Transgressive - Dominated Architecture of the Bead Mountain Sequence (Lower Permian), Texas: Implications for Evolving Sequence Architectures in the Midland Basin

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The Lower Permian Bead Mountain sequence (BMS) outcrops in north central Texas and is composed of the lower Valera Shale and overlying Bead Mountain Limestone of the Albany Group. Limestone - mudrock couplets are the fundamental stratal motif of the BMS, however the thickness and specific lithofacies composing these couplets varies between two end member types dominated by either mudrock or limestone lithofacies.

Mudrock - dominated couplets contain thick intervals of generally drab, fissile to blocky mudstones and claystones with variable amounts of macerated plant debris, root traces, conchostracans and vertebrate material. Weak paleosols are indicated by sparse to common clay slickensides and color mottling. BMS sequence boundaries are defined by well - developed red blocky mudstone with carbonate nodules and abundant slickensides/peds. The associated carbonate beds within these packages are generally thin skeletal packstones or peloidal wackestones to mudstones that can contain ostracodes, serpulid colonies, and rare concentrations of vertebrates at bed tops.

Carbonate - dominated couplets are composed of medium to thin - bedded bioturbated mollusk - foram packstones and grainstones with thin to very thin - bedded carbonaceous mudstone interbeds. These mudstones are sparsely fossiliferous with ostracodes, serpulids, and mollusks. Near the top of the BMS, one carbonate dominated interval contains a zone of crinoids and bryozoans indicative of fully marine open shelf conditions. Taken together, these couplet types are interpreted as the proximal to distal expression of high - frequency variations in climate and/or base - level on the Eastern Shelf.

Systematic stacking of these couplet types are recognized as parasequence sets. These parasequence sets begin with mudstone - dominated couplets and evolve up-section into carbonate - dominated couplets, indicating an overall trangressive trend for each. Outcrop gamma ray spectrometry through the carbonate intervals display up-section falling Th:U ratios with minima at the top of the sets, indicating further reduction of detrital input onto the carbonate platform through each set. The crinoid - bryozoan interval near the top of the upper set is interpreted as the MFS of the BMS, implying that the gross rock volume of the BMS is dominantly within the TST. This composite transgressive architecture appears to be common within the Albany Group, which is the Transgressive SS of the Leonardian supersequence.