Brine and Hydrocarbon Evolution in a Salt Diapir-Oil Field Environment, Southeast Mexico

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The Campeche Bay Cretaceous oil fields consist of dolomitized carbonates with superimposed impact breccias and an ejecta seal on top, thought to be formed after the Chicxulub impact. The structure of this area is principally driven by tectonics and salt diapirism during Miocene. Both oil fields are anticline structures. Chuc and Cantarell oil fields are crosscut by salt diapirs, which act as fluid flow barriers. Fractures are cemented by dolomite and late calcite and host most of the fluid inclusions studied. These are classified as two-phase brine-bearing (LAQ-V), two-phase oil-bearing (LHC-V); and poly-phase (LAQ-LHC-V-S = celestine, anhydrite) fluid inclusions. The petroleum inclusions contain around 30 mole% of methane and 1 mole% of CO_2 and belong to the “black oil” family. The majority of aqueous inclusions are methane-depleted and show no evidence of hypersaline brines. Gas/liquid ratios on fluid inclusions, ranging from 3 to 11%, were determined by confocal scanning laser microscopy at a given temperature. Microthermometric data show two maximum Th distribution around 50-60°C to 115°C for hydrocarbon inclusions and around 100°C-140°C for aqueous inclusions. These facts suggest that the end of the dolomitization process was closely related with the beginning of the main accumulation of oil in the reservoir, displacing the aqueous fluids and precluding the precipitation of carbonates. As we found no clear evidences of hypersaline fluids related with diapirism, the oil charge would probably occurred before the salt tectonics took place.