

P-T Conditions during Methanogenesis and Oil Filling in Mesozoic Dolostones from the Saramako Oil Field, Southeast Mexico

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The Saramako oil field is located onshore the Mexican Gulf, in the Reforma-Comalcalco area, SE Mexican Basin (Mexico). The Tithonian and middle Cretaceous carbonates present a comparable evolution, with two events of pervasive dolomitization and a late calcite event. Dolomite carbon and oxygen isotopic compositions suggest that dolomitization occurred in a burial environment with a low water to rock ratio.

Three fluid inclusion types have been found: (1) two-phase brine-bearing (LAQ-V) fluid inclusions; (2) two-phase oil-bearing (LHC-V) fluid inclusions; and (3) poly-phase (LAQ-LHC-V-S1-3= celestine, anhydrite, OM) fluid inclusions. The oil composition spans from black to light oil. Homogenization temperatures for type 2 (LHC-V) and 1 (LAQ-V) inclusions range from 5°C to 165°C and from 56°C to 82°C in the Tithonian reservoirs, and from 32°C to 155°C and from 80°C to 169°C in the middle Cretaceous reservoirs.

Calculated salinity for aqueous fluids associated with oil inclusions in Tithonian and middle Cretaceous dolostones range from 5.5 to 7.5 moles of NaCl/kg H₂O and from 0.33 to 2.4 moles of NaCl/kg H₂O respectively. The CH₄ contents in type 1 (LAQ-V) fluid inclusions is similar for Tithonian and middle Cretaceous reservoirs, and varies from 0.009 to 0.242 moles of CH₄ /kg H₂O. Both reservoirs reveal the same filling history. A first, high pressure CH₄-rich brine pulse (ca. 1200 bars) precedes a hydraulic breccia event subsequently followed by a first hydrocarbon pulse (ca 500 bars). The last fluid P-T conditions calculated (ca. 300 bars; ca. 130°C) are thought to represent the main filling episode in the hydrocarbon reservoir history.