

Siliciclastic Sequence Models in Wide and Low-Gradient Continental Margin of Northern South China Sea*

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Abstract

The northern shelf of the South China Sea, more than 250 km wide and less than 1 degree of average terrain gradient, is a typical wide and low-gradient continental shelf. There are 2 types of slope breaks, the depositional break in the Huizhou area, and the physiographic break in the northern area of the Baiyun Depression ([Figure 1](#)). Based on sedimentary facies associations and stratigraphy stack patterns, 20 third-order siliciclastic sequences in the Paleogene Zhuhai Formation, to the Neogene Yuehai Formation in the northern continental margin of the South China Sea, are recognized and categorized into three types of sequence models.

Stratigraphic Sequence Models

Model 1: Tripartite sequence model in the shelf margin

The sequences SQ13.8, SQ21 and SQ23.8 belong to this model ([Figure 2](#)). Sequence development is controlled primarily by relative sea level change in this model, and characterized by stream rejuvenation and fluvial incision. Shelf-margin deltas formed during rapidly falling relative sea level or low relative sea level, and are associated with basin floor turbidite fans. When the deltas are already at the shelf margin, the subsequent fall, even at a very small magnitude, may result in shelf-edge dissection and the formation of basin-floor fans. At the transgressive stage, the outer-shelf wave-dominated delta transforms to the mid-shelf delta. At the high relative sea level stage the inner shelf tide-dominated delta and the bayhead delta develops.

Model 2: Tripartite sequence model in the continental shelf

The sequences SQ18 and SQ17.5 are typical examples of this model (Figure 3 and Figure 4). Sediment supply is dominated in the formation of this sequence model. Although the falling relative sea level cannot expose the entire shelf, the rapid supply of sediment results in delta accumulation in the inner shelf to form a local depositional break. The high sediment supply drives the delta beyond the former shelf depositional break, but an incised valley does not occur at the depositional break edge during lower relative sea level. Below the depositional slope break exists shelf-perched lowstand tidal sand ridges resulting from the reforming of the pre-existing delta, transgressive and highstand deposits are the inner shelf wave-dominated and especially the tide-dominated deltaic sediments (Figure 5).

Mode 3: The dimidiate sequence model in the shelf margin

This model is seen in sequences SQ14.8, SQ12.7, SQ11.7 and SQ8.5. Relative sea-level and sedimentary supply control development of this sequence. Lowstand systems tracts do not occur. When the continental shelf is submerged and the sediment supply flux decreases, mid-shelf to inner-shelf deltas develop in the transgressive stage, and the bayhead delta at the high sea level stage.

Conclusions

The sequence stratigraphic models of siliciclastic deposits in the northern South China Sea were controlled and influenced by factors such as eustatic tectonic subsidence, sediment supply and paleogeography. Paleogeography such as flatness and landform gradient controlled unloading of terrigenous clastic sediments from the paleo Zhujiang River, and stratigraphic patterns of terrigenous siliciclastic depositional system and high sediment supply may result in depositional breaks in the northern shelf of the South China Sea.

Shelf-perched LST in pre-existing submerged shelf and thus a “Model 2” sequence of siliciclastic depositional system occurred if the depositional shoreline break did not reach the pre-existing physiographic shelf edge when the rates of eustatic fall exceeds the rate of shelf subsidence. “Model 1” sequence occurred if the depositional shoreline break reached the physiographic shelf edge and coincided with it. When the rate of eustatic fall is larger than the rate of basin subsidence at the depositional shoreline break, a relative fall in that position occurs.

