Carbonate reefs may have triggered a bout of global cooling

Earth's history shows a steady stream of extreme climatic change, spanning everything from planet-engulfing glaciers to tropical conditions near high latitudes. These large climate shifts are often attributed to permanent changes: the opening of a new waterway, the evolution of photosynthesizing plants, or massive bouts of erosion. Punctuating each long stretch of roughly steady climate are smaller transient shifts in environmental conditions commonly associated with changes in atmospheric carbon dioxide concentration. Yet the initial change in the climate system that led to the shift in carbon dioxide concentration for each period often remains unknown.

Focusing on the Middle Late Jurassic Transition (MLJT), a million-year-long bout of cool temperatures that took place roughly 160 million years ago, *Donnadieu et al.* found that changes in the growth rate and spatial extent of carbonate platforms may explain the temporary climate shift. Carbonate platforms are reefs laid down by carbonate-precipitating organisms. The authors found that leading up to the MLJT, carbonate platforms became concentrated at low latitudes before eventually ceasing production. They suggest that the drop in carbonate platform growth would have increased the oceanic concentration of carbonate ions, shifting the equilibrium for carbonate chemistry and increasing the ocean's ability to act as a sink for carbon dioxide. The changes in carbonate platform activity decreased atmospheric carbon from 700 to between 200 and 350 parts per million by volume, with a corresponding 9.3°–4.5°C drop in atmospheric temperature.

The researchers were unable to pin down the specific trigger for the sudden change in carbonate platform activity, suggesting it could be attributable to temperature changes, tectonic activity, nutrient fluxes, or other processes that could affect the community of carbonate-precipitating organisms. However, by tracking the effect on historical climate, the research shows that carbonate platform functionality could be an important feedback system in Earth's currently changing climate. (*Paleoceanography,* doi:10.1029/2010PA002100, 2011) —CS