9th FTSES 2024 Penghu, Taiwan

9th France-Taiwan Symposium in Earth Sciences
Session: Marine Geology/ Underwater Geophysics

Syn-rift magmatism in the continent-ocean transition in the Southwest Sub-Basin of South China Sea

Kuan-Hong Chen[1], Sung-Ping Chang[1], Hsien-Hsiang Hsieh[2], Arif Mirza[2], Jih-Hsin Chang[3], Ho-Han Hsu[2, 3]

[1] Department of Earth Sciences, National Cheng Kung University
2 Ocean Center, National Taiwan University
3 Institue of Oceanography, National Taiwan University

The South China Sea (SCS) rifting began in the Eocene and continued into the Miocene. The lithological changes along the continent-ocean transition (COT) reveal the rapid magmatism of the ridge spreading with limited magmatism within the continental crust. However, there are still uncertainties about the processes of the spreading period at the onset of the Southwest Sub-Basin, such as the magmatic additions and ridge jumps. We selected four multi-channel seismic (MCS) profiles, two lines in the east of the Taiping Islands (Spratly Islands) and two lines in the west, to illustrate the spatial distribution of the magmatism indicating the period prior to the lithospheric breakup. Many marine surveys have been conducted on ship-boned gravity, magnetic, and MCS data. We established crustal architectures along the four lines constrained by seismic horizons and gravity-derived Moho surfaces, resulting in the gravity and magnetic forward simulations by assigning the density and magnetic susceptibility. Therefore, this study clarified the origin of the basin, crust, and magmatic additions to explore the relationship between igneous bodies and ocean ridge expansion along the survey lines. The simulations generally indicate high-density and high-susceptibility bodies distributed close to the COT, coinciding with the high-amplitude reflectors along the seismic profiles on the two eastern profiles. In addition, the reflections approximately dipping seaward usually appear on volcanic rifted margins. The assigned density of the magmatic bodies shows higher adjacent to the Zongnan Fault and decreases laterally, corresponding to a strip of magnetic anomaly. In the western area, thicker syn-rift successions instead of strong magmatism cover hyper-extended continental crust, and local magmatism tentatively modified the density of the continental crust. The overall magmatism is localized in the east of Taiping Islands and scattered in the hyperextended crust. Therefore, the multi-discipline results suggest that the onset of the seafloor spreading in the Southwest Sub-Basin of SCS was accompanied by a relatively higher amount of magmatic activity than the breakup in the East Sub-Basin.

Keywords: South China Sea; continent-ocean transition; reflection seismics; gravity model; magnetic model