Contrasting Structural, Tectonic and Sedimentary Features Between the East and West Qiongdongnan Basin, South China Sea: Implications for Deepwater Oil and Gas Exploration

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Covered approximately 2/3 by deepwater area,the Qiongdongnan (QDN) basin is one of the Cenozoic basins that developed in the north continental margin of the South China Sea (SCS).The basin structure and tectonic evolution hold key for the increasingly emergent deepwater exploration in this area, but are still not understood well. Here we presented the integrated studies of the QDN basin, and found the obvious difference in rift style, tectonic evolution, faulting and sedimentation of the east and west parts of the QDN basin.

Seismic profile interpretation show that half graben structure is found in the sags of the east QDN basin, but obvious compound graben structure for the sags in the west, analogue experiments indicate that this diverse structure is controlled by the different thermo-rheological structure of the lithosphere in the east and west QDN basin. Sedimentation and subsidence during the different tectonic evolution stages as rifting, depression and neo-tectonic deformation also differ remarkably in the east and west QDN basin, witnessed by variation in sediment thickness and transference of subsidence centre. Temporal and spatial difference of fault activity in the east and west QDN basin is also found in this study. The boundary of the difference mentioned above, supported by the regional gravity and aeromagnetic anomalies, locates approximately at one NW striking fault zone within the centre of the basin. We propose that the deep structure of the QDN basin mainly account for the difference and the NW direction dextral strike slip fault zone as relay structure basically accommodates the deformation difference in the east and west.

The different structure, tectonic and sedimentation in the east and west QDN basin has insights for oil& gas exploration in this area. The diverse rifting structure and sedimentation will result in the different source and reservoir-cap pattern, along with difference in the hydrocarbon migration and accumulation. The Neocene fault is more intensive in east than in west, resulting in the lack of vertical migration pathway in the west, and the overpressure occurs generally in the west due to the rapid subsidence during neo-tectonic stage, so both the upper and lower exploration targets should be emphasized and mainly for the gas reservoir. As for the east QDN basin, the preferential target with both gas and oil reservoir should be the structural traps in the uplifts around the sags.