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Sedimentology of Goat Seep Dolomite (Guadalupian, Permian), Guadalupe Mountains, West Texas and New Mexico

The Goat Seep "reef" constitutes the lower third of Guadalupian shelf-edge deposits but has been studied less than the Capitan because of outcrop inaccessibility and pervasive dolomitization. The Goat Seep is not simply an older Capitan but differs in aspects of morphology, biota, and cements.

Field studies reveal that the Capitan overlies Goat Seep without an apparent depositional break and that this contact is not the dolomite-limestone transition previously mapped. Instead, several hundred meters of the oldest Capitan are dolomitic. The Shattuck Sandstone extends across the shelf edge and into the foreslope, providing a convenient marker for the Goat Seep–Capitan contact. The shelf-to-basin relief of the Goat Seep (300 to 400 m) is similar to the older Capitan. The upper shelf-edge Goat Seep consists largely of high-angle (25 to 30°) foreslope deposits of autochthonous and allochthonous carbonate rocks (primarily wackestones) and minor siliciclastics. The Goat Seep, in contrast to the Capitan, has little high-angle, shelf-edge, massive facies (0 to 10 m compared to 100 to 200 m). Deeper, lower angle, toe-of-slope carbonate deposits are largely allochthonous, consisting of channelized debris flows and other gravity-flow deposits.

Goat Seep biota, consisting largely of calcareous sponges, with some bryozoans, brachiopods, corals, echinoderms, and *Tubiphytes* resemble Capitan biota. The Goat Seep lacks the abundant calcareous algae of the upper Capitan.

Cement crusts, present as pore linings in wackestones and as pockets of closely packed, broken, platelike grains, form a distinctive lithology in the youngest Goat Seep and oldest Capitan. These cements have an inferred submarine origin and probably formed an inorganic framestone on or near the seafloor.

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Alluvial-Fan Deposition and Tectonic Significance of Two Late Cretaceous–Paleocene Conglomerates in North-Central Utah Thrust Belt

The synorogenic fluvial Echo Canyon and Evanston Conglomerates provide evidence for tectonic events and paleoenvironments near the end of the Sevier orogeny. The great thickness (950 m), coarseness, obscurity of stratification, polymodal texture, poor imbrication, and abundance of fluid-escape structures in the Echo Canyon suggest high discharge, large sediment load, rapid deposition, and steep gradient. Deposits identified as low-relief gravel bars, shallow channel fills, sieves, debris flows, and infills of abandoned channels are present. The Echo Canyon is interpreted as a shallow braided-stream deposit of the proximal part of a large, humid-climate alluvial fan, analogous to a glaciofluvial outwash fan.

In contrast, the basal conglomerates of the Evanston show better sorting and rounding, stronger bimodality, overall finer clast sizes, well-developed imbrication, and better sandstone-conglomerate segregation. Recognized deposits include distinct traction and suspension loads, longitudinal and transverse gravel bars, side channels, and flood-plain (lacustrine?) deposits. Inferred deposition was by a graded, shallow braided river in a distal alluvial-plain setting.

Coarsening and increase of less durable clasts, together with imbrication and cross-bedding measurements, indicate dispersal from sources 10 to 30 km to the northwest. Clast counts show that the Echo Canyon was derived from Jurassic to mid-Paleozoic quartzite, sandstone, and carbonate rocks. The Evanston was derived from distinctive Cambrian and Eocambrian quartzite and carbonate rock and minor Precambrian gneiss. This pronounced compositional contrast and an intervening unconformity provide evidence for major thrusting between deposition of the two formations. The Echo Canyon source involved deformed, parautochthonous rocks in advance of the Willard thrust sheet, whereas the Evanston was derived from the older rocks of the allochthon itself.

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Source of Oils in Gulf Coast Tertiary: Why Look a Gift Horse in the Mouth?

Our understanding of the system in which oil is trapped in Gulf Coast Tertiary reservoirs is quite elegant: there is an orderly, systematic, predictable relation of environment of deposition, stratigraphy, structure, and hydrocarbon accumulation. The one essential element in the source-reservoir-trap-seal system for which we do not yet have definitive data is source. To predict distribution and volumes of undiscovered reserves and to use the Gulf Coast Tertiary basin as an analog for prediction in similar geologic settings elsewhere, we would like to have a realistic understanding of the source element of the system.

Oils in Gulf Coast Tertiary reservoirs have a wide range of chemical and physical characteristics, some of which are related to the characteristics of the source rocks from which they originated. Using both geologic and geochemical criteria, workers have identified possible source rocks in a variety of Cretaceous and Tertiary shallow-water to deep-water settings.

To generate hydrocarbons, a source rock must have sufficient organic richness and sufficient maturity. Paleogeographic settings for depositional environments where anoxic conditions could have caused accumulated organic matter to be preserved are widespread along the gulf margin in the Cretaceous and can be postulated at least locally in several parts of the Tertiary. Minimum richness values needed to generate hydrocarbons are still a matter of dispute.

The level of maturity of possible source rocks has been assessed by a wide range of criteria. With the generally low geothermal gradients in the Gulf Coast sediments, relatively deep burial is indicated. However, in the absence of agreement on criteria, general agreement regarding the identification of mature source rocks is lacking.