

Seismotectonics of the Taiwan Shoal Region in the Northeastern South China Sea: Insights from the Crustal Structure

*Jinlong Sun¹, Huilong Xu¹, kuiyuan Wan¹

1. South China Sea Institute of Oceanology, Chinese Academy of Sciences

An earthquake cluster, which included the great September 16, 1994, earthquake, occurred in the Taiwan Shoal region on the outer rise of the Manila Trench. Several previous studies had given important information to better our understanding of the September 16, 1994 earthquake. However, little is known about the earthquake cluster. To understand the mechanisms that controlled and generated the earthquake cluster, it is important to investigate the deep crustal structure of the Taiwan Shoal region. We present a two-dimensional seismic tomographic image of the crustal structure along the OBS2012 profile, which is based on ocean-bottom seismograph (OBS) data. The structure exhibits a high-velocity anomaly in the upper crust beneath the Taiwan Shoal, which is flanked by low-velocity anomalies. We studied 765 earthquakes (Richter magnitude $M_L > 1.5$) that occurred from 1991 to 2015. An analysis of the earthquake epicenters, regional faults, and crustal structure allowed us to better understand the nature of the active tectonics in this region. The results of these analyses indicate that (1) the high-velocity area represents major asperities where stress is concentrated and corresponds to the location of the earthquake cluster; (2) the earthquake cluster was influenced by fault interactions. However, the September 1994 earthquake was independent of these seismic activities and instead was associated with the reactivation of a pre-existing fault, and (3) an accumulation of compressive stress may trigger future damaging earthquakes in the Taiwan Shoal region, because the slab pull was resisted by the exposed pre-collision accretionary prism and the resistive force caused the in-plane compressive-stress accumulation.

Keywords: earthquake cluster, crustal structure, Taiwan Shoal