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## *What We Don't Know About the Structural History of the West Texas Basin*

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The West Texas or "Permian" Basin, home to a large percentage of America's hydrocarbon resources, has a long tectonic history, of which many key parts are poorly known or underappreciated.

- 1) The basin is built on a varied Precambrian basement, mostly dating from 1275–1350 Ma. Major features related to the presumed 1250 Ma extension, notably the layered mafic intrusion under the Central Basin Axis, are poorly mapped. Early Cambrian (540 Ma) rifting is likely in the Val Verde and southern Delaware Basins. *These poorly known rift trends may have controlled subsequent structuring.*
- 2) Despite an early Paleozoic "Tobosa" Basin (in part a product of Devonian erosion), the major subsidence history of the West Texas Basin began in the Pennsylvanian and continued into the latest Permian. Subsidence curves for this 80-million year period show complex patterns of subsidence rates. Early Pennsylvanian subsidence was rapid in the foredeep Fort Worth Basin. Later Pennsylvanian and Wolfcampian subsidence was rapid in the Val Verde Basin and southern Delaware Basin (foredeeps related to flexural subsid-

ence in front of either the Ouachita orogen or impinging foreland uplifts), but also became general throughout the basin area. General subsidence (including true tectonic subsidence) continued into the latest Permian. *The cause of the general subsidence is not known.*

- 3) Major deformation within the West Texas Basin occurred during the Early Pennsylvanian (pre-Strawn) and the Wolfcampian (earliest Permian). Deformation essentially ceased in late Wolfcamp time (although lesser subsidence continued over the high areas); subsidence outlived deformation. Mapping of the pattern of uplifts and basins, particularly in the complex Central Basin Axis, shows a series of structural domains. A consistent interpretation of these domains suggests generally east-west compressional structures with considerable strike-slip faulting, generally running west-northwest with an apparent left-lateral sense. *There is still controversy over the nature of West Texas structures.*
- 4) The present eastern, western, and southern margins of the bowl-shaped West Texas Basin are in fact the result of post-Paleozoic erosion. Triassic and

Jurassic erosion on the rift flanks of Gulf of Mexico rifting in east and south Texas stripped Permian strata from a large area of central and northern Texas. Early Cretaceous erosion on the rift flanks of the Bisbee/Chihuahua Trough stripped post-Wolfcamp strata from the Diablo Platform area. Both episodes of rifting affected Coahuila and may have resulted in the stripping of Permian strata from the Marathon and Val Verde areas. This means that *the present basin boundaries do not follow or preserve the original limits of subsidence*, which may have affected now-high areas such as the Llano Uplift and connected over the Diablo Uplift into the Pedregosa Basin.

- 5) Albian rocks cover the entire basin area and do not show any effects of the basin in their thickness, lithology, or present structure. Tertiary erosion in the western part of the West Texas Basin has exhumed the Guadalupe Escarpment.■

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