EG04

Facies Architecture and Depositional Environments of the Marble Falls Formation (Morrowan-Atokan), Central Texas

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The Pennsylvanian Marble Falls Formation in the southern Fort Worth Basin (central Texas) is a Morrowan-Atokan carbonate unit whose lithofacies and depositional environments are investigated in this poster. Until recently, descriptions of lithofacies and interpretations of the Marble Falls Formation have only come from outcrop studies at the fringes of the Llano Uplift, making it difficult to have an understanding of the complete section and regional stratigraphy. A series of 30 cores are now available with many cores showing the upper and lower contacts with the Smithwick and Barnett Formations (respectively) enabling the complete Marble Falls section to be described and correlated.

Core examination indicates that the strata within the study area were deposited in a shallower water ramp setting in the south (possibly associated with the Llano Uplift) and a deeper water slope/basinal setting to the north into the Fort Worth Basin. Initial examinations of cores and thin sections have identified 14 platform and basin facies ranging in lithology from shales to carbonates. Dominant facies are (1) dark gray to mottled, argillaceous, burrowed spiculitic wackestones and packstones, (2) green and red algal grain-dominated packstones to grainstones, (3) skeletal foraminiferal wackestones, (4) lithoclast-rich debrites and (5) phylloid algal wackestones. Several siliciclastic mudstone facies are also present.

Lithofacies are being used to create a regional depositional model, define the facies architecture, and produce a sequence stratigraphic framework for the Marble Falls Formation. Because the Marble Falls strata were deposited during Pennsylvanian icehouse times, the resulting rapid facies changes and depositional cycles reflect a highly fluctuating sea level. The distal cores in the slope/basinal setting have abundant density-flow deposits making interpreting cycle stacking patterns difficult. Shallow-water allochems must be evaluated as to whether they were deposited *in situ* under shallow-marine conditions or transported into a deeper water setting. Lithofacies stacking patterns were, therefore, analyzed to separate depositional units responding to sea-level changes (especially sea-level drops) from depositional units resulting from gravity-flow deposition. Thus far, stacking patterns indicate that the green and red algal facies further to the northeast, away from the shelf, are part of shallower water lowstand wedges related to rapid drops in sea level. Analyses of these results will improve previous interpretations of the Marble Fall's depositional history and form a unified regional model.

Results from this study contribute to our understanding of the depositional response to glacioeustatic sea-level changes during the Pennsylvanian. These findings also form the basis for a sedimentological and facies analog for middle to late Atokan shallow- to deepwater carbonates present in the Permian Basin and in the northern Fort Worth Basin.

Keywords: Marble Falls, mixed carbonate-siliciclastic system, Pennsylvanian, debris flows, density flows, southern Fort Worth Basin, Llano Uplift, stratigraphy, sequence stratigraphy