

The Facies and Sedimentary Architecture Related to Wave-to-Tidal Variability in the Sego Member of the Mesa Verde Group in Utah, USA

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Upper Cretaceous deltas of the Sego Member of the Mesaverde Group in Utah and Colorado are characterized by multiple coarsening-upward units which form the lower and upper Sego Sandstone, separated by the Anchor Mine Tongue shale, with the thick Buck Tongue shale at the bottom. The sandstone-dominated units of Sego thin toward the east of Utah, with a thicker section of Anchor Mine and Buck Tongue shales toward the central part of Colorado. The thick sandstone units of the Sego Member have been interpreted as a tidal-dominated delta, with the paleocurrent direction toward the southeast. However, the marine shale intervals of Anchor Mine and Buck Tongues are often overlooked in previous studies and not linked with the deposition on the Sego Sandstone

Six outcrop measured sections, with overall thicknesses ranging from 60 to 100 meters, have been acquired in Utah and combined with LIDAR datasets and over 300 well logs to understand the large-scale architecture of the Sego Sandstone. The Sego Member consists of three major sequences with amalgamated coarsening-upward deposits, interpreted as delta deposits. The sandstone intervals are dominated by tidal current deposits, as evidenced by high-angle cross-stratifications, bi-directional paleo-currents, and double mud drapes within the sandstone. In contrast, the shale intervals contain thin, erosionally based sandstone beds with asymmetrical ripples and hummocky and swaley cross-stratifications indicating wave and storm deposits.

In addition to outcrops and LIDAR data, the correlation of the well logs indicates that the overall thickening of the Sego delta deposits is caused by the thickening of the Buck Tongue and Anchor Mine shales, while the sandstone units are thinning. These geometries suggest a likely double clinoform character of Sego tidal deltas. The well-studied coarsening upward sandstone-dominated Sego units are interpreted as shoreline deposits formed by mixed tidal-wave processes, while the underlying and laterally coeval mud-dominated coarsening upward units of Anchor Mine and Buck Tongue are interpreted as subaqueous delta deposits. The presented double clinoform delta model was never proposed for the Sego Sandstone. Documenting of double clinoforms deltas in Western Interior Seaway provides criteria to recognize such system in other basins as well.

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