sediments relatively low in organic matter yield low molecular weight hydrocarbons due to more carbon-carbon bond cleavage. Kerogens mixed with quartz, silica, alumina, calcium carbonate, kaolin, or illite yield pyrolyzates more similar to those of the respective kerogens alone. This is due ostensibly to a lack of catalytic activity of these minerals as compared with the catalytically active smectites. Smectitic argillaceous sediments that contain less than approximately 2% organic carbon are poor sources of oil, although they may be productive of gas and gas condensate. These observations are related to gas and gas condensates of the northern Gulf of Mexico basin and in Indonesia, and to oil in the North Sea area.

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Paleoenvironments of Upper Albian Stage (Cretaceous) of Western Trans-Pecos, Texas

Upper Albian (Cretaceous) rocks of western Trans-Pecos Texas crop out in an east-west trend along the northeastern margin of the ancient Chihuahua trough and adjacent Diablo platform. These rocks represent an alternating terrigenous-carbonate sequence within an overall transgressive phase.

Twelve lithofacies and six biofacies were recognized from thin section point-count analysis and empirical outcrop data. Environmental parameters derived from lithofacies and biofacies, the interrelationships of facies, and comparison with several carbonate depositional models provide the basis for the establishment of depositional environments represented by upper Albian strata.

A time-stratigraphic framework consisting of ammonite interval zones was used to trace the movement of environments through time and space. Distribution of these environments indicates initial transgression came from the south and proceeded northeastward across Trans-Pecos Texas. Upper Albian deposition was concluded with the onset of a major regressive phase marking the beginning of the Cenomanian Stage.

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Massive Zinc and Iron-Rich Sulfide Deposits Associated with Hot Springs, Juan de Fuca Ridge

Warm-water faunal communities and zinc- and iron-rich sulfide deposits in the axial valley of the Juan de Fuca Ridge were photographed and sampled at a site about 15 to 20 km north of the Blanco Fracture Zone, approximately 500 km west of the coast of Oregon. Fine-scale bathymetric profiling along the 1-km wide axial valley reveals a shallow apparently continuous axial depression bisecting the planar valley floor. Faunal communities were observed in 75% of the camera traverses across this depression over a distance of 4 km. Although active venting of hot water was not directly observed, higher than ambient temperatures are inferred from the presence of sulfides and fauna that resemble those associated with previously described hydrothermal-vent systems. The presence of palagonite coatings on basalt recovered with the sulfides, the freshness of the sulfide minerals, and the thin (<1 cm) oxidized crust on the sulfide deposits all imply that volcanism and deposition of sulfides are recent events.

Sulfides dredged from one of the vent areas include: (1) a porous black sulfide consisting of sphalerite, wurtzite, and minor chalcopyrite, pyrite, galena, and cubanite; (2) a spongy gray sulfide consisting of sphalerite and minor pyrite; and (3) a yellow sulfide consisting of pyrite, marcasite, and sphalerite. Black and gray sulfide constitutes 95% of the total recovered sulfide. Other minor phases include amorphous silica, anhydrite, gypsum, barite, sulfur, and secondary iron oxide. Sphalerite is commonly colloform, with delicate growth zonation; Fe/Zn ratios across growth zones vary, and Cd content is low. Well-formed hexagonal wurtzite crystals have broad growth zones; Fe/Zn ratios and Cd content decrease from core to rim.

The results of bulk chemical analyses by atomic-absorption spectroscopy are:

	Black Sulfide	Gray Sulfide	Yellow Sulfide
		wt %	
Zn	54.0	59.2	0.63
Fe	8.0	1.8	50.5
Cu	0.32	0.07	<0.0003
Pb	0.25	0.06	0.11
		ppm	
Ag	290	230	<3
Cd	290	1,060	8

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Devonian Storm- and Tide-Dominated Shelf Deposits, Parnaiba Basin, Brazil

Storm- and tide-dominated shelf deposits crop out in the Parnaiba basin, Picos region, State of Piaui, Brazil, belonging to the Pimenteiras and Cabecas Formations. The Pimenteiras is dominantly Middle Devonian whereas the Cabecas Formation is Late Devonian in age.

The Pimenteiras Formation is organized into coarsening-upward cycles, with the top marked by bar-like sand bodies, bearing hummocky cross-stratification. Locally, channel-like depressions, carpeted with shale clasts, transect or are nested between adjacent bars. The overall environment is envisaged as a storm-dominated open shelf.

The Cabecas Formation consists of a thick quartzarenite interval composed of apparently elongate bodies with radial accretionary wedges in a complex imbricated pattern. Double-tangential—or "sigmoidal"—bedding is the main sedimentary structure, followed by slumping and dewatering features and locally by lenticular-wavy-flaser bedding. This unit, in this part of the Parnaiba basin, can be interpreted as formed in a tide-dominated environment, probably of the "shoal-retreat massif" type, with subordinate tidal flats.

In terms of vertical succession, the Pimenteiras and Cabecas Formations depict a cycle of relative rise of sea level (or of coastal onlap) with an increasing terrigenous influx toward the upper end of the cycle. The dominance of storm-wave action in the base of the cycle (Pimenteiras paracycles) points to a narrower shelf or steeper basinal slope. Later, the high terrigenous influx would decrease such a slope, preclude storm-wave action, and possibly amplify the tidal range—by shelf widening—in such a way that deposition would become tide-dominated.

Oil shows have been reported in the Cabecas Formation, which presents remarkable reservoir characteristics, but apparently its high sand/shale ratio would not favor the formation of stratigraphic traps. Conversely, storm-dominated deposits appear to form excellent stratigraphic traps despite their poorer reservoir characteristics.