and Jefferson Counties, Ohio, show large amounts of vitrinite, varying amounts of exinites, and inertinites. The inertinites, consisting mainly of fusinites and semifusinites are normally present in larger amounts than the sporinites and resinites that make up the exinites. Large amounts of mineral matter, composed of pyrite, carbopyrite, and carbargillite, exist within this high sulfur coal. Vitrinite reflectance studies reveal that all seams rank as high volatile bituminous coal.

Macerals within the coal imply that at the time of deposition the predominant facies was forest moor, occasionally interrupted by the mixed forest-and-reed and reed moor facies. The coal seams were in an upper delta-plain fluvial environment on an easterly building deltaic lobe.

The two westerly seams are thinner, with a higher ash content indicating their proximity to the main delta. They were deposited under brackish water conditions due to the distributary's diluting of the marine sea. The southern and northernmost seams have higher pyritic values reflecting deposition under marine conditions. The southernmost seam's higher pyritic values at its extremes indicate inundations of the sea in that area of the deltaic lobe.

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Subsurface Geology of Tertiary Rocks of Northeastern District of Western Desert, Egypt

The lithofacies analysis of the Tertiary rocks reveals two ancient subbasins at the north and southeast of the northeastern district, Western Desert. The southeastern subbasin seems deeper than the northern one as it received relatively thicker Paleocene and early and middle Eocene rocks. The lithofacies of the Paleocene and early and middle Eocene sections are mainly calcareous. The clastic ratio ranges from 0.05 to 1. Shale predominates in the late Eocene rocks. The clastic ratio is more than one everywhere. The Paleocene rocks seem to have accumulated in a lagoonal environment of epineritic depths. Semi-restriction of water circulation at the southeastern subbasin was caused by an elongated ridge, separating the two subbasins. The Paleocene rocks of the northern subbasin indicate accumulation on an unstable shelf, i.e., slow deposition in a rapidly subsiding basin or at least slow deposition in an overall carbonate aerobic environment. Widening of the northern subbasin occurred during the early Eocene. The Paleocene environmental conditions seem to have prevailed during the early and middle Eocene. During the late Eocene, rocks of shallow-water and current-agitated environments accumulated. The lower clastic layers of the Oligocene, having a sand/shale ratio less than one, indicate a clastic shoreline environment-lagoonal subenvironment. The sediments of such an environment are brought down by rivers and reworked by waves and currents. The Oligocene clastics are overlain by a basaltic sheet at the eastern part of the district. The depocenter of the northern middle Miocene subbasin lies farther north. The sand/shale ratio increases to the south, being more than one. The middle Miocene lithofacies indicate rock accumulation in a contemporaneously subsiding basin under lagoonal or delta-front conditions at the southern part of the district. Marine stagnant-bottom-water conditions prevailed during the accumulation of the middle Miocene rocks at the northern parts. The Pliocene shoreline shifted farther northward. The Pliocene rocks seem to have accumulated in lagoons, where the inflow exceeded evaporation and alternating periods of exposure and flooding by either fresh or saline water of poor circulation prevailed. The tectonic instability of the district was initiated by volcancity during the late Oligocene. This volcanic activity was accompanied by uplifting, folding, and faulting of Oligocene and older rocks. The uplifting of the southern part was accompanied with subsidence of the northern one. The subsidence was associated with vertical block movements of the basement rocks. Basaltic magma climbed along faults. The folds are of the brachyanticlinal type, affected by faulting forming a median horst block. This block remained high for a great period of time. The axes of folding are parallel to the fault trends due to their association with the vertical block movements of the basement. The northern flanks of the folds are relatively steeply dipping. The middle Miocene and Pliocene rocks are not affected by faulting. The source lands of those sediments are deduced as nearby low elevated lands affected by the same tectonic events that affected the depositional basin itself during different epochs.

