

## Teleseismic tomography and origin of the intraplate Wudalianchi volcano in Northeast China

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The active intraplate Wudalianchi volcano in Northeast China is located over 1000 km to the west of the Kuril-Japan trench where the western Pacific plate is subducting beneath Northeast Asia. Investigation of the deep structure beneath the Wudalianchi volcanic area is of great importance to understand the origin of the intraplate volcanism and mantle dynamics of Northeast Asia, but it is still unclear because few seismic stations exist there. In this study, we determine the first high-resolution (~50 km) P-wave tomographic model of the upper mantle and the mantle transition zone (MTZ) under the Wudalianchi volcano. We used 32,443 relative travel times from 697 teleseismic events, which are obtained by applying the multi-channel cross-correlation technique to process the waveform data. These teleseismic events were recorded at the WAVESArray (Wudalianchi Active Volcano Experiment of Seismology Array) that is composed of 148 portable seismic stations around the Wudalianchi volcano, which are newly and jointly deployed by Institute of Crustal Dynamics, China Earthquake Administration and Institute of Geology and Geophysics, Chinese Academy of Science during 2015 to 2019. This dense array has a station interval of ~20-30 km and its aperture is ~600 km. Our tomographic images reveal an obvious low-velocity anomaly down to ~200 km depth beneath the Wudalianchi volcano, whereas a broad high-velocity anomaly appears in the MTZ east of the Great Xing' an range. Our results indicate that the deep origin of the Wudalianchi volcano is related to hot and wet mantle upwelling in the big mantle wedge above the subducting Pacific slab that is stagnant in the MTZ. These results shed new light on the intraplate volcanism and mantle dynamics in the western Pacific and East Asian region.

Keywords: Wudalianchi volcano, Seismic tomography, Mantle structure, Deep origin, NE Asia