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Regional Sequence Stratigraphic Model of the Miocene Dam Formation and Its Impact on Lithofacies Architecture and Heterogeneity, An Outcrop Approach, Eastern Saudi Arabia

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The Middle Miocene was an active tectonic period in the eastern province of Saudi Arabia. This study describes and characterizes the lithofacies, of the mixed carbonate-siliciclastic succession of the Dam Formation to interpret paleoenvironments, develop a stratigraphic framework and reconstruct regional depositional and sequence stratigraphic model for the Formation. The approach and methods followed include detailed lithofacies analysis based on several outcrop sections of the formation along a 200 Km long traverse extending from the north to south in the eastern region. The field description was combined with Spectral Gamma Ray measurements along the vertical outcrop sections. The sedimentologic analysis revealed several lithofacies and variation in stratigraphic sequence hierarchies and stacking patterns. These regionally investigated outcrops contain inner and mid-ramp lithofacies which are grouped into four composite sequences. The LST is characterized by the presence of the sandstones, conglomerates, siltstones, and sandy shales. The TST is characterized by the occurrences of skeletal wackestone with dasycladean algae. The HST is dominated by the presence of oolitic and skeletal grainstones. The clastic content increases towards the North-West direction from southeast area. The production of terrigenous clasts is determined by the exposed source rocks, their brittleness, and sea-level change. These whole carbonate strata show disorganized stratal relationships suggesting a more complex interplay of rates of subsidence and tectonic uplift, variation in carbonate productivity and deposition. Modeling of detailed internal stratigraphic architecture of each outcrop allows the spatial fluctuations in relative sea-level changes to be predicted and is essential for understanding the carbonate platforms geometries. The constructed deposition models may be useful for the prediction of subsurface facies relationships beyond inter-well spacing in hydrocarbon exploration and development activities.