Geophysical Research Abstracts
Vol. 12, EGU2010-5879-2, 2010
EGU General Assembly 2010

Structures and evolution of the northernmost South China Sea continental margin and ocean basin

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The South China Sea (SCS), a marginal sea offshore Southeast Asia, covers a surface area of 2.32×10^6km^2. It is bounded by the passive China continental margin to the north, Taiwan and the Luzon arc to the east, north Palawan to the south, and Indo-China peninsula to the west. Tectonically, the SCS is at the junction of Eurasia, India-Australia, and Philippine Sea plates. Based on marine magnetic studies, seafloor spreading of the South China Sea was previously to take place between 32-15 Ma, associated with magnetic anomalies C11 to C5c. In general, the South China Sea can be divided into three portions, the northern continental margin, the central oceanic basin and the southern continental margin. The northernmost SCS abuts the Southeastern Asia continental margin and is contiguous to the Taiwan accretionary wedge in the northeast. Morphology of the northern SCS continental margin shows distinctive variation, from wide and gentle dipping continental slope to the west of 118˚E to steeply dipping and narrow continental slop near Taiwan. It has been suggested that the oldest oceanic crust of the SCS lies in the northeastern most corner of SCS, and there might exist a NW-SE trending fossil transform fault at 118˚E, but the evidences are inconclusive. The tectonic evolution of the northernmost part of the South China Sea thus has been both interesting and perplexing.

Multichannel seismic (MCS) reflection profile data are used to characterize the crustal structures in the northernmost South China Sea from about 115˚E to 120˚E. We have mapped structures of the northern SCS continental margins where normal faults, igneous bodies, slope basins are prevailing west of 118˚E, on the other hand, few slope basins and igneous bodies are identified east of 118˚E. From the large-offset MCS data collected by the R/V Marcus G. Langseth during the 2009 TAIGER survey, we have identified some strong deep reflectors at some profiles underneath the northern SCS continental margin and beneath a thickened oceanic crust in the northeastern corner of the SCS that maybe represents Moho reflections. We suggest that volcanic activities played a key role in shaping the northern SCS continental margin to the west of 118˚E, and igneous activities may have large influence on the whole Cenozoic evolution of this region.