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Shoreline migration paths, stratigraphic architectures and sea-level changes for early-mid Miocene deltaic clinoforms in the northeastern shelf margin of South China Sea

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Early to mid-Miocene delta-scale clinoforms are described and mapped using a 3.3×10^4 km^2 3D seismic data set in the Pearl River Mouth basin, South China Sea. Five types of sandy deltaic clinoforms, constructed by sediment influx of paleo-Pearl River, are identified: (1) tangential oblique clinoforms; (2) parallel oblique clinoforms; (3) sigmoidal-to-oblique clinoforms; (4) sigmoidal clinoforms; and (5) oblique clinoforms. The sigmoidal and oblique clinoforms of up to 450m high generally occur along the shelf-edge which are typically associated with gravity-driven deposits when the sediment supply is highest during the early Miocene. The other clinoforms generally formed with height of 50 -120m on the mid-outer shelf. These delta system are strike-elongate, which are likely generated by strong wave action along the continential margin. The evolution of the Early-mid Miocene delta system across the northeastern shelf was defined as a key proxy for tracing the migration process of shoreline position and, as a result, the deltaic clinoform stacking patterns and shoreline trajectories occurred in three major stages with variation of clinoform relief and foreset gradient. The early stage (23.8-17.5Ma) was dominant by transgressive trajectories with high gradient, sigmoidal or oblique shelf-edge deltaic clinoforms evolving into low relief, parallel tangential oblique inner-shelf deltaic clinoforms, indicating the rising relative sea level and a landward retrogrodation of deltaic clinoforms for over 120 km. During intermediate stage (17.5-13.8Ma), the shelf delta system stepped seaward from inner-shelf to outer shelf with a progradation rate at 35 km/m.y. and was characterized by tangential oblique, shelf deltaic clinoforms with barely any topsets preserved when the relative sea level fell. Thereafter, the delta systems retrograded 70 km landward and formed transgressive trajectories in the late stage (13.8-10.5Ma), and were associated with sigmoidal-to-oblique, outer-shelf deltaic clinoforms transitioned into parallel tangential oblique, inner-shelf deltaic clinoforms, which is derived from a combination of relative sea-level rise and decreased sedimentation rates. This study shows the shoreline migration paths that is traced from the evolution of deltaic clinoforms correlates well with both regional and global sea level change, which is regarded as the dominant controlling factor on the stratigraphic architecture and depositional systems in the outer shelf setting. Thus the shoreline trajectories along the depositional dip offers more information about sea-level fluctuations, sediment transport routes and dispersal patterns of depositional systems with higher resolution of chronostratigraphy during the accreation of the shelf margin.

Key words: Deltaic clinoforms; Shoreline migration; Continental shelf margin; Pearl River Mouth Basin