



A large-scale detachment fault system in deep water area of South China Sea under the background of continental passive rifted margin: A case study of Heshan Sag

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Heshan sag locates in the deep-water area of continental passive rifted margin of northern South China Sea, where preserved strong thinning crust of the ocean-continent transition zone. This area owns particular and unique tectonic settings with the geological characteristics of lithospheric ductile deformation and high temperature gradient, which highly differs from the continental shelf area.

In this research, we try to determine the detachment faults within Heshan sag and build its tectonic-stratigraphic framework and geological evolution history as well. The research achievements are as followed: (1) According to the interpretation of 2D seismic profiles covering the whole study area, we basically recognized that Heshan sag was a detachment basin which is floored by a large-scale seaward detachment fault with a very low angle of 10 degrees to 20 degrees and overlain by tilted and hyper extended hanging wall block. And the heave of detachment fault has been extended to approximately 20 km. (2) Based on the latest geophysical and geological data, in the northern part of South China Sea, the strike of Moho surface is from NE to SW. The overall Moho depth is between 10 and 29 km from north to south, from shelf to continental slope and abyssal plain, mirroring the topography of the sediment basement, which means the crustal thickness decreases from land to ocean. Our study area exactly exists in the zone that the crust is hyper-extended and has the characters of continental crust and transitional crust. (3) Continental passive rifted margin closely relates to the ocean-continent transition zone (OCT). Guided by the basin dynamic analysis and lithosphere extension and breakup theory, combined with overseas and domestic research status on OCT and the latest information of adjacent areas, we tried to elucidate the geological nature of OCT and construct continental lithosphere configuration in different tectonic units on the northern continental margin in South China Sea. Also we compared Heshan sag with the northern shelf basins and proposed that it belongs to the distal margin unit where developed extensional detachment system with the crust thinning sharply and the crustal thickness even decreases to zero in the OCT unit.

Based on the research work above, we further discuss the relationship between the development of large-scale detachment fault and the spreading of the South China Sea in Cenozoic, hope this study can improve our understanding on the geodynamic construct model of the ocean-continent transition zone better in northern South China Sea, and guide the economic exploration in deep water/ultra-deep water area.