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Thermal History of the Jurassic-Tertiary Succession of the Zagros Mountains (Iran): Constraints from the Study of Fluid Inclusions

The Mesozoic-Tertiary succession of the Zagros Fold Belt is a worldwide known important petroleum province due to many potential source rocks and reservoirs. To constraint the thermal history of the succession and related time of oil generation for each source unit, a study was performed on fluid inclusions trapped both in intergranular cements and fracture filling minerals in samples with ages ranging from Jurassic to Miocene collected along the Anneh and Fahliyan Valleys (Khuzestan Province, SW Iran). The main results are as follows. Petrography of samples allows recognising at least two systems of fractures postdating intergranular cementation. Petrography of fluid inclusions identified two different types of oil-filled fluid inclusions occurring both in intergranular cements and in the first fracture network, while they lack in the last one. Microthermometry of fluid inclusions allows discriminating temperature and salinity of fluids responsible for mineral precipitation. In intergranular cements and calcite fillings the oldest fractures, precipitation occurred from relatively high saline fluids, in a temperature range between 60-115 °C, depending on the stratigraphic depth. The strong correlation between temperature and stratigraphic depth suggests that both intergranular cementation and the first fracturing event occurred when the succession was undeformed and records a relatively constant paleogeothermal gradient of 25 °C/Km. On the contrary, fluid inclusions trapped in cements filling the last fractures resulted oil-free, freshwater-filled with low trapping temperature independently from the stratigraphy; this probably suggests last fracturing occurred after oil migration and during or post-Zagros deformations, when samples were in a near surface position yet.