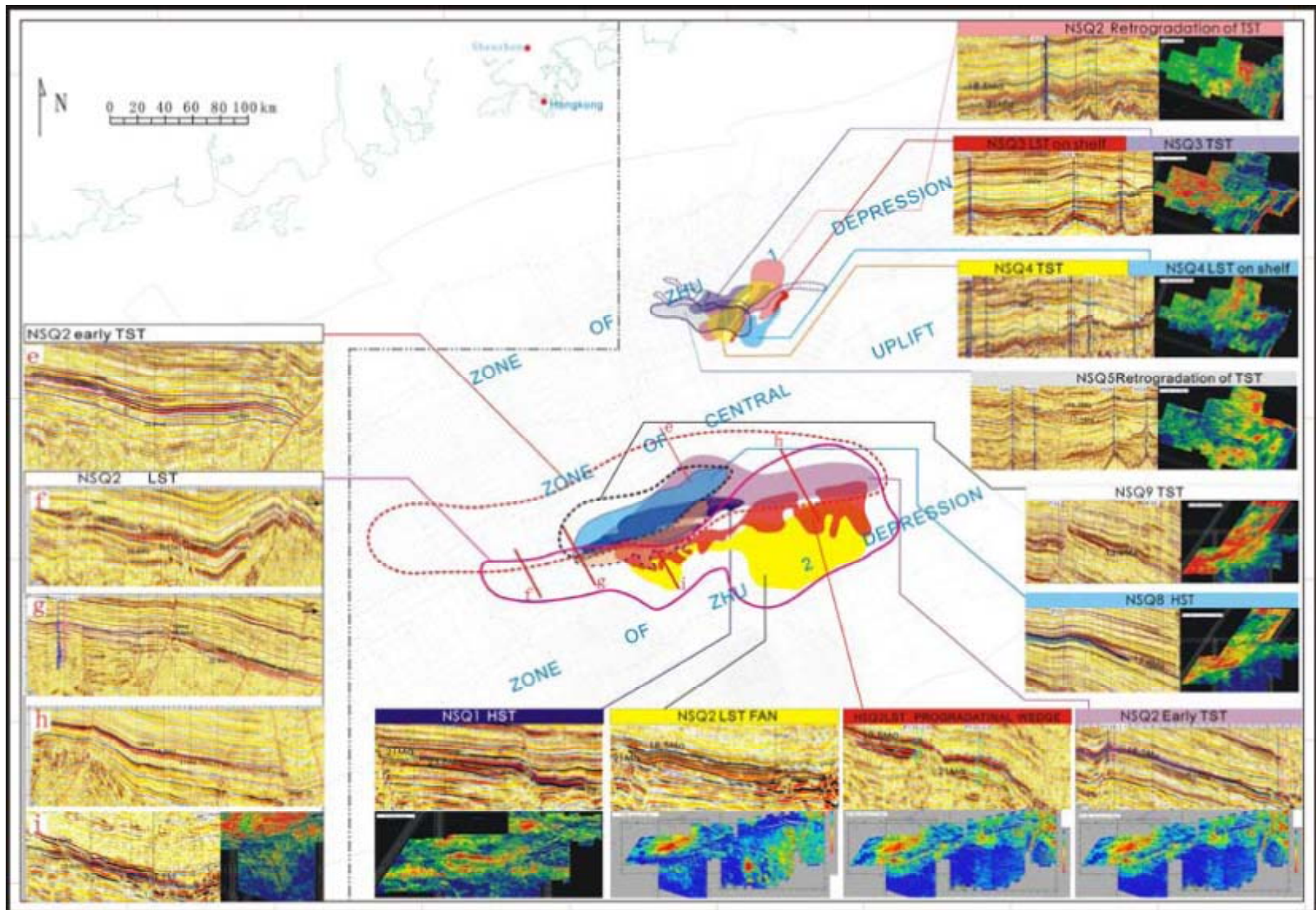
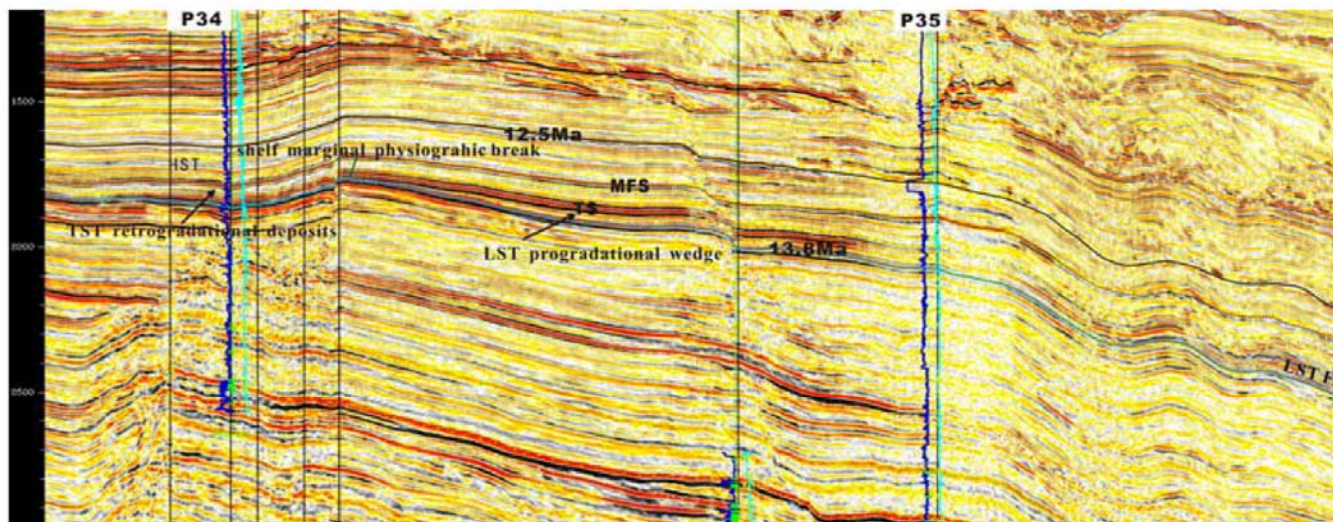
