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MINERALIZATION, FLUID FLOW, AND SEALING PROPERTIES ASSOCIATED WITH AN ACTIVE THRUSTFFAULT: SAN JOAQUIN BASIN, CALIFORNIA

We describe and discuss diagenetic patterns associated with a Quaternary thrust fault in the subsurface of the Wheeler Ridge oilfield. The oilfield is situated in California, between the southern edge of the San Joaquin basin and the northern limit of the Transverse Ranges. Petrographic observations indicate that the distribution of cements and porosity in the fault zone, is a function of depth and temperature. At depths shallower than 2500 m, the porosity increases towards the fault zone due to open microfractures and plagioclase dissolution. At depths greater than 2500 m, the porosity, in the fault zone, decreases due to calcite cementation in microfractures that ultimately form vein networks. Based on $\delta^{18}O$ data, veins cemented by intraformational (lateral) flow into the fault are distinguished from veins cemented by ascending fluids. Ascending cementing fluids traveled more than 75 to 800 m vertically. Petrography suggests that oil migration was the last event following dissolution and calcite cementation. Based on oil chemistry, whole-oil $\delta^{13}C$, °API gravity, and petrographic data we propose that hydrocarbons, presently in shallow and deep reservoirs, flowed laterally to the fault zone. While hydrocarbons in shallow reservoirs flowed across the fault into the hanging wall, hydrocarbons in deep reservoirs were trapped against the fault in the footwall. Lack of evidence for retrograde condensation and increasing °API gravity with depth indicate a limited vertical migration and re-accumulation of hydrocarbon, suggesting that, below 2.5 km depth, the thrust behaves as vertical seal. The sealing properties of the thrust may be controlled by calcite cementation.