Cenozoic subsidence characteristics and evolution at a hyper-extended continental margin: Revealed by 3D high-resolution seismic data from the Baiyun Sag, northern South China Sea

Penggao Fang¹, Weiwei Ding¹,²,³, and Yanghui Zhao¹,²
¹Key Laboratory of Submarine Geosciences, Second Institute of Oceanography, Ministry of Natural Resources, Hangzhou, China (310012)
²Southern Marine Science and Engineering Guangdong Laboratory, Zhuhai, China (519080)
³School of Oceanography, Shanghai Jiaotong University, Shanghai, China (200240)

The hyper-extended continental crust in the passive margins, which recording the extensional processes in relation with the breakup of continental crust and lithosphere as well as the onset of seafloor spreading, have been widely recognized and studied at present-day rifted margins. The Baiyun Sag (BS) represents one of the hyper-extended continental marginal basins with a sharply thinned continental crust from 25 km to 7 km over a ~ 50 km distance along the Northern South China Sea, which experienced syn-rift to post-rift during the Cenozoic. Although the Cenozoic infill of the BS has been extensively described, newly acquired 3D seismic profiles revealed a thick succession (up to 10 km) with thicken syn-rift but relatively thin post-rift strata particularly well imaged in the central part. The imaged succession is controlled by the interaction between well-developed detachment systems and depth-dependent stretching, resulting in different and complex subsidence architecture. Attempts had been made to quantify the subsidence in the BS, while most studies were only carried out in a limit set with one or few 2D seismic sections and generally focused on the post-rift subsidence but ignoring that in the syn-rift stage. As result, we investigate the interaction between spatial-temporal distributions of tectonic subsidence from continent break-up to post-rift and the evolution of hyper-extended rift systems along the relatively young age passive margins.

In this presentation we analyze the vertical and horizontal motions of tectonic subsidence and sedimentary processes with integrated high-quality multi-channel seismic profile grid data (~30 seismic sections). This study enables us to 1) interpret the main unconformities and analyze the depth conversion of the BS, 2) reconstruct the tectonic subsidence from syn-rift to post-rift, 3) provide a 3D subsidence analysis unravelling the temporal and spatial architecture of Cenozoic infill of the BS. The main objectives of this contribution is to discuss the possible mechanisms accounting for the origin and subsidence at the BS, reveal its interrelationships with magmatic activities, and explore the style of rift to post-rift subsidence pattern at a hyper-extended continental margin.