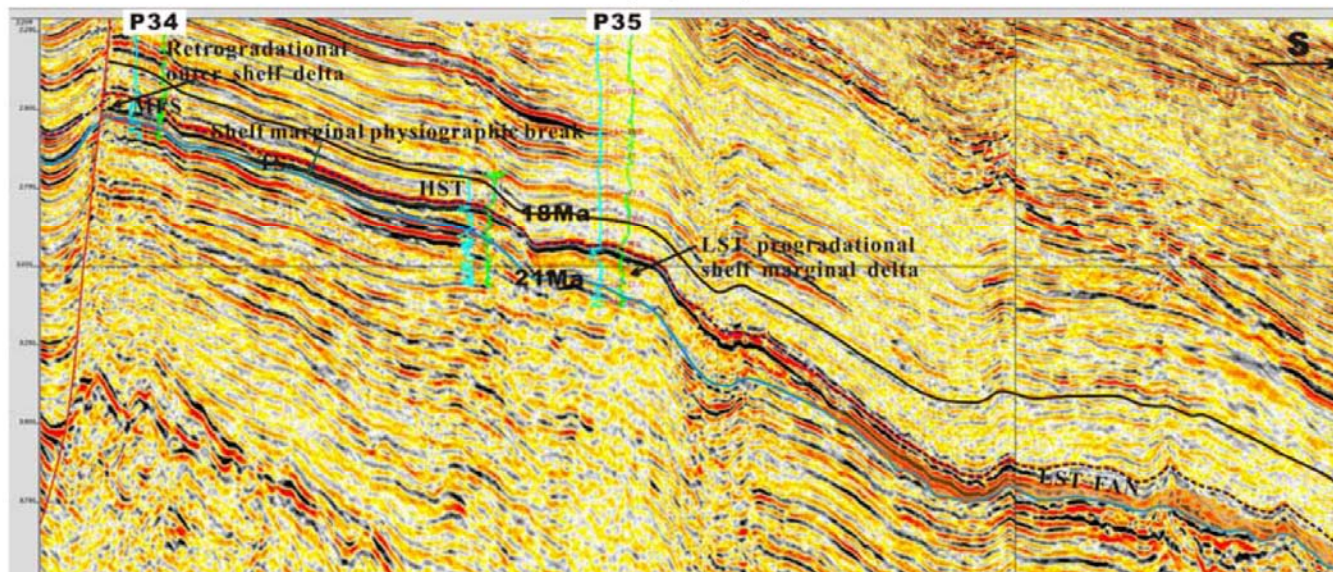


