

Absence of stagnant slab: implication for volcanism, back-arc opening and trench migration

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We obtained three-dimensional P-wave velocity model with a focus on the Northeast China. We combined global data with the data of a passive broadband seismic experiment, NorthEast China Extended Seismic Array (NECESSArray) deployed since 2009 for two years. The result shows slow anomalies below the Cenozoic volcanoes around the Songliao basin. The slow anomalies can be traced down to 200km depth. On the other hand fast anomalies are observed below the Songliao basin in the uppermost mantle up to a few hundred km depth. In the mantle transition zone, the slab subducted from the Japan Trench meets to the 660-km discontinuity beneath the orogenic at the eastern margin of the basin. No extended flattened slab is observed to the further west beneath the basin in the transition zone while it is observed to the north and south. It looks like a hole of the stagnant slab. The volcanism around the Songliao basin has been active since about 30 Ma. At approximately the same time, the opening of Japan Sea has taken place and the Izu-Bonin Trench started to migrate rapidly eastward with a clockwise rotation as contrasted with the moderate migration of the Japan Trench. We speculate that absence of the stagnant portion of the Japan slab are caused by a slab detachment and the geological events above were related with the detachment.

Keywords: tomography, transition zone, off-arc volcanism, back-arc opening, trench migration