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Analysis of the Facies Distribution, Internal Architecture, and Development of an Isolated, Microbially-Dominated Carbonate Platform (Terminal Proterozoic Nama Group, Namibia)

Digital surveying technologies have been used to map the internal architecture, geometry, and facies distributions of a well-exposed, terminal Proterozoic, isolated carbonate platform (Nama Group, central Namibia). Three-dimensional data obtained from differential GPS mapping, combined with digital elevation models, facilitates the visualization and understanding of the geometrical relationships and facies transitions, and aids in constructing reservoir models.

The platform has a width of 8km and a thickness of approximately 300m and was initiated on a grainstone-dominated outer ramp during an overall rise of relative sea level. It comprises two 3rd-order accomodation cycles: After an initial stage of nucleation in relatively shallow water, aggradation (TST) of the platform resulted in a sheet-like geometry dominated by poorly developed, small stromatolite columns and stratiform stromatolites. This stage was followed by strong progradation (HST) and development of a grainstone-dominated platform interior, followed by base-level fall and creation of sequence boundary. The overlying sequence also features initial aggradation in a TST, followed by drowning: initially, a sheet-like stromatolite biostrome was able to keep up with rising sea level, but a shift from these sheet-like stromatolites to thrombolite mounds and pinnacle reefs signals continued accomodation increase, and eventually drowning as marked by blanketing deep-water shales.

The facies transitions and geometries of the platform-to-basin transition have been mapped in significant detail. Facies (updip-to-downdip) include mounded stromatolites (shelf margin), irregularly laminated carbonates (stratiform stromatolites), turbiditic grainstones, breccias, and toe-of-slope thrombolite mounds. Slope geometries are straight and concave and contain microbial in addition to muddy and grainy fabrics.