

Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

The carbon isotope composition of global marine authigenic carbonate

H.J. BRADBURY^{1*} AND A.V. TURCHYN¹

¹Department of Earth Sciences, University of Cambridge, Downing Street, Cambridge, CB2 3EQ, United Kingdom (correspondence: hjb62@cam.ac.uk)

The removal of carbon from the surface of the planet is a critical component of the long-term carbon cycle; this removal is through the deposition and subsequent burial of carbon-minerals in the ocean. Sedimentary, post-depositional processes play a key role in the global carbon cycle because much of the organic carbon in sediments is microbially oxidized back to dissolved inorganic carbon. Most anaerobic respiration in sediments consumes protons, raising pH, and leading to some of the dissolved inorganic carbon precipitating as *in situ*, or authigenic carbonate. Because this authigenic carbonate has a different carbon isotope composition to marine carbonate, it may influence the overall carbon isotope balance at Earth's surface and critically, our interpretation of global shifts in the carbon cycle over geological time. In today's ocean the two main processes that produce alkalinity and drive authigenic carbonate formation are the organoclastic reduction of sulfate and the anaerobic oxidation of methane, coupled to microbial sulfate reduction. However, each of these produces authigenic carbonate with a different carbon isotope composition, and it is unclear how important these processes were in past oceans with limited sulfate concentrations.

To identify the processes that are linked to the precipitation of authigenic carbonate we have utilised the global ODP/IODP pore fluid database. Here we concentrate on the relative change in alkalinity, methane and sulfate concentrations to predict regions of anaerobic methane oxidation versus organoclastic sulfate reduction and the relative decrease in calcium concentration to predict the amount of authigenic carbonate formed. Idealized carbon isotope profiles for dissolved inorganic carbon then allow us to determine the global $\delta^{13}\text{C}$ of the authigenic carbonate sink today. We use a neural network tuned with chlorophyll, temperature, water depth and distance from the coast to predict the extent of anaerobic methane oxidation versus organoclastic sulfate reduction to extend the sites with observations to those areas that have none. This knowledge is then applied to a simple steady-state model to discuss how the formation of authigenic carbonate would have been impacted by the lower sulfate and higher calcium concentrations found in Cretaceous seawater.