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Cenozoic fault system and structural evolution in Xijiang Sag, Pearl River Mouth Basin, South China Sea

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Xijiang Sag is located in northwestern Pearl River Mouth Basin and belongs to passive margin basin system. Pearl River Mouth Basin has gone through multiple phases of complex tectonic evolution during Cenozoic, because it is situated at the intersection of Eurasia Plate, Indio-Australia Plate, and Pacific Plate. Existing structural evolution analyses about Xijiang Sag are restricted by localized research and the lack of high resolution seismic data. Based on borehole data and high resolution 2D seismic profiles, this study aims to investigate characteristics of fault system in Xijiang Sag and demonstrate implication for regional tectonic evolution. Fault polygons maps, isopach maps and balanced cross sections are presented to reconstruct the structural evolution. Xijiang Sag predominantly developed normal faults with NE, NW, and EW striking and the striking of faulting varied across different geological stages. It suggests that Cenozoic tectonic evolution of Xijiang Sag could be divided into 4 stages. The first stage was characterized by positive and intense fault activity. The western Pacific subduction zone's moving back resulted in the generation of NE-striking faults and the reactivation of NW-striking pre-existing faults during Early-Middle Eocene. The second stage ranging from Late Eocene to Early Oligocene was accompanied by dominant EW-trending faults with a comparatively intense fault activity. The India-Asia collision and the change of subduction direction of Pacific Plate integrally induced the transition of regional stress field. The third stage experienced a relative tectonic silence due to the expansion of South China Sea during Late Oligocene-Middle Miocene. The last stage occurred when the Philippine Plate collided with the Taiwan Plate, which changed the tectonic stress to a NE-striking right-lateral shearing. A series of NWW-trending faults and EW-trending faults were reactivated while a number of secondary strike-slip faults were generated in response to the stress field.