



## Sequence Stratigraphy of the Lower Cretaceous in Aer Sag, Erlian Basin, North China

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The concepts of sequence stratigraphy, initially developed for the study of marine depositional systems, are increasingly also being applied to sequences deposited in lacustrine basins, particularly in the context of petroleum exploration. However, lacustrine basins differ from marine basins. They are typically smaller, exhibit a strong diversification in sedimentary facies, generally contain thinner sequences and are characterized by multiple sedimentary source regions. These characteristics should be taken into account when analyzing sequence stratigraphy in lacustrine basins. Aer Sag is a balanced-fill sag in Erlian basin, North China. During the Early Cretaceous tectonic subsidence is the main controlling factor for sequence development. Based on the unconformities observed at the top of different inversion-induced depositional cycles, the 2nd-order sequence of the Lower Cretaceous can be sub-divided into six 3rd-order sequences of which the lower four, which bear most of the hydrocarbon reservoirs, are the focus of this study. Generally, a complete 3rd-order sequence can be partitioned into four systems tracts: i.e. lowstand systems tract (LST), transgressive systems tract (TST), highstand systems tract (HST) and forced regression systems tract (FRST). In LSTs, tectonic activity is weak and there is a slow subsidence rate. Thus, the rate of creation of accommodation space is so slow that coarsening-upward prograding sedimentary units develop. In TSTs, tectonic activity becomes stronger and the rate of creation of accommodation space outpaces the rate of sediment supply. TSTs are characterized by fining-upward retrograding sedimentary units and by onlaps on seismic profiles that are caused by the expansion of the lake. In HSTs, tectonic activity slows down again and the rate of creation of accommodation space becomes lower than the rate of sediment supply, which causes the lake to shrink and the development of coarsening-upward prograding sedimentary units. In FRSTs, the regional stress changes from transtension to transpression, which results in widespread uplift-induced erosion. Coarse sediments, eroded from the basin margins, are transported to the foot of slope breaks, where coarsening-upward prograding units develop with a sharp contact with the underlying HST. LSTs are poorly developed during all the sequences, which implies a high tectonic subsidence rate at the beginning of each sequence. TSTs are mainly developed in the SQ2 and SQ3. HSTs are abundant in SQ1 and SQ4, while FRSTs are mainly developed in SQ2 and SQ3. Combined with drilling results, we can conclude that most of the petroleum reservoirs occur around the horizon T7 in the HST and FRST in SQ2 and LST in SQ3.