

Oil and Gas Fingerprinting in Onshore Kuwait: Implications for the Petroleum System

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Recent and existing analyses on oil and gas samples in onshore Kuwait field, combined with a 3D petroleum system modelling approach allow to infer the origin of the present day hydrocarbon accumulations and evaluate the impact on the exploration strategies.

Existing GC-MS oil analyses from Cretaceous and Jurassic oils confirm that the main source-rock is the Najmah-Sargelu complex. Recent Sulfur analyses of Najmah source-rock show a high organic S content (up to 3%), which is responsible for the high S content observed in the Cretaceous Oils. Lower S content in Jurassic oil is probably the consequence of oil cracking due to higher maturity, as suggested by petroleum system modelling.

There is little evidence of a significant contribution of a Paleozoic source-rock to the Jurassic and Cretaceous oil accumulations. However, locally high API° and recent C-Isotope and Rare gases measurements of gases associated to the oils support a minor contribution of this deep source in a few areas of onshore Kuwait.

The petroleum system modelling suggest the existence of a rather efficient regional seal at the base of the Jurassic (Jihl evaporite), responsible for the very high overpressure measured below this seal. This seal is locally fractured in the vicinity of the main faults encompassing the Jurassic and the Paleozoic. These weakness zones control the overpressure regime but allow for some minor hydrocarbon flow from deep sources up to the Upper Jurassic accumulations.

Recent gas Isotope measurements on Triassic condensates support the existence of a deep source-rock, possibly related to the regional Qusaiba source.

The paper will discuss the recent analyses results in the framework of the petroleum system modelling in order analyse the gas/condensate supply system from the deep Paleozoic source toward the Paleozoic/Triassic reservoir.