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Storm-Deposited Outer Shelf Facies from Precambrian Ortega Group, New Mexico

The 1,700 million year old Ortega Group in northern New Mexico accumulated in diverse shallow shelf environments under the influence of tidal, wave, and storm processes. Tidal and fair-weather wave reworking dominated the inner shelf but a significant storm overprint is indicated by offshore-directed trough cross-stratification, and winnowed lags and scour channels at the top of tabular units. Storm-surge currents supplied sand to the outer, mud dominated shelf where deposition occurred predominantly under flat-bed conditions. Amalgamated, upward-thickening depositional units of horizontally stratified sandstone comprise 1 to 7 m (3 to 23 ft) thick genetic packages. Based on their position in the progradational shelf sequence, these sandstones are inferred to have accumulated in proximal reaches of the outer shelf. The upper parts of individual 2 to 25 cm (.78 to 9.8 in.) thick depositional units are commonly defined by inter-laminated siltstone and mudstone, and the thinner basal sandstones frequently have wave-rippled tops. Scour channels are often present at the top of the sandstone packages. The sandstone:mudstone ratio decreases outward on the shelf with discrete, 2 to 5 cm (.78 to 1.9 in.) thick, horizontally-stratified sandstone beds and rare hummocky cross-stratified beds passing distally into mm-thick horizontally stratified sandstones. Associated lenticular sandstones are exclusively wave rippled. The preponderance of horizontal stratification in outer shelf sandstones coupled with the resemblance of individual depositional units to b-d turbidite beds suggests suspension fallout under conditions of high but waning bed shear. Such conditions may have been related to unidirectional storm surge currents or oscillatory storm waves; the paucity of hummocky cross-stratification may favor the former process. Wave-rippled sandstones developed through fair-weather reworking of the storm-deposited sandstones. In the absence of bioturbation, Precambrian shelf sequences provide an excellent opportunity for studying outer shelf depositional facies and processes.

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Diagenesis in Stevens Sandstone, a Miocene Deep-Water Turbidite in San Joaquin Valley, California, and Probable Interactions with Surrounding Siliceous Shales

The late Miocene Stevens Sandstone deep-water turbidite in the Paloma oil field, San Joaquin Valley, is an arkosic sandstone overlain and underlain by distal fan siliceous shales. Porosity development in about 100 ft (30 m) of Stevens Sandstone in well U36-28 (present burial depth ~ 11,000 ft; 3,352 m) has followed these stages: (1) reduction of primary porosity due to initial burial compaction; (2) formation of authigenic quartz and smectite; (3) replacement of silicates and filling of much of the remaining primary porosity with calcite cement reducing the porosity to near zero; (4) dissolution of most calcite cement to produce up to 15% secondary porosity; and (5) reduction of secondary porosity by growth of authigenic clay minerals, mostly chlorite and kaolinite. Thus, major porosity development is contingent on a source of calcium for the calcite cement. The source of the calcium is assumed to be from dissolution of calcite tests in the surrounding siliceous shales, though this is difficult to prove. Thin beds of ankerite containing diatom frustules attest to the presence of a siliceous-calcareous microfossil component in the siliceous shales. The siliceous shales, stratigraphically equivalent to the siliceous Monterey Formation, and more quartz-rich than the arkosic Stevens Sandstone. The source of the silica in the siliceous shales is inferred to be recrystallized diatom frustules. Mobilization of silica within the shales is suggested by the presence of stylolites, which are depleted in silica relative to the amount of silica in the non-stylolite zones. Abundant quartz overgrowths within the sandstone may have formed in part from silica derived from the surrounding siliceous shales.

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Oil Migration Examples in Irati Formation, Parana Basin, Brazil

The Irati Formation (Late Permian), in the Parana basin, is a source rock with high oil generating potential.

Different geochemical methods have been applied to this study in relation to geological observations, such as, Rock-Eval pyrolysis, optical observations, gas chromatography of C_{15+} hydrocarbons, and isotopic analysis.

