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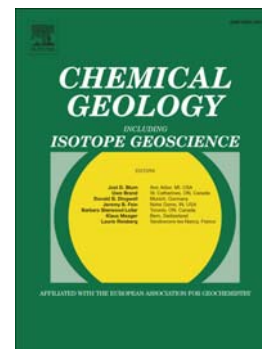
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Carbonate minerals in the global carbon cycle

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Abstract

Carbonate minerals constitute Earth's largest C reservoir. This reservoir is considered unimportant to the global C cycle over long periods of time (e.g., $> 10^6$ yrs) because it provides balanced sources and sinks of atmospheric CO_2 as carbonate minerals precipitate and dissolve from carbonic acid, respectively. However, carbonate mineral reactions may impact the carbon cycle at short time scales (10^2 to 10^5 yrs) particularly when atmospheric pCO_2 changes by several hundred ppm, as exemplified by the Paleocene-Eocene Thermal Maximum, at transitions between glacial-interglacial times, and over the past century from anthropogenic inputs. Here I review recent literature about mechanisms in which carbonate minerals may impact the global carbon cycle. Carbonate mineral dissolution, which increases dissolved inorganic carbon (DIC) concentrations, may represent a net atmospheric CO_2 sink as primary productivity consumes DIC, resulting in organic C burial in fluvial systems of carbonate terrains. Alternatively, carbonate minerals dissolved by sulfuric and nitric acids may represent an atmospheric source of CO_2 with no rapid balancing atmospheric sink. Sulfuric acid dissolves carbonate minerals of modern carbonate platform sediments and water-filled sinkholes, and in the deep sea at the base of carbonate platform scarps. In terrestrial landscapes, sulfuric acid dissolves carbonate minerals of karst terrains (hypogene caves) and in comminuted glacial sediments. Nitric acid forms from

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