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Beach Bar Sedimentary Characteristics of Es1 member in Beipu Area, Nanpu Sag

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The Nanpu Sag, one of the many small sags within the Bohai Bay Basin, is located in the northeast part of Huanghua Depression and covers an area of 1932 km²[1]. It is a half-graben, and two faults serve as border faults (Xinanzhuang–Baigezhuang and Shaleitian faults) with steep dips towards the south and southwest.

Nanpu Sag is filled with a thick sequence of Cenozoic strata including the Eocene Shahejie Formation which is divided into three intervals, Es1, Es2, and Es3 (from top to base)[2]. The upper member, Es1, is further divided into two submembers, Es₁^s and Es₁^x, from top to bottom. During the Es1 sedimentary period, after the rapid expanding and the uplift of the basin in episode 1, Nanpu Sag was in synrifting stage (episode 2). In this stage, tectonic activity was not so strong and the lake was broad and shallow. Beipu area locates in the northwest side of the Nanpu Sag, on the south side of western Beipu fan delta and north side of southern Nanpu No.1 structure belt delta. Meanwhile, beach bar is a delta or fan delta sand body re-deposition system. The deposited sand bodies was transported by lake current and waves in a broad and shallow lake (a flat lakebed is existed and interruption of rivers is lacked) and re-deposited again.

Combining sequence stratigraphic theory, tectonic evolution analysis, core observation, well logs and palaeontological material analysis, a sedimentary conclusion is made: During Es1 sedimentary period, a certain area of beach bar sand body were deposited in Beipu area.

Based on core observation, the beach bar sedimentary structure characteristics are summarized: wave ripple cross bedding is the most common type in this area, and parallel bedding formed in relatively strong hydrodynamic condition can also be seen; bioturbation structure and boring pore are observed in several cores; ooids and bioclasts are developed partly. The sandstones are mostly lithic arkoses and feldspathic litharenites. Bi-segment pattern and rolling-transition-suspending pattern are two main grain-size probability accumulated curves pattern in Beipu area. In well logging graph, a thin sand-shale interbed characteristic can be shown by the GR curves, reflected a rapid changing hydrodynamic condition. Typical well palaeontological material also shows a shallow water environment which is beneficial for beach bar deposition. Microscopicalgae like *Prominangularia*, *Granodiscus* and *Dictyotidium* are abundant in B5 well. *Ostracoda* and *Charophyta*, reflect a shore shallow lake environment, are also common palaeontologic type here.

Beach bar sedimentary system of Es1 member has a coexisting relationship between western Beipu fan delta sand body and northern Nanpu No.1 structure belt delta sand body. The latter two sedimentary bodies provide deposit material for the beach bar deposition. So light and heavy mineral characteristic in Beipu area shows a mixing feature due to the primitive sedimentary information retained in the source.

The comprehensive analysis reveals that beach bar sedimentary characteristic and distribution pattern are controlled by differences of lake bed forms, material supply sources, sedimentary hydrodynamic condition and etc.

References:

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[2] Guo, Y., et al. (2013). Journal of Asian Earth Sciences 77: 140-150.