Figure 1. Distribution of multi-slope breaks in northern South China Sea.



A(SQ13.8)



B(SQ21)

Figure 2. Tripartite sequence model in the shelf margin.

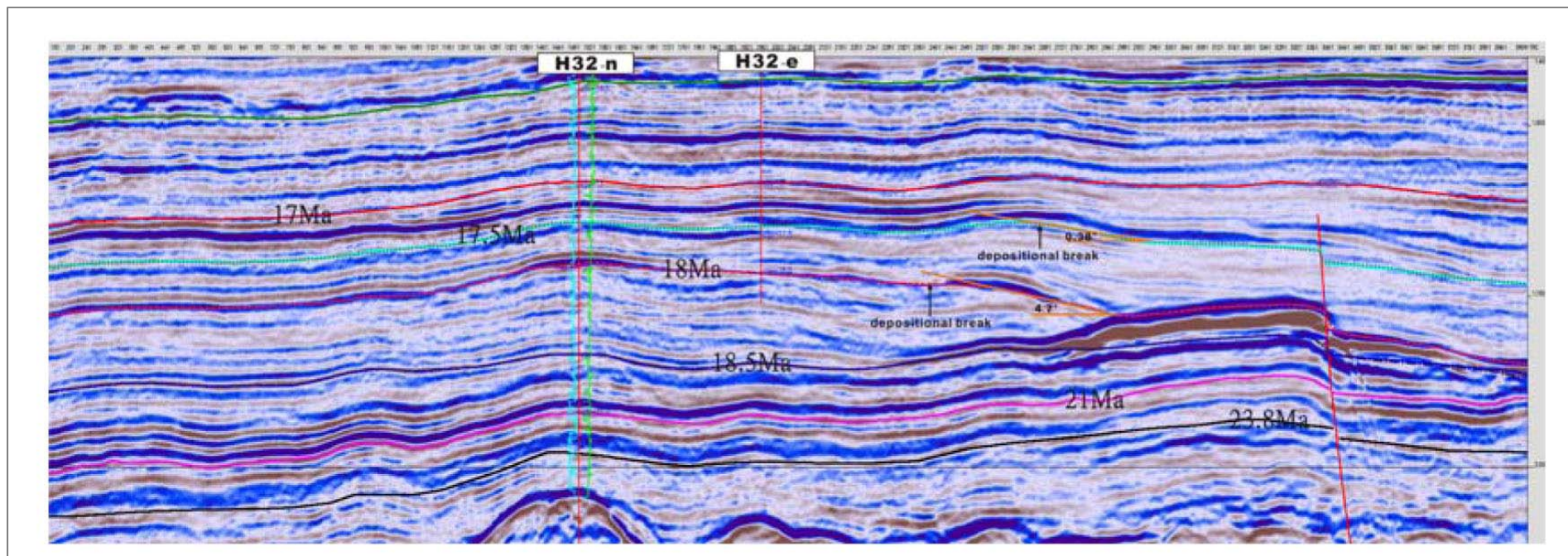
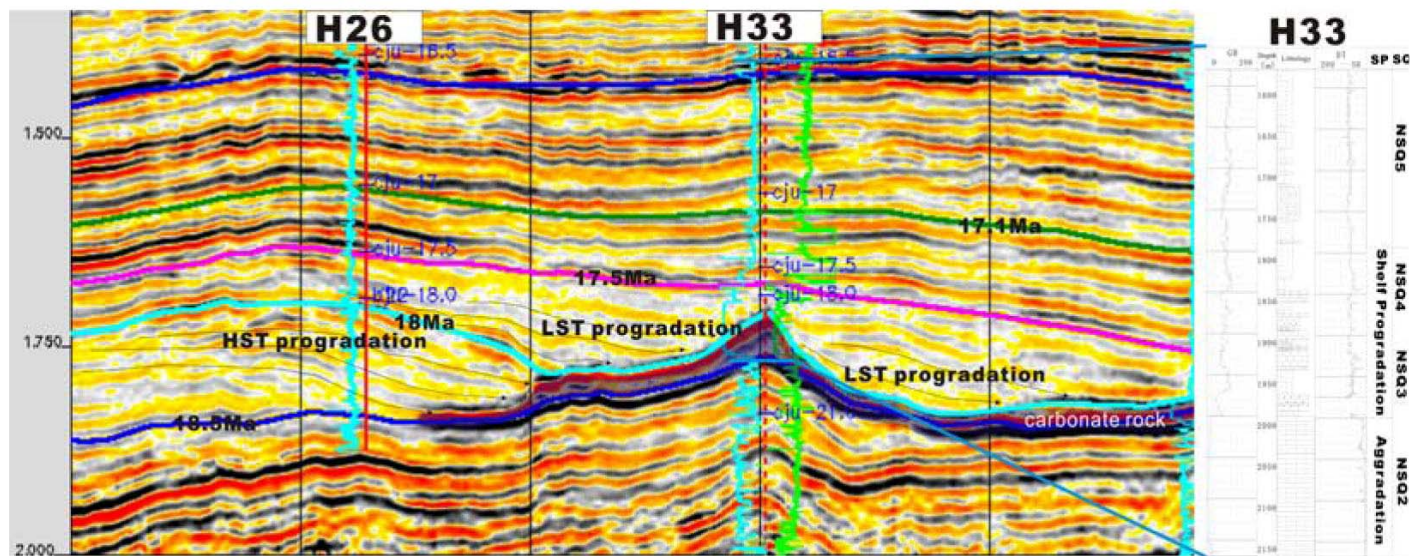
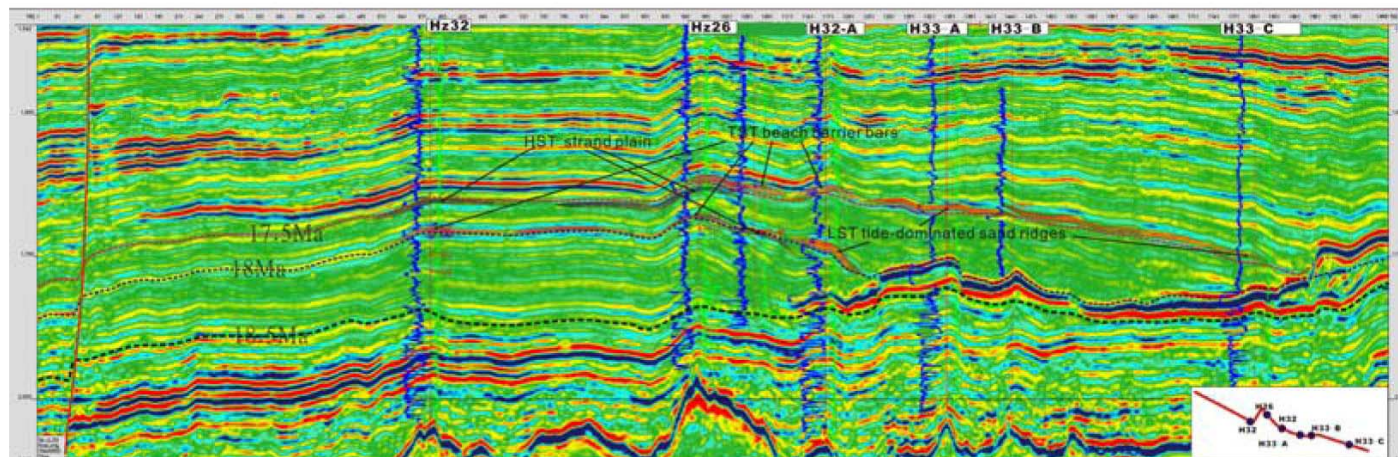


