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Facies, Depositional Environments and Sandstone Composition of the Late Ordovician Glacio-fluvial Sanamah Member, Wajid Formation, South West Saudi Arabia

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The Late Ordovician Sanamah Member of Wajid Formation at SW Saudi Arabia is an outcrop reservoir equivalent to the glacio-fluvial Late Ordovician Sarah Formation which is considered as a primary potential reservoir target in the Rub al Khali basin of southern Saudi Arabia. The study of the properties of this outcrop reservoir equivalent is critical for understanding, prediction and characterization of reservoir quality in the subsurface. This study aimed to characterize the facies, depositional environments, sandstone composition, and diagenesis. The lithofacies analysis indicates that the Sanamah member was deposited within a glacio-fluvial depositional setting during period of advance and retreat of the ice during Late Ordovician, where both glacial and fluvial braided stream deposits are distinctive. Lithofacies vary from massive to cross-bedded conglomerates, pebbly sandstone, and medium to very coarse grained trough cross-bedded, low-angle and horizontally-bedded sandstone facies. Scoured and erosive surfaces are common with local deformation and slumping features within the facies. Petrographically, Sanamah sandstone comprises 95% quartz, 4% feldspars, 1% mica, 1% rock fragments and 1% heavy minerals. Modal analysis is classified as quartz arenite deposited within a stable cratonic for the sediment and accumulated in a passive margin basin. Diagenetic features include dissolution and leaching of feldspars and rock fragments. Authigenic kaolinites occur in most samples as euhedral pseudo hexagonal plates forming booklets and aggregates filling pores and also by replacement of detrital feldspars and mica. Grain fabric comprises straight grain contact (15%) and mostly point contact (85%). Other diagenetic features include corrosion, oversized pores and complete dissolution or replacement of detrital grains resulting in secondary porosity. Porosity decreases with the increase the matrix content and cement content. Both depositional and post depositional heterogeneities appear to have their impact on porosity and permeability patterns at outcrop scale and consequently reservoir quality and architecture.