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Magmatism within a large-scale fault zone in the Pearl River Mouth Basin, northern South China Sea

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Multi-beam, 2D seismic reflection and borehole data reveal that the tectonic development of a large-scale fault zone is matched by intense magmatism. A large-scale volcanic complex was identified at water depths of 500 to 3000 m, covering an area of ca. 8000 km2. This volcanic complex includes seamounts, igneous sills, dykes and intruded volcanic bodies. Evidence from the geophysical and borehole data shows magmatic activity within the fault zone seems to have been episodic rather than continuous. The first volcanic episode was characterised by the extrusion and deposition of tuffs, consistent with a Late Eocene age. Combining data from exploration wells BY7-1 and BY2 with published seismic stratigraphic data, we can highlight the second volcanic episode from the Early Oligocene to Early Miocene. Due to a lack of exact dating are provided for the third episode of volcanism, the igneous intrusions within our survey area were constrained to emplace after the end of seafloor spreading. Given the evidence in this work that Tertiary magmatic bodies are confined within the fault zone, we can postulate magmatism in the northern margin of the South China Sea was largely controlled by the (major) faults mapped in this work. Reactivation events in the fault zone are suggested to have generated preferential vertical pathways for the ascent of magma within a context of progressive continental breakup, thinned continental crust, and tectonic-plate stress readjustment, as the South China Sea was being formed.

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