



## The spreading history and paleo-ridge segmentation of the northwestern sub-basin of the South China Sea

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The spreading history of the South China Sea (Nanhai) is a key factor to understand the tectonic evolution of Eurasian, Philippine and Australian plates in Southeast Asia. Since there is no valid deep sea drilling core, the age of seafloor is most constrained by the identifications of magnetic anomalies. Owning to the small area, few magnetic polarity reversals and low magnetic anomalies amplitude of the northwestern sub-basin, there are some intense controversies about its opening age and even whether it is a oceanic crust. Constrained by newly measured ocean bottom seismic and multi-channel seismic data, we present a new identifications to the latest marine magnetic profiles which closely spaced less than 10 km and sampled with 6 seconds intervals (about 40 meters per sample). The location of the relict spreading axis corresponding to the last spreading episode was deduced by the bathymetry and roughness of sediment basement. The magnetic layer thickness was assumed to be constant (0.5 km) under sediment basement. Given full spreading rate varying from 15 to 100 mm/yr and extinct age varying from 10 Ma to 50 Ma, the magnetic anomalies which calculated with Talwani method was evaluated by its correlation with observed anomalies. According to the results of quantitative comparison, we prefer the northwestern sub-basin initially opened at 35.8 Ma (C16n, 2n) and the spreading direction is about 160° to the north. The paleo-ridge formed at the east part of northwestern sub-basin and propagated to southwest at about 34.5 Ma (C13r). All paleo-ridge ceased at the same time (33.2 Ma, C13n). There were some asymmetric spreading with the average full spreading rate about 47mm/yr which is similar to the first episode of the eastern basin. The result implies the South China Sea was initially opened in the northwestern sub-basin and the eastern basin began to spreading after the cease of the northwestern sub-basin. The magnetic anomalies reduction to the pole and the inversed magnetization reveal there were one obvious transform fault about 50 km and five segments. Two segments which have intense magnetic anomalies are consistent with the variations of crustal thickness obtained by OBS data. To the east of the transform fault, the main part of paleo-ridge is composited with four segments which are connected by non-transform offsets and each segment is about 30 km. To the west of the transform fault, one segment is about 50 km. Magnetization in the center of segments is lower than that of segments ends and its magnetic structure along spreading axis is similarly to the slow-spreading mid-Atlantic ridge which also has similar full spreading rate. The continent-ocean boundary is also marked by the presence of a relatively low magnetization zone, corresponding to the thinned portion of the continental crust.