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Undiscovered Karst Country: A New Paradigm for the Pecos Region of Eastern New Mexico and West Texas as a Basin-Scale, Hypogene Speleogenetic Province [Abstract]

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Undiscovered Karst Country: A New Paradigm for the Pecos Region of Eastern New Mexico and West Texas as a Basin-Scale, Hypogene Speleogenetic Province [Abstract]

Since the mid-Tertiary, lateral migration and entrenchment of the Pecos River Valley (PRV) in eastern New Mexico and west Texas has significantly influenced regional groundwater flow paths, providing a focus for ascending flow in multi-storey artesian systems and a powerful potentiometric driving force for hypogene speleogenesis. Individual occurrences of hypogene karst phenomena associated with the central PRV are widespread throughout the greater Delaware Basin region, including development in a wide range of Permian carbonate and evaporite facies. Hypogene occurrences are well-documented as far north as Santa Rosa, New Mexico and as far south as Iraan, Texas.

Throughout the northern shelf, intrastratal dissolution and brecciation of the San Andres formation is widespread as a result of the eastward migration of the PRV. Proximal to the current PRV, hypogene dissolution in interbedded carbonate / evaporite facies of the Seven Rivers formation has produced three-dimensional network caves and vertical collapse structures. In the carbonate reef facies of the Guadalupe Mountains, complex three-dimensional caves are common, as well as stepped terraces associated with eastward migration of the PRV. Although these caves have been attributed to sulfuric acid dissolution, they are the result of hypogene speleogenesis in which solution aggressivity was increased by the addition of both thermal and sulfuric-acid components. Within the interior of the Delaware Basin, hypogene karst in basin-filling evaporite facies of the Castile and Salado formations is widespread, including development of large solution subsidence troughs associated with the lateral migration of the PRV. On the far eastern margin of the Delaware Basin, at the southeastern tip of the Central Basin Platform, persistent downcutting of the PRV contributed to the development of hypogene karst within the Yates Petroleum Field, providing cavernous reservoir porosity for the largest individual oil field known within the Permian Basin region.