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Hydrologic Regulation of the Geologic Carbon Cycle

Abstract: The Earth's thermostat is thought to be a negative feedback between atmospheric CO₂ levels and chemical weathering of silicate rocks that moderates temperatures over geologic (*i.e.*, million year) time scales. To explain variations in the strength of the weathering feedback, I will discuss a model for silicate weathering that links climatic and tectonic by coupling together the balance between the rate of fluid flow, which controls the amount of time fluids react with rocks and the resulting fluxes, and the erosion rate, which controls the physical and chemical properties that limit silicate weathering. This model can be used to evaluate silicate weathering fluxes, marine isotope proxies and changes in atmospheric CO₂ over the Cenozoic. Rather than an appreciable increase in the silicate weathering flux, the long-term decrease in atmospheric CO₂ may be associated with an increase in the strength of the silicate weathering feedback. Changes in the silicate weathering feedback could also explain the apparent discrepancy between Cenozoic marine isotope proxies of weathering and carbon cycle mass balance.