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Heterogeneity and Reservoir Quality of Yabus and Samaa Formations, Agordeed Field, Melut Rift Basin, Sudan

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The Tertiary Yabus and Samaa Formations occur within the Melut Rift basin of interior Sudan which is regionally linked to the central and west African rift system. Yabus and Samaa Formations in Agordeed oil field are ones of the most productive oil reservoirs in Melut basin and are composed of sandstones and mudstones lithofacies that differ in size and length along and across the basin. The reservoir sandstone, which occurs at shallow burial depth, deposited within fluvial/lacustrine environments. This work aims to describe and characterize the reservoir heterogeneity and to investigate their impact on reservoir quality and architecture. This study employed a multi-disciplinary and integrated approach that investigated and synthesized stratigraphic, sedimentological, cores, logs, petrographical, petrophysical and seismic data from Agordeed oil field. The stratigraphic and lithofacies analysis indicated that Yabus and Samaa formations vary systematically in their facies, sequences and stacking patterns within the basin. Reservoir heterogeneity exists at multiple scales, where reservoir sandstones macro- and micro scale heterogeneity shows vertical and lateral variations along and across the basin. These variations reflect the tectonic, depositional and post depositional controls within the proximal to distal fluvial, prodelta and lacustrine environments. The porosity and permeability distributions are controlled by the heterogeneities within the reservoir formation, such as stratigraphic layering, facies, diagenetic processes, and fracturing. Porosity is enhanced by extensive fracturing and grain dissolution creating intergranular, intragranular and moldic porosity. In addition, permeability is also increased by fractures connecting separated the buildups, that affect directly the reservoir quality. Assessing the different scales of heterogeneity is important to understand their impact on reservoir quality and architecture in Agordeed Field.