations produced by biological, kinetic, radiogenic and nucleosynthetic processes. *Reviews in Mineralogy and Geochemistry*, *55*, 255–288. https://doi.org/10.2138/gsrmg.55.1.255

Sun, X., & Turchyn, A. V. (2014). Significant contribution of authigenic carbonate to marine carbon burial. *Nature Geoscience*, *7*(3), 201–204. https://doi.org/10.1038/ngeo2070