The Nature of Neogene Mixed System Clinothems: Cibao Basin, Dominican Republic

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We characterize the composition of mixed system clinothems and the nature of shelf progradation by clinoformal beds of the Mao Formation, Cibao Basin, Dominican Republic. During the early Pliocene these shelf margin deposits prograde some 6 km basinward in just 0.5 my. This pulse of progradation is synchronous with pure carbonates on the western margin of Great Bahama Bank. The clinothems consist of mixed skeletal debris and mud. Prolific coral and skeletal growth on the shelf provided the necessary in situ sediment for margin progradation. These coral and skeletal sediments were admixed with muddy sediment to form the "limestone" component of a depositional couplet. The other component of the couplet is siliciclastic mud with subordinate skeletal debris. In weathered outcrop (and in resistivity and magnetic susceptibility logs) the limestone-mud couplet is distinct, but much more subtle when viewed in core. Bed-by-bed measurements of ~140 meters of the prograded unit provide basic statistical characterization of both the mud-rich beds and limestone beds. The limestone beds have a slightly greater mean thickness than the mud beds (28.7 cm to 20.2 cm, n=575). The probability curve provides baseline data on the variability of mud and limestone bed thickness. Bed-thickness data indicate that the couplets are organized into cycles. Each cycle consist of a 1-3 m thick basal unit of sand, silt, and gravel, overlain by a 10-15 m thick set of couplets (interbedded limestone and mud beds that form clinothem foresets and bottomset beds). The basal units are recognized by greater values on the cumulative bed thickness curve for the siliciclastic beds. At least ten of these high-frequency cycles (parasequences) are recognized within the clinoform sequence. This succession is interpreted to mark a short sea level lowstand or stillstand (basal unit) with ravinement erosion followed by a sea level rise (couplets in bedded unit). The Cibao Basin mixed system sequence has a stratal architecture built by two hierarchical components: the individual limestone-mud couplet bed, and the high-frequency cycle that bundles these couplets and is bounded by the basal siliciclastic unit. Here, ten high-frequency cycles define the depositional sequence. Lithologic and petrophysical properties at the bed-scale will likely influence the evolution of porosity and permeability, and also provide basic constraints on potential flow units within tropical shelf-margin mixed system deposits.