

Structural features and tectonic development of the Dongsha marginal plateau: from multi-channel seismic data

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The marginal plateaus indicate those relatively flat and elevated reliefs between continental shelf and lower slope. Their formations are interpreted to be associated with submerged thinned continental fragment detached from continent crust, basaltic buildup from hotspot, and volcanic intrusion from magma-rich breakup. They are commonly seen along the passive margin of Atlantic and Indian ocean, while similar observations in marginal sea have not been discussed. In the South China Sea (SCS), a marginal plateau is recognized on the northern margin around Dongsha Island (hereafter Dongsha marginal plateau, DMP). In this study, we explore the structural nature and tectono-stratigraphic history of the DMP, by conducting the multi-channel reflection seismic (MCS) data, integrating published results, and drawing subsurface structural maps. In our MCS profiles, several unconformities are recognized by taking advantage of seismic sequence boundaries correlation with published results, including Tg (Top of basement, ~65 Ma), T7 (breakup unconformity, ~32 Ma), T6 (~23 Ma), T5 (~20 Ma), T4 (~16 Ma), T3 (~10 Ma) and T2 (~5 Ma). Among these unconformities, we found that Only Tg, T7, and T2 are distributed extensively and universally, indicating the existence of episodic structural events. Based on distribution of Tg and T7, we recognized a subsurface basement high beneath the DMP, extending in a NE-SW direction and seemingly to be affected by paleo-anticline. No Paleogene (syn-rift) sedimentary sequence was found on the basement high. Based on distribution of T2, we recognized an uplifted event (so-called Dongsha movement). The structural high is bounded by Dongsha Cliff to the west, a bathymetric scarp trending NNW-SSE and of ~300 m height. We proposed that the ancient arc formed by the northward subduction of the Paleo-Pacific plate during the Cretaceous, resulted in the first uplift event of the DMP and created lithospheric heterogeneities that hindered the following rift events in the northern margin of the SCS. After Cretaceous, rifting faults occurred parallel to the axis of ancient uplifting structures, and transfer faults developed to connect the fault systems between rifting basins. The second uplift event is likely due to the lithosphere bending by subduction of Manila trench. During the Dongsha movement, Dongsha Cliff acts as a barrier for both flexure uplift from lithosphere bending and magmatism through reactive faults respectively, leading to significant differences in intensity of the uplift on either side.

Keywords: Dongsha island, tectono-stratigraphic history, northeastern margin of the South China Sea