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Tertiary (Deltaic) Petroleum System, Niger Delta

Regional integration of results from exploration geochemistry, structural analysis, sequence stratigraphy and gravity-magnetic data have provided a new comprehensive understanding of the Tertiary (deltaic) petroleum system of the Niger Delta. This petroleum system is complex and regionally variable. Historically, structural play types have dominated, although large structural-stratigraphic traps have also been discovered. Currently, about 2 million BOPD are produced, and gas, which until recently was entirely flared, is beginning to be commercialized. Recent success in deepwater exploration is propelling the basin into its second cycle of exploration and attracting significant international attention.

Oil-prone source rocks in a well from the northwestern part of the delta and inferences drawn from oil biomarkers define the Tertiary (deltaic) petroleum system. This petroleum system is the principal source for hydrocarbons in the Niger Delta. Laterally and temporally varying source-rock facies, dominated by terrigenous organic matter, as well as regional differences in thermal maturity are the principal factors controlling the complex regional distribution of oil and gas across the delta. Enhanced migration focus near the structural level of oil-prone source rocks provides significant hydrocarbon charge to several large oil fields in the northwestern part of the delta. Episodic hydrocarbon migration predicts changes in the composition of generated hydrocarbons through time and, along with secondary processes, explains most of the complex GOR distribution found within fields and on a sub-regional scale. There is a reasonably good correspondence between richer source-rock facies, inferred on the basis of biomarker and carbon isotopic data from oils, and oil reserves.