Architectural Characteristics within Lacustrine Carbonate Reservoirs, Angola and Brazil

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Large to giant oil fields like Kambala and Malongo West, offshore Cabinda, Angola, and Linguado and Pampo, offshore Brazil, produce from lacustrine carbonate reservoirs of the Cretaceous Atlantic Margin Rift system. The Angolan and Brazilian accumulations are controlled by structural-stratigraphic traps due to rapid facies changes, related to high frequency of the lake level fluctuations, and synsedimentary tectonic activity. These combinations of factors pose unique challenges for exploration specially on the flow unit scale, which can be elucidated through the application of outcrop studies in the search for the common thread that binds the fabric of reservoir architecture.

The Atol Quarry, in the Alagoas Basin, Brazil, provides a unique dataset to examine lacustrine carbonate facies changes and stacking patterns within a cyclo/sequence stratigraphic framework. High frequency, upward shoaling cycles of pelecypod-dominated grainstones and packstones are the key facies in the quarry dataset and subsurface reservoirs alike. These stack into moderate frequency cycles that are often bounded by flooding events marked by black shales. These shales are first order vertical permeability barriers within a reservoir. They can be discontinuous when associated with active structural areas or can be eliminated by erosion during lowstands and early transgressions of lake level. Structural activity, on differentially subsiding fault blocks, also causes low-angle intra-reservoir angular unconformities marked by penetrative karst. This type of sequence boundary is often difficult to identify on the well-spacing scale of a typical offshore field.