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Tectonic Transformation and Dynamic Mechanism of Break-up Unconformity in the Pearl River Mouth Basin

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Research on break-up unconformity (B.U.) is significant for the basins evolution and deep dynamics of northern continental margin of South China Sea (SCS). Based on the integrated analysis of seismic-drilling-logging data, by giving insight to the synsedimentary tectonics and their controls on sedimentation, this study aims to reveal the tectonic transformation and dynamic mechanism of B.U. in the Pearl River Mouth Basin (PRMB).

Most faults oriented NEE-EW and controlled a series of small separate rifted sub-basins below the B.U., fluvial or lacustrine environment predominated. A new set of faults with NWW-NW direction were developed above the B.U., surrounding the Baiyun sag and mostly dipping towards the sag center. The Baiyun sag instead of a number of separate sub-basins became the major depocenter and filled marine-continental transitional facies. According to the faults geometries, we suggest that nearly SSE extensional stress field strongly controlled the development of the small separate rifted sub-basins underlying the B.U., and SSW extensional stress field resulted in the formation of new faults set over the B.U.

The evidence of regional and biostratigraphical correlation indicated that the B.U. age is 30Ma in the PRMB, which is consistent with the time of initial spreading of the SCS. Therefore this B.U. should be influenced by the continental breakup and SCS's open. On this basis, dynamic mechanisms associated with tectonic transformation at 30Ma may be put forward: (1) Before 30Ma (pre-breakup stage), due to the spreading directions parallel to the general trend of the northern SCS margin, the PRMB was controlled by SSE stretching; (2) When seafloor spreading began, the PRMB on the northern margin entered the transitional stage from rift to drift, suffering lithosphere thinning and mantle upwelling. In this context, the Baiyun sag occur abnormal subsidence, what is more, high-deposition-rate sediment derived from the continental slope accumulated here, eventually the Baiyun sag deformed strongly driven by gravitational potential, and developed plenty of faults surrounding and dipping toward the sag center.