

Exploration of the Senegalese Portion of the Greater MSGBC Basin: A New Frontier Petroleum Province

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The MSGBC Basin remains one of the last few remaining under-explored basins along the west African margin. This study located offshore Senegal, south of the Dakar peninsula and north of Gambia identifies all the key components required for a successful petroleum system. In 2007, an extensive 3D seismic program (2050² km) was acquired which highlighted two key para-sequences: the pre-Senonian unconformity section consisting of a long-lived carbonate platform of Jurassic to Cenomanian age and the syn-post Senonian unconformity section which consists mainly of stacked Santonian age fans with multiple stacked amplitudes on seismic, and an overlying tertiary succession. Uplift and subaerial exposure along the platform during the late Cretaceous time led to karstification and erosion that we believe are key to development of fractured related permeability in the carbonate reservoir. Platform uplift was likely associated with differential rotation induced by the withdrawal of Triassic age salt in the southern MSGBC. The erosion event is marked by the Senonian unconformity, clearly recognizable on seismic by hummocky karstified topography. In contrast, the syn-post Senonian section consists of stacked Santonian age deepwater fans. These fan systems are genetically related to incised-valley canyons, which acted as conduits for down-slope transportation and deposition. We mapped three key canyons within the study area where detailed rock physics and attribute analysis indicate that the turbidites are a mixed lithology of reworked carbonate material and paralic siliciclastic sediments. 3D basin modeling was used to determine the timing of generation and spatial extent of the petroleum kitchen for the Turonian age source shale that was deposited along the west African margin. Onset of generation began during the Maastrichtian and continues through present-day, and the down-slope turbidites, as well as the karstified carbonate platform, are located either within or adjacent to the present-day kitchen. Drawing on analogues from recent Ghanaian discoveries in late Cretaceous turbidites, this opens up the Senegalese offshore basin as an exciting new deep water province along the Central Atlantic realm.