

## **Mixed Carbonate-Siliciclastic Slope Sedimentation in a Foreland Basin (Lower to Middle Permian, Southern Delaware Basin, Texas)**

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The Glass Mountains outcrops in the southern Delaware Basin in west Texas expose more than 1000 meters of mixed carbonate-siliciclastic slope and basinal deposits of early to middle Permian age. The Permian shelf and slope within the area developed just north of the terminal thrusts of the Marathon orogenic belt which have been active until the early Permian. These outcrops provide a unique opportunity to compare the lithofacies and geometries of a syn- to post-orogenic mixed carbonate-siliciclastic slope succession combined with a variety of depositional profiles and types of carbonate factories. At least 4 distinct slope systems can be recognized in the succession. During period of foreland deformation, in early Lower Permian (middle Wolfcampian), older rocks exposed in the Marathon fold-and-thrust belt to the south served as the source for periplatform sediments with accumulation of coarse polymictic conglomerates. As tectonic activity waned during middle Lower Permian (late Wolfcampian and Leonardian p.p.), extensive carbonate platforms developed across the region and smoothed the complex paleotopography. Crinoid-fusulinid shoal systems and isolated patch reefs along the margin led to the production and shedding of great amounts of skeletal grains onto the slope. Granular hyperconcentrated density flow deposits and turbidites form the bulk of the slope succession. An abrupt backstepping of the aggrading-slightly prograding carbonate margin happened during early Leonardian which could be coeval with failure at the platform edge and deposition of thick megabreccia units onto the granular

slope. From late Lower to Middle Permian (late Leonardian to middle Guadalupian times), lenticular debris flows and granular turbidites were deposited on a low-angle silt-dominated slope. Slope failures with slides and slumped units are relatively common. Finally, in late Middle Permian (late Guadalupian), the development of extensive Capitan-type sponge reefs prevailed at the shelf margin. The relatively steep fore-reef and slope environment was dominated by autochthonous bioherms and coarse reef debris. Reef-collapse products can be found at the toe-of-slope while granular turbidites are rare. The evolution of the early to middle Permian slope system is the combined result of the waning tectonic activity and transition from an ice-house to greenhouse climatic-eustatic signal which resulted in the development of massive reefal systems in the late Middle Permian.

