

## **Structure and sediment dispersal from the southwestern Central Basin Platform into the partitioned East Delaware slope system, West Texas**

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### **ABSTRACT**

Unconventional reservoirs in the Delaware Basin were deposited coeval with and after the development of Late Paleozoic structures. Although the unconventional sweet spots are found basinward, understanding their updip linkages resultant from inherited topography, is pivotal for unraveling the prevailing facies distributions from slope and platform source areas. Our study focuses in the Waha-Samboca Field area, which offers an excellent opportunity to investigate the Pennsylvanian-Leonardian slope-to-basin stratigraphic architecture and deformation history from 3D seismic reflection interpretation and sequence stratigraphic correlations. Lithofacies distributions were derived from integrating core data from one well and petrophysical analyses of 22 wells.

Mapped thickness distributions of seven unconformity-bounded seismic packages display a contrasting architecture from partitioned, east-tapering clastic wedges that were deposited during Pennsylvanian-Wolfcampian fault-controlled subsidence (Atoka - Wolfcamp B), to isopachous and conformable Leonardian post-orogenic infill (Wolfcamp A - Bone Spring). Significant late Pennsylvanian basement-rooted uplifts defined the slope geometry with updip fold and thrust systems, middle-slope reverse slip systems, and middle- to lower-slope transpressional systems. Within these zones of accommodation, thick, carbonate-rich fan deposits accumulated in the intervening footwall blocks. During the middle Wolfcampian, an oversteepened slope profile is comprised of the coupled, west-verging activation of deep-seated reverse faults in the lower slope, and westward-propagating thrust systems in the upper slope. This middle Wolfcampian slope grade readjustment likely facilitated incision and bypass, routing sediments across the intervening footwall blocks and storing them at the toe-of-slope and proximal abyssal plain depocenters. In the late Wolfcampian, the significant thickening of upper slope packages is coupled with an increase in clay and TOC content, suggesting an increase in accommodation space and sediment delivery from southern-derived regions. By contrast, early Leonardian prograding topsets and clinofolds, displaying fairly uniform thickness distributions atop the main structures argue for sustained carbonate-rich sediment input from a north-south-oriented upper slope, and likely platform margin. In the late Leonardian, however, sustained westward upper-slope progradation trends and north-directed progradation of clinofolds suggest competing east and south sediment sources. The diagnostic

stratigraphic architecture and dispersal patterns across compartmentalized sub-basins advance our unconventional reservoir predictive criteria, and highlight the potential for new petroleum play concepts.

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