Depositional Controls on Sediment Body Architecture in the Eagle Ford/Boquillas System: Insights from Outcrops in West Texas, USA

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GCAGS Explore & Discover Article #00117*
http://www.gcags.org/exploreanddiscover/2016/00117_frebourg_et_al.pdf
Posted September 13, 2016.

*Abstract published in the *GCAGS Transactions* (see footnote reference below) and delivered as an oral presentation at the 66th Annual GCAGS Convention and 63rd Annual GCSSEPM Meeting in Corpus Christi, Texas, September 18–20, 2016.

ABSTRACT

This study focuses on outcrop analogues of producing facies of the subsurface Eagle Ford Fm.: the Boquillas Fm. in West Texas. These rocks display cyclic alternations of organic-matter-rich, globigerinid wackestones; organic-matter poor, planktonic skeletal grainstones; and volcanic ash beds. The goal is to investigate whether this cyclicity can be used for correlations or not, and to what extent. Sedimentological observations, lidar panorama, GigaPan high-resolution photomosaics and photogrammetry datasets were collected along U.S. Highway 90 in Val Verde County and in Big Bend National Park. Large hand samples were slabbed for visual analysis and classical petrography was carried out on thin sections. Observations show that both the globigerinid wackestones and the planktonic skeletal grainstones were deposited below storm wave base under the influence of bottom currents. Detailed study of the planktonic skeletal grainstone body geometries show that they accumulated as hydraulic dunes, megaripples, sand ridges, and sand sheets that were locally modified by diagenetic concretionary crystallization. Grainstone body geometries vary significantly between stratigraphic horizons. Detailed measurements of geometries show that these bedforms are on average only 50% continuous laterally. Ash beds' lateral continuity reaches up to 72%. The discontinuous character of the planktonic skeletal grainstone bodies and the volcanic ash beds makes using wide scale correlation problematic. The abundance of the coarse planktonic skeletal material that makes up these planktonic skeletal grainstone bodies is a function of changes in abundance of high level trophic level predators and the reproduction of primary producers. This activity, in turn, is driven by the input of iron from the volcanic ash beds. Cyclicity is, thus, a function of alternating periods of lower primary productivity with lower sediment accumulation rates (globigerinid wackestones), and shorter periods of high primary productivity and higher accumulation rates (planktonic skeletal grainstones). Organic matter content is a function of the bioclastic sedimentary dilution.

Originally published as: Frebourg, G., S. Ruppel, R. Loucks, and J. Lambert, 2016, Depositional controls on sediment body architecture in the Eagle Ford/Boquillas system: Insights from outcrops in West Texas, USA: Gulf Coast Association of Geological Societies Transactions, v. 66, p. 953.