

Depositional Environments and Sequence Stratigraphy of the Cretaceous Lacustrine/Fluvial Abu Gabra and Bentiu Formation, Muglad Rift Basin, Sudan

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The paper aims to characterize the facies, positional environments and the sequence stratigraphic framework of early to middle Cretaceous syn-rift lacustrine/fluviol sedimentary succession of Abu Gabra and Bentiu formations in the Muglad Rift basin. Methods of study utilized included integration and analysis of wire line logs, lithological description, stratigraphic hierarchy analysis and seismic data analysis. six lithofacies were recognized in Abu Gabra formation. These are deep lacustrine claystone and shale, shallow lacustrine fine grained sandstone and claystone, fluvial channel fill sandstone; valleys fill deposit, over bank claystone and fluvial deltaic coarse grained sandstone and conglomerate. Four lithofacies were recognized in Bentiu formation. These are shallow lacustrine sandstone, braided channel fill sandstone, meandering fluvial deposit and over bank claystone. Lithofacies associations were interpreted in terms of depositional systems, namely, from base to top are fluvial dominated, lacustrine, fluvio-deltaic, shallow lacustrine, braided stream and meandering stream system. From seismic facies analysis five different phases of rifting were recognized. These are: rift initiation, early rift climax, late rift climax, early post rift, late post rift. The syn-rift succession of Abu Gabra and Bentiu formations is a second order super sequence (span 51 Ma) and each of Abu Gabra (span 17 Ma) and Bentiu (span 36 Ma) formations represent second order sequence. These sequences are separated by major unconformity (SB) that is dated and serves as formations top. Three system tracts were interpreted within Abu Gabra formation, namely, from bottom to top, low stand system tract of fluvial dominated facies, transgressive system tract of lacustrine facies and high stand system tracts of fluvio-deltaic facies. Within Bentiu formation three system tracts were recognized, from bottom to top, low stand system tract of braided channel deposit, transgressive system tract of isolated meandering channel deposit and highstand system tract of amalgamated meandering channel deposit. Third and fourth order cycles were also recognized in these formations. Fourth order cycles range from few meters to ten meters and represent Milankovitch cycles. Controls on sequence development are tectonic, lake level change, climate and sediment supply.