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Ghadames-Illizi basin thermal history definition – The contribution from a Middle Devonian reservoir infilling history

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The Ghadames-Illizi basin is one of the major petroleum system of North Africa with two major source rocks both located within the Palaeozoic sequence: the Silurian and the Frasnian Hot Shales. They play an important role in defining the petroleum system in the area.
The main reservoirs are located within the Palaeozoic (Ordovician, Silurian and Devonian) and the Mesozoic sequences (Triassic). Several regional seals are interbedded within the Palaeozoic sequence and a Triassic evaporitic unit acts as the shallower seal within the Mesozoic sequence.
In terms of exploration activity, the basin can be considered mature with the discovery of large oil and gas accumulations. traditionally considered Recent studies evaluated the residual potential for conventional or unconventional exploration.
The basin is characterised by two major erosional events related to the Hercynian and Alpine orogenesis. The burial and heating processes preceding these erosional events are traditionally considered responsible for the source rock getting the oil and gas window state at shallower depth than those related to the present thermal setting.
A possible interesting and alternative thermal model may be correlated to the role played by the tertiary heating event due to intrusive bodies affecting the entire north African craton.
The classical maturity parameters are not able to discretise which is the maximum heating event responsible for the present state of maturity of the two major source rocks.
The reservoir thermal and hydrocarbon infilling history can help in solving this problem. Actually, by considering secondary migration as an instantaneous process at geological scale, the moment of hydrocarbon arrival into the reservoir can be correlated to the moment of hydrocarbon generation in the basin.
The application of the Fluid Inclusion analysis microthermometric to rock samples coming from a Middle Devonian reservoir within the Ghadames-Illizi basin provides a contribution to the definition of the thermal history of the entire basin.