Favorable Play Fairways for Abu Gabra Formation in Mugald Basin, Republic of Sudan

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ABSTRACT

Abstract: Muglad Basin is an intra-Craton passive rift basin related to Central Africa Shear Zone (CASZ), which is located in the Southern-Central of Republic of Sudan. There rifting-sagging cycles were developed in the basin since early Cretaceous. The main targets in the basin are sands formed in the sagging stage, which were highly explored with limited potential remained. The first rifting sequence in early Cretaceous Abu Gabra formation is considered as the new plays in the basin, while the favorable plays fairways are unclear due to complicated sedimentary systems developed in Abu Gabra period. Based on the analysis of more than 60,000 Km length of 2D seismic, 5,000km2 of 3D seismic data and 200 wells data in the whole basin, five third order sequences can be divided in Abu Gabra formation, which were corresponded as five stages of sequence evolution such as Pre-rift fast infilling, first flooding, retrograding, maximal flooding and final retrograding stages. Facies mapping showed that during the fourth (AG-2) and the last (AG-1) sequences lacustrine was predominant, and delta systems developed in the Western Kaikang Trough, Neem, the south of Shelungo and Fula south areas. There are two sets of source rock developed in Abu Gabra formation, such as shale developed the fourth sequence (AG-2) during the maximal flooding period and shale developed in the second sequence (AG-4) during the first flooding period. Three reservoir-cap assemblages developed inner Abu Gabra formation. The first assemblage was inner AG-1 reservoir charged from AG-2 source rock, the second one was inner AG-2 self-sourced assemblage, and the last one was AG-3 reservoir charged from AG-4 source rock. The inner AG-2 self-sourced assemblages was also potential for lithological traps. The favorable facies for both structural and lithological traps were delta front with appropriate shale content, the area were Neem-Azraq, the western flank of Bambo-Unity sub-basins, the eastern slope of Unity sub-basin, Haraz-Diffra in Western Kaikang Trough, and Fula South.