

Investigating anomalous crustal structures along the convergent zone in eastern Taiwan with the new airborne magnetic survey and updated seismic tomographic models

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The convergence between Eurasian plate and Philippine sea plate produces the tectonically and geodynamically complex regions of Taiwan. The orogeny has been suggested as from ancient oceanic-oceanic plate subduction transforming to the continental-oceanic plate collision as the proceeding of the accreted volcanic arcs. The major suture of the plate boundary in eastern Taiwan, the Longitudinal Valley, contributes most of the seismic activities and absorbed about half of the plate convergence. How the shortening and disappearance of the oceanic plate provoked multidisciplinary researches in discussing the kinematics and the related earthquake structures.

Local seismic tomography is a useful technique for unraveling the subsurface structures. The Taiwan seismic tomographic studies that are advanced by large projects or by integrating multiple data sets have been proposed in recent years. Furthermore, since 2012 the seismic signal digitization of the Central Weather Bureau (CWB) seismic network was upgraded from 12 to 24 bit, and the potential timing issue of telemetry delays has been eliminated with onsite GPS time system. Additionally, the new airborne magnetic survey has been carried out in eastern Taiwan by the Central Geological Survey (CGS) and the Industrial Technology Research Institute (ITRI) recently. High magnetic anomalies were detected not only in the volcanic arc but also in the eastern Central Range along the north-south trending Longitudinal Valley. These observations motivate us to revisit the subsurface structures with updated seismic tomographic models using new CWB data sets from 2012 to 2015.

The iso-velocity contours of the updated model keep similar structures with the previous model at first order but furtherly reveal more details. A continuous high-Vp and high-Vp/Vs bulge which extends to the shallow depths of the eastern Central Range has been interpreted as a high-pressure rock exhumation along the subduction of South China sea plate or an obducted Luzon forearc sliver. On the other hand, the new airborne magnetic survey reveals two individual high magnetic stripes that share the same high magnetic characteristics with the oceanic crust. However, the magnetization vectors behave oppositely in the direction at both flanks of the Longitudinal Valley. Such findings of these integrated geophysical analyses enable us to discuss the anomalous crustal structures and their tectonic implications.

Keywords: Airborne magnetic Survey, Seismic tomography, Forearc obduction, Exhumation, Oceanic crust