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%.