The results have shown that this formation contains organic matter belonging to type I and type III predominantly. The T.O.C. contents range from 0.5 to 13% according to the quality of the organic matter. Pyrolysis analysis indicates that the area where the Irati has the highest oil-generating source rock is in the north and south of the Parana basin. In these areas petroleum potential can reach 90 kg HC/t of rock. In the central part of the basin the Irati Formation might reach a depth of about 3,200 m (10,498 ft).

The degree of evolution of the organic matter by "burial effect" is generally low (immature), reaching the beginning of the "oil window" in the deepest part of the basin.

In many wells diabase intrusions have more or less completely "cooked" this formation, thus generating oil or gas, and leaving residual organic matter. The phenomenon of migration into the Irati Formation has been observed in many wells. In certain places, oil is accumulated in shales embedded between intrusion levels; in other places oil is accumulated into limestone beds, intercalated in the Irati Formation.

It seems safe to assume that the oil accumulated in the deeper beds resulted from the effect of thermal intrusions and also from the effects of normal burial.

Oil migration occurred after diabase intrusions (Late Cretaceous) during the increasing subsidence of the basin.

In the Parana basin, the Irati Formation may be compared to a "drain" with a lateral oil migration. Vertical migration was hindered by the lack of enough porosity and permeability in the shales above the Irati source rock.

Consequently, migration and accumulation of oil above and below the formation might have resulted from changes in facies of the Irati itself, by faulting, or by fractures due to diabase intrusions.

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Cementation of Upper Miocene Reefs in Western Mediterranean

Coral reefs in the western Mediterranean (southeast Spain, Balearic Island, northern Morocco, Sicily, and Italy) show a wide variety of cement types, ranging from completely tight, well-cemented, to poorly cemented reefs with most of the primary porosity still preserved. Cementation processes in those coral reefs appear to be controlled to a great extent by repeated changes of relative sea levels and regional variations of seawater chemistry. Reef progradation occurred during four to six (or more) important sea level changes, resulting in complicated geometric relationships of reef complexes and their freshwater lenses. Progradation occurred during sea level rises and falls and is reflected in abrupt escarpments in some field localities, generally separated by important terraced erosional surfaces. Various types of "aragonitic isopachous" cement fringes of marine origin, 0.1 to 1.5 cm (.04 to .6 in.) thick, are well preserved in some localities. This is probably due to subsequent plugging by gypsum cement during the Messinian salinity crises. Another possible effect of salinity fluctuations is the abundance of thick crusts of peletoidal, micrite cement of marine origin, locally forming about three-fourths of the volume of the reef core.

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Sour Gas Resources in Western Wyoming Basins and Adjacent Overthrust Belt

Sour gas is widely distributed in the Big Horn, western Wind River, and greater Green River basins, and the eastern part of the Overthrust belt in Wyoming. In adjacent parts of Idaho and Utah, available data to evaluate the probable occurrence of sour gas diminished rapidly west of the Wyoming border. Principal geologic and geochemical factors in the formation of sour gas include (1) hydrocarbon reactions with sulfates in source and reservoir rocks and formation fluids, (2) thermal desulfurization of crude oil at temperatures in excess of 100°C (212°F) and depths of 3,000 m (9,842 ft) or greater, and (3) catagenic decomposition of kerogen to form CH_4 and H_2S at temperatures of about 350°C (662°F) and depths of 7,000 m (22,965 ft) or more.

Sour gas is found with an increasing probability of occurrence from the Chugwater Formation (Triassic) to the Madison Group (Mississippian). It also occurs in lower Paleozoic rocks, but the few reported occurrences preclude estimation of its resource potential at this time. Based on both surface and subsurface evidence, sour gas is closely associated with carbonate-evaporite sequences from cyclic depositional environments from subtidal through supratidal-sabkha that are present in western Wyoming from the Mississippian through the Triassic. In the three basins and the Overthrust belt, sour gas resources are estimated to have a mean volume of 20 to 27 tcf, with a 95 to 5% probability range of 7.5 to 56 tcf. The distribution by basin is estimated to be the following: Big Horn, 17%; western Wind River, 13%; greater Green River, 45%; and eastern Overthrust belt, 25%.