Controls on Sequence Stratigraphy of Miocene Mixed-Carbonate-Siliciclastic Systems, Early Miocene, Dam Formation, Eastern Saudi Arabia

Alkhaldi, Fawwaz M.[1]; Tawil, Aus [2]; Read, J. Fred [2] (1) Saudi Aramco, Daharan, Saudi Arabia. (2) Geosciences Department, Virginia Tech University, Blacksburg, VA.

The middle Miocene Dam Formation in Saudi Arabia is a mixed carbonate/siliciclastic succession deposited in a restricted embayment. The facies profile consists of paleosols, eolianite and conglomerate marine red beds (up-dip), quartz sandstone channel-fills, microbial laminates, digitate stromatolites, oolites, monospecific mollusk grainstone sheets and subtidal skeletal packstone/wackstone mounds and biostromes. The Dam Formation contains three composite sequences: composite sequence 1 (7 m thick) is made up of four meter-scale cycles capped by a massive, rooted paleosol. Composite Sequence 2 (9 m thick) and Composite Sequence 3 (10 m thick) each is made up of two high frequency sequences (HFS 2-1, HFS 2-2, HFS 3-1 and HFS 3-2). These have incised Type 1 sequence boundaries and are overlain by cross-bedded, burrowed, quartz sandstone (estuarine fill) that formed during the earliest flooding phase of the Transgressive Systems Tract (TST). The Highstand Systems Tract (HST) consists of prograding skeletal grainstone channel fills. HFS 2-2 and HFS 3-2 are made up of a TST that floods a Type 2 sequence boundary. The HST consists of prograding bank and bioclastic channel facies. Within the HFS, skeletal and microbial banks tended to form buildups during the TST, whereas broad and shallow skeletal grainstone channel-fills dominated the late HST. An arid climate is indicated by eolianites, scattered gypsum crystals, shallow subtidal stromatolites, and hypersaline monospecific shell beds. The observed Miocene eolianites at the basin margin suggests that the dominant transport mechanism for siliciclastics into the marine embayment was by eolian transport during lowered sea level. These quartz sandstones were marine reworked into erosional lows during subsequent base level rises of the transgressive system tracts. Early Miocene moderate amplitude eustatic sea level fluctuations of a few tens of meters generated the incised sequence boundaries and brought clastics onto the shelf. Subsequently, floods on the up-dip portion of the platform in the study area caused flooding to shallow depths and high stand carbonate depositions.