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Tomographic Imaging of a New Seismic Zone in Northern Taiwan: Implications for Crustal Magnetism and Tectonic Inheritance

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To the west of 121°E, we found that the northern South China Sea magnetic anomaly in central Taiwan is coincident with high seismic velocity zone derived from a joint analysis of gravity anomaly and seismic travel time data. To the east of 121°E, we found a new seismic zone which remains enigmatic because of its apparent relationship with both the emplacement of high magnetic anomaly and termination of Okinawa Trough. In order to understand the new seismic zone and breakup of the high magnetic anomaly, a joint analysis of gravity anomaly and seismic travel time data have been used to construct three-dimensional velocity structure for the study area. Earthquake data were collected by the Central Weather Bureau Seismological Network from 2000 to 2012. A modified velocity model obtained by previously local earthquake tomography, was used to construct an initial three-dimensional gravity model, using a linear velocity-density relationship. To derive a crustal velocity-density model that accounts for both types of observations, this study performed a sequential inversion of traveltime and gravity data. The main features of our three-dimensional velocity model are: (1) an uplifted zone with velocity greater than 6.5 km/s is observed in the lower crust, (2) the width and the shape of the uplifted zone is found strongly correlated with the high magnetic belt, (3) the trend of the high-velocity zone turns from NE to N in central Taiwan, where the feature of high magnetic was truncated. This study suggested that integration of seismic data with new perspectives on crustal magnetism will provide a better understanding of terrane accretion, rifting processes, and passive margin formation in the Taiwan region.