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A Comparative Analysis of Paleozoic Petroleum Systems of Illizi and Murzuq Basins (Algeria and Libya)

The Illizi basin (Algeria) and the Murzuq basin (Libya) constitute a single depositional domain during many stages of their evolution, and they share most of the elements and processes that characterize the Paleozoic petroleum system in North Africa. However despite their similarity they present significant peculiarities and further work is needed to reduce risk in the future exploration of the basins. Exploration in Illizi is focused primarily on a structural play concept whereas exploration of Murzuq combines structural and palaeomorphological traps. Successful structural traps are associated with Palaeozoic tectonic events (mainly Caledonian, Acadian and Hercynian). The relative importance of these events and the effects of later phases (Austrian and Alpine) needs further analysis since these structural peculiarities combined with variations in reservoir depositional and diagenetic patterns lead to significant differences in hydrocarbon distribution. Thus, more than 4 billion barrels reserves of oil and 20 TCF of gas have been discovered in Illizi, in Devonian and Cambro-Ordovician reservoirs respectively whereas 2 billion barrels reserves of oil and about 3 TCF of gas have been found in the Murzuq basin in Cambro-Ordovician reservoirs. Additional work is also needed to discriminate the relative contribution from the main Palaeozoic source rocks (Lower Silurian and Frasnian-Fammenian "Hot" Shales) to the accumulations, improving the definition of their extension, depositional patterns and maturity. Detailed thermal and fluid flow modelling under construction would confirm a proposed Mesozoic age for the critical moment of the petroleum system in both basins and a model of relatively short lateral up-dip migration.