Carbon Isotope Proxy for the Discrimination of Eustatic from Transgressive-Regressive Changes in Accommodation Space for Carbonate Ramps: Oxfordian Smackover of Alabama, U.S.A. Example

Pigott, Kulwadee, Michael Engel, Richard P. Philp, and John D. Pigott, University of Oklahoma, Norman, OK

Separation of vertical (eustatic) from horizontal (transgression-regression) changes in accommodation space is commonly conducted through the interpretation of stacking patterns of Walter's Law lithofacies. However, distinguishing such changes is problematic when lithofacies changes are gradational as can commonly occur in carbonate ramp environments.

The sequence stratigraphy of the Upper Jurassic (Oxfordian) Smackover marine carbonate sequence was investigated from a chemostratigraphic analysis of core sequences of the Conecuh Embayment and the Manila Embayment of southwest Alabama, Gulf Coast of United States. The results demonstrate the effectiveness of using stable carbon isotope chemostratigraphy as a proxy for differentiation of vertical from horizontal forcing functions upon sedimentary responses.

During sea level lowstands, combination of both local and global effects caused negative ä13Ccarb excursions. In the ensuing transgression and relative sea level highstands, low to absent siliciclastic contamination increased carbonate sedimentation and resulted in heavier ä13Ccarb values. In contrast, these Jurassic changes in ä13Corg appear reflect the interplay between terrestrial nearshore biochemistry (heavy) with open shelf biochemistry (light) carbon excursions, opposite to the Holocene.

Chemostratigraphy can be a powerful tool for differentiating global effects from local effects in carbonate sequence analysis. Carbonate ramp platforms such as the Smackover, owing to rapid changes which can occur laterally owing to small changes in vertical sea level, make ideal proxies for testing hypotheses of global versus local effects of sea level upon carbonate sequence development.