The importance of sedimentary cannibalism for global weathering

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Since the BLAG model proposed by Berner, Garrels and Lasaga in 1983, numerous studies have attempted to refine the parametric dependence of weathering on temperature, runoff, physical erosion or biological activity. However, the idea that over geological timescales, major cations delivered to the ocean come from ancient marine deposits and are continuously recycled at the Earth's surface through dissolution-precipitation has not attracted much attention. This recycling was included in BLAG, and later in the GEOCARB family of models, by the simple fact that limestones, which are a recycled component of the Earth's surface, do not count in the global C budget over geological timescales.

Nevertheless, the importance of recycling is to be extended to other minerals than carbonates. Here, we will review a series of evidences, based on isotopic tracing and trace metal concentrations, showing that the cations delivered to the ocean mainly derive from weathering reactions involving recycled silicates, carbonates and sulfide minerals.

The cannibalistic nature of chemical weathering of the Earth's surface is thus a first order feature of our planet that must now be better quantified. As a consequence, the geological rock cycle should be included in models of long-term global C cycle, in which the weathering of non-recycled lithologies such as basalts and andesites remains a powerful way of subtracting CO_2 to the atmosphere.