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Paleozoic, Mesozoic and Cenozoic Carbonate Ramp Successions of the Arabian Plate: Facies, Sequential and Quantitative Stratigraphic Analysis from Outcrop Analogs, Saudi Arabia

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Paleozoic, Mesozoic and Cenozoic carbonate ramp successions are excellently exposed in outcrops in central and eastern regions of Saudi Arabia. These carbonate formations are economically important as hydrocarbon reservoir targets in Saudi Arabia and the Arabian Plate in general. During the Phanerozoic time, the Arabian plate passed through various events of tectonic, paleogeographic, sea level changes and depositional settings that affected the development and distribution of carbonates through space and time. This study describes and characterizes the facies, paleoenvironments, sequential and stratigraphic architecture. The study integrates different techniques including facies analysis, bed thickness, sequence and stacking patterns and quantitative facies percentages among outcrop examples from Permo-Triassic Khuff carbonates, Jurassic carbonates and Miocene carbonates well exposed in central and eastern Saudi Arabia respectively. Various controls appear to have influenced the sequential stratigraphy and architecture of the carbonate examples studied. Vertical and lateral outcrop observations and measurements revealed variations in facies types, abundances, paleoenvironments, sequences, stacking patterns and stratigraphic architecture. Different scales of variations observed among these carbonates examples that indicate the influence of various controls including sea level changes, sediment supply, paleoclimate and tectono-paleogeographic development of the Arabian Plate during the Phanerozoic time. Locally, autocyclic controls on individual paleoenvironments have also superimposed some variations among the depositional systems. This outcrop analog study might help and provides guides for understanding their development and prediction of the properties of their equivalent carbonates formations in the subsurface in the Arabian Plate and elsewhere.