

Petroleum Geochemistry of Hydrocarbons in Gadiaga Field, Senegal: A New Lower Jurassic Lacustrine Source Rock and Play Identified

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ABSTRACT

The Gadiaga Field, Senegal contains a number of Upper Cretaceous reservoirs with oil, condensate and gaseous hydrocarbons. The Gadiaga Field located to the northeast of Dakar has seen Eocene volcanism and exhumation, and the heating associated with the volcanism and exhumation plays an important role in controlling the maturity and subsequent charge history. The main source rocks predominantly considered to have generated the petroleum in the Greater Senegal Basin from Mauritania to Guinea Bissau are the deepwater, marine Upper Cretaceous-Turonian section as in much of West Africa, with secondary source rocks in the graptolitic Silurian as in North Africa and syn-rift lacustrine late Permian-Triassic as in Morocco and Newark Basin, USA. Each of these potential source rocks on the shelf areas to the east of the hinge line has problems either because of the lack of sufficient burial of the Cenomanian-Turonian, or in the case of the Triassic and Silurian being too deeply buried. Rifting and volcanism associated with continental breakup are now thought to occur in the late Triassic-early Jurassic and with additional Tertiary volcanism also occurring in the Dakar Uplift to the southwest of the Gadiaga Field, and therefore unlikely to remain viable source rocks capable of sourcing hydrocarbons for the Cretaceous reservoirs. Analysis of Gadiaga Field hydrocarbons show that the dry gases were generated from late oil window to gas window mature source rocks. Some of the condensates contain diamondoids and while ratios derived from such biomarkers indicate dry gas window maturities, the reliability of these ratios may have been affected by evaporative fractionation. The oils contain TPP, dibenzothiophene and tricyclic terpane data indicative of lacustrine source rocks, which is incompatible with the littoral marine Upper Cretaceous being the source rock that have generated these oils to the southwest. The reason for the believing that the Lower Jurassic is the potential source rock is that littoral/lacustrine depositional environments are common in rifting basins, e.g. East African Rift. Given the Tertiary volcanism then there are both oil- gas-prone source rocks that can generate the gases and condensates with the appropriate maturities. The main difficulty arises from the presence of a Lower Jurassic oil, given the Tertiary volcanism. The prospects of this source rock for the remainder of Senegal will be discussed.