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Biodegradation and oil quality in siliciclastic Cretaceous reservoirs

Case study from Canar area, Muglad basin, Sudan

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This study evaluates and correlates the state of biodegradation and oil quality of the Cretaceous sandstone reservoirs in the Canar area at the northwest corner of the Muglad rift basin of interior Sudan. The area is characterized by isolated sub-basins that show a decreasing trend of Abu Gabra source rock effectiveness as we stepping out of the basin towards the flanks. Analyzed oils shown to be very similar indicating one source that correlates very well to the Abu Gabra sourced oil and representing one generation pulse that took place during late Cretaceous time. Laboratory analyses included API gravity, pour point (PPnt), Wax content, Asphaltene fractions, Gas Chromatography (GC) for whole oil plus gas and Chromatography-mass spectrometry (GC-MS) for both saturated hydrocarbons and aromatic fractions of nine oil samples; with the aim of studying the different maturity indices, genetic and physicochemical interrelationships. A regional composite seismic line was restored to various stages of basin evolution in order to model structural setting, maturation and hydrocarbon generation history at the study area through time. The degree of biodegradation, in some samples, was found high enough to have strongly affected oil properties, including API gravity and producibility. When correlated with other fields in the basin, oil biodegradation in Canar area was found to depend upon location. Being located closer to sources of oxygen-rich meteoric water recharge; the most westerly reservoirs were severely hit by microbial degradation.