

# Clinoform Geometry and Sequence Stratigraphic Architecture of Lower and Middle Eocene Carbonate Prograding Sequences, Sirte Basin, North Central Libya

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9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

## Abstract

Isolated carbonate platforms are common and contain important petroleum reservoirs. Internal geometry of well-developed prograding clinoforms and stratigraphic architecture of a lower and middle Eocene isolated carbonate platform in Sirte rift basin, Libya, were interpreted from 3-D seismic and well data. Four stratigraphic surfaces in the Eocene strata have been interpreted on the basis of reflection termination patterns (truncation, toplap, onlap, and downlap). They divide the Eocene strata into a depositional sequence composed of transgressive (TST), highstand (HST), and lowstand systems tracts (LST). The systems tracts differ in thickness and development of depositional systems. The TST was developed at the base of the sequence and contains lagoonal deposits with mound-shaped patch reefs. The HST is the thickest and contains a well-developed slope system with an overall progradational stacking pattern. The LST is the thinnest and composed of middle ramp deposits developed during the lowest sea level. The interplay of accommodation space and sediment supply is responsible for the variation in thickness and depositional systems. The thickness is determined by the available accommodation space, while the spatial distribution and temporal evolution of depositional systems by sediment supply. Three packages of clinoforms form a seismic unit and are bounded by a toplap or truncational top and a downlap base. The top package shows high angle sigmoidal clinoforms; middle package is high angle oblique tangential; and basal

package has a low angle subparallel pattern. The overall progradation direction is N-NW, along which the slope angle of individual clinoforms and clinoform packages varies. The width of individual clinoforms varies from ~ 1.7 km in top package to ~ 2.5 km in basal package; and the height ranges from 220-350 m. Vertically in well H3-6, individual clinoforms consist of 5-100 m thick coarsening upward cycles of grainstone and packstone, possibly rudstone and breccia. The change in clinoform angle indicates changes in accommodation space and depositional regime during relative sea-level highstands. The large height and small lateral extent of clinoform packages suggest a steep reef front topography. The slight change in progradational direction is associated with a change in the direction of transporting currents. These conditions may be unique to isolated platforms.