

## Source Rocks: Global and Regional Control on Organic Matter Accumulation; Middle East Examples

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### Abstract

Most source rocks in the Middle East belong to secular world-wide Paleozoic and Mesozoic time intervals recognized to be prone to accumulation of sedimentary organic matter. They include Neoproterozoic- Early Cambrian: e.g. Huqf SGp (inter alia Nafun Gp, Athel Fm) in Oman, Silurian: e.g. Qusaiba Fm in Saudi Arabia and Oman, Jordan and Iraq, Upper Jurassic: e.g. Tuwaiq mountain - Hanifa Fm in Saudi Arabia, Najmah in Kuwait, Diyab Fm in UAE, Mid-Cretaceous: e.g. Kazdhum Fm in Iran, Shilaif Fm in UAE, Natih Fm in Oman.

As far as the geological context is concerned, the Neoproterozoic-Early Cambrian source rocks were deposited in a rift system. The Lower Silurian source rocks were deposited during a period of sea level rise and were mainly accumulated in depressions of the paleo-topography resulting from the Late Ordovician glacial erosion (e.g. glacial valleys, fluvial incisions), and depressions inherited from Early Paleozoic tectonic features. Mesozoic source rocks accumulated within shallow carbonate intra-shelf basins (ISB) along the southern rim of the Tethys Ocean, in an arid rain shadow climatic regime.

With the major exception of the Silurian source rocks (Type II), the marine carbonate/evaporitic environments of the infra-Cambrian rift system and of the Mesozoic ISB's, when associated with anoxic conditions (and when depleted in iron-bearing minerals, often connected with clay clastic input), lead to the widespread occurrence of sulfur-rich sedimentary organic matter (Type IS, e.g. Athel Fm, and Type IIS).

In the last decades, enormous progresses have been achieved in identifying and quantifying the processes implied in the accumulation of fossilized sedimentary organic matter. However the multiple interplaying factors resulting in the deposition and distribution of regional source rocks and the difficulties to encompass their respective role in a given petroleum system paves the way to the development of approaches taking advantage of the integrating power of numerical modelling. Several research or in-house models are currently used and developed for this purpose. They serve to integrate field data, to test hypothesis and scenario, and ultimately to tentatively populate basin models with realistic source rock distribution and attributes. In this respect, Forward Stratigraphic Models are well fitted to accommodate Source Rock modules. As an example, based on previous geological model, it is possible to model the main specificities of the Natih formation with a numerical stratigraphic model. This model, which takes into account inorganic and organic sediment transport and deposition, allows testing several organic matter deposition scenarios.