Figure 3. Depositional break in the wide and low-gradient Huizhou continental shelf.

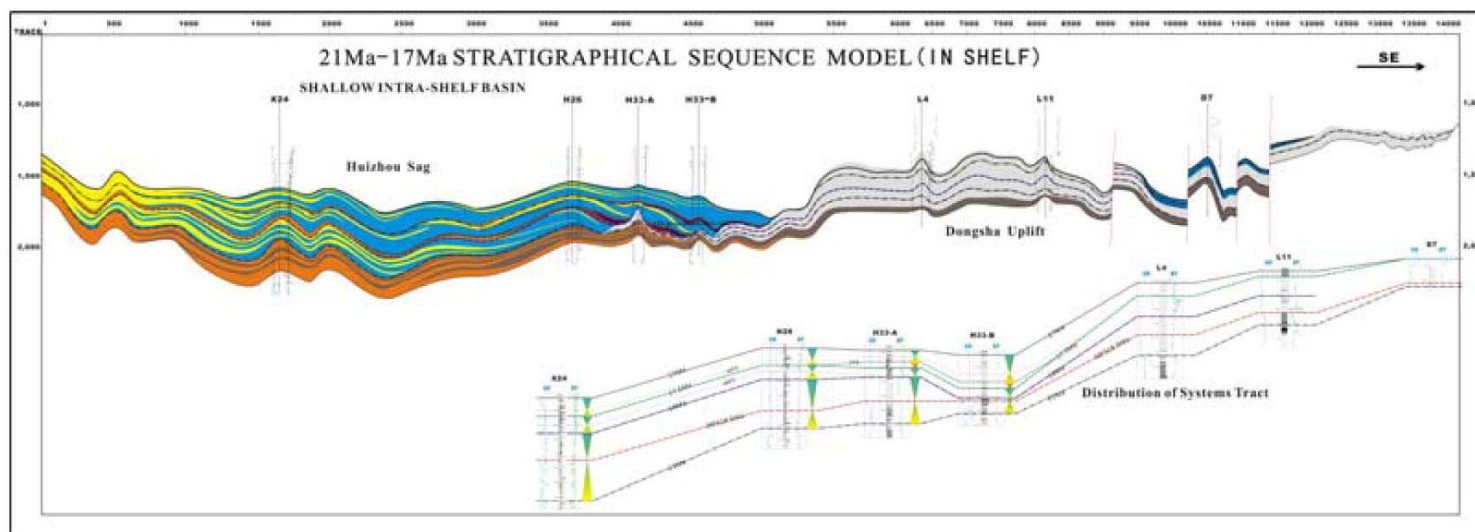


A(sequence model)

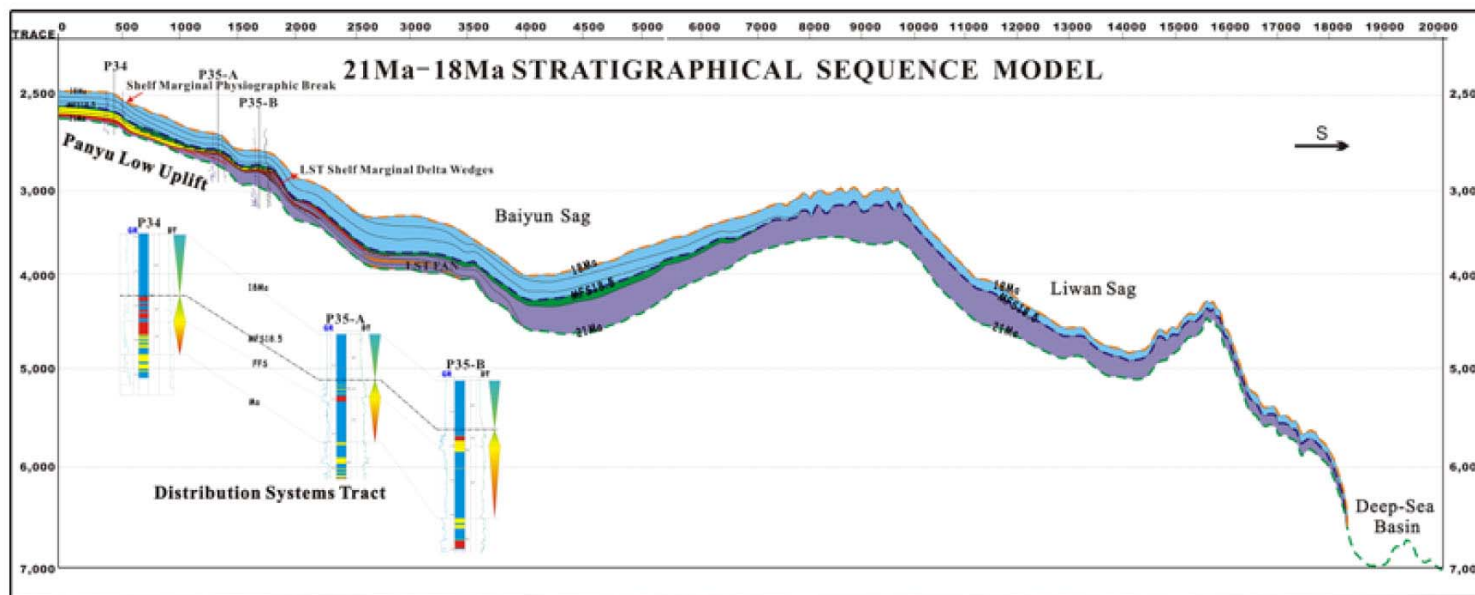


B(LST sandbody)

Figure 4. Tripartite sequence model and LST sandbody in the continental shelf.



A



B

Figure 5. Comparison of tripartite sequence models.