Palaeogeographic Evolution and Petroleum Potential of the Equatorial Atlantic Margins

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Following recent oil and gas discoveries and very promising drilling in Ghana, Cote d'Ivoire and Sierra Leone, the Equatorial Atlantic Margins of Africa and South America have seen increasing exploration interest. We present here some results from our geodynamic and petroleum geology study of the Equatorial Atlantic Margins. We will focus on the petroleum potential of this area through the investigation of the structural and tectonic settings and analyses of the palaeogeographic, palaeolandscape and palaeodrainage evolution since Neocomian times.

In the Equatorial Atlantic area, Phanerozoic structures and geological evolution have been controlled by very distinct transform faults: the Chain, Romanche and Saint Paul Fracture Zones. These are still active since their initiation at the Early Cretaceous. During the Aptian-Albian, the Equatorial Atlantic domain appeared as a transfer zone between the northward propagating tip of South Atlantic and the southward propagating tip of the Central Atlantic. Between the transform faults, rapidly subsiding rift basins have been initiated, then oceanic accretion started during late Aptian and Albian times in small divergent segments. Within these basins, organic-rich lacustrine sediments were deposited and could represent prolific source rocks. During mid-Albian times, important uplift and erosion, related to changes in the African and South American plates motions, occurred and resulted in the creation of topographic highs which not only influenced sedimentation, but which also represent traps for some of the fields (i.e. the Jubilee Field located on top of the South Tano High offshore Ghana).

Aptian and Albian continental and lacustrine to shallow marine sedimentation was followed by open marine sedimentation during the Late Cretaceous: the margins evolved as active transform between Cenomanian and Coniacian, then passive margins since the Santonian. During the Late Cretaceous, rapid drowning of the margins created ideal conditions for deposition of thick organic-rich marine sediments. Clastic input from the onshore domain by the palaeo-river systems led to deposition of large turbidite fan/channel complexes in the deep water. These represent migration routes and excellent reservoirs for many fields and prospects.

Continued subsidence since the Late Cretaceous led to deposition of thick marine shales which represent effective seals for the stratigraphic and structural traps.