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スラブの深部構造・脱水と長白山火山の起源
Deep slab structure, dehydration and the Changbai intraplate volcanism

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We obtained a new 3-D P-wave tomography model down to 800 km depth beneath NE Asia by assembling a large number of arrival-time data of local, regional and teleseismic events recorded by ~2500 seismic stations in Japan, China and South Korea. The data from a portable seismic network (NECESSArray) in NE China are also collected and used. Our updated model shows a sharper image of the volcanism-related asthenospheric upwelling and the stagnant Pacific slab in the mantle transition zone (MTZ) beneath the Changbai intraplate volcano. The main findings are summarized as follow.

(1) Relative travel-time residuals of teleseismic events alone are not able to recover the flat stagnant slab in the MTZ, and a slab gap in the MTZ beneath the Changbai volcano imaged by relative travel-time tomography is an artifact.

(2) The low-velocity anomaly in the big mantle wedge (BMW) becomes the most prominent near the hinge of the stagnant slab, which is located slightly east of the Changbai volcano and may reflect focused hot upwelling in the BMW. This low-velocity feature coincides with the depression of both 410-km and 660-km discontinuities and a cluster of very deep earthquakes (>500 km depth) in the Pacific slab.

(3) Besides the deep dehydration of hydrous minerals within the stagnant slab, additional fluids released through deep-earthquake faulting and a stronger mantle flow circulation near the hinge of the Pacific slab have made Changbai the largest and most active intraplate volcano in NE Asia.

(4) The BMW origin of the Changbai volcanism agrees well with other geophysical, geochemical and numerical-modeling studies.

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