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The crustal structure of continental shelf in northern South China Sea: revealed by joint onshore-offshore wide-angle seismic survey

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Known as a significant region for studying tectonic relationship between South China block and South China Sea (SCS) block and evolution of rifted basin in continental margin, the continental shelf of northern SCS not only preserved the information about intensive tectonic deformation and magmatism generated by the west Pacific subducted to Eurasian Plate in late Mesozoic, but also recorded the process from continental margin rifting to seafloor spreading of SCS in Cenozoic for the same mechanical property. To investigate crustal structure of continental shelf in northern SCS, a wide-angle onshore-offshore seismic experiment and a coincident multi-channel seismic (MCS) profile were carried out across the onshore-offshore transitional zone in northern SCS, 2010. A total of 14 stations consisted of ocean bottom seismometers, portable and permanent land stations were deployed during the survey. The two-dimensional precise crustal structure model of central continental shelf in northern SCS was constructed from onshore to offshore. The model reveals that South China block is a typical continental crust with a 30-32 km Moho depth, and a localized high-velocity anomaly in middle-lower crust under land area near Hong Kong was imaged, which may reflect magma underplating caused by subduction of paleo-Pacific plate in late Mesozoic. The Littoral Fault Zone (LFZ) lies 12 km south of Dangan Island with a width of 18-20 km low-velocity fracture zone from surface to Moho discontinuity. The shelf zone south of LFZ was consisted of a differential thinning upper and lower continental crust, which indicate stretch thinning of passive continent margin during the Cenozoic spreading of the SCS. All these results appear to further confirm that the northern margin of SCS experienced a transition from active margin to passive one during late Mesozoic and Cenozoic.