High-Resolution Lithospheric Velocity Structure and Earthquake Locations in Continental China

ZHANG Haijiang¹ and XIN Hailiang¹,²

¹ University of Science and Technology of China, School of Earth and Space Sciences, Hefei, Anhui 230026
² China Deep Exploration Center of the Chinese Academy of Geological Sciences, Zhengzhou, Henan, 450000

Abstract: Continental China is located in the southeastern portion of the Eurasia, surrounded by three major plates: the Indian plate, the Philippine plate and the Pacific plate. Owing to the interactions of the three plates, the continental China has complex geological structures, drastic crustal deformations and frequent earthquake activities. Complex tectonic environment makes continental China an important region for studying the continental dynamics and intraplate tectonics. To determine high-resolution Vp and Vs models of the lithosphere of continental China, we have assembled numerous high-quality arrival-time data from 11953 earthquakes recorded by the China Digital Seismic Network. Double-difference seismic tomography is applied to simultaneously determine earthquake locations, Vp and Vs models. The checkerboard resolution test shows that with the current data configuration both Vp and Vs models have a spatial resolution of 1° in the horizontal direction in most of continental China and up to 0.5° in eastern China. High-resolution Vp and Vs models of crust and upper mantle down to 150 km provide important constraints on tectonics beneath continental China. Overall, our tomographic images in the shallow crust correlate well with surface geology. In the deeper part, our velocity models show some well known features such as low velocity layer in the middle crust beneath Tibetan plateau and thin lithosphere beneath north China craton.

After determining Vp and Vs models, we followed the method of Fang et al. (2018) to determine the Vp/Vs model of the lithosphere in continental China. Compared to Vp and Vs models, Vp/Vs is more sensitive to temperature and fluids in the lithosphere. We will also systematically compare the relationship between velocity structures and earthquake locations.

Key words: continental China, lithosphere, seismic tomography, earthquake locations, Vp and Vs models

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References
Xin, H., H. Zhang, M. Kang, R. He, L. Gao, J. Gao, 2018, High-resolution lithospheric velocity structure of continental China by double-difference seismic travel time tomography, Seismological Research Letters, 90 (1): 229-241

About the first and corresponding author
ZHANG Haijiang, male, born in 1973 in Zhongmu, Henan province; PhD in seismology and geophysics; Graduated from University of Wisconsin-Madison in 2003; Professor at the School of Earth and Space Sciences, University of Science and Technology of China. He is now interested in developing advanced seismic imaging methods and applying them across scales. E-mail: zhang11@ustc.edu.cn; Phone: 0551-636-3428, 15555179395.

* Corresponding author. E-mail: zhang11@ustc.edu.cn

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