Seismic imaging of lithospheric structure and upper mantle deformation beneath east-central China and their tectonic implications

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In this study, a non-linear joint inversion of receiver functions and surface waves was applied to obtain the lithosphere structure of east-central China, and SKS splitting measurements were used to evaluate the upper mantle deformation. The velocity model reveals that to the east of the North-South Gravity Lineament, the crust and lithosphere are significantly thinned. Three extensive crustal/lithospheric thinning sub-regions were identified. This indicates that the lithospheric modification in east-central China is non-uniform due to heterogeneity in lithospheric strength. Extensive crustal and lithospheric thinning probably occured in some weak zones such as basin-range junction belts and large faults. The structure beneath the Dabie orogenic belt is complex due to the collision between the North and South China Blocks during the late Paleozoic–Triassic. The Dabie orogenic belt is delineated by a thick crust with a mid-crust low-velocity zone and a two-directional convergence at the lithospheric scale. The crust and uppermost mantle across the Tanlu fault exhibit a strong seismic velocity contrast, which suggests deep penetration of this lithospheric-scale fault. Most of our splitting measurements show nearly E-W-trending fast polarization. A similar present-day lithosphere structure and upper mantle deformation may imply that the eastern North China Craton and South China Block have been dominated by a common dynamic process since the late Mesozoic. The westward subduction of the Philippine plate and the long-range effects of the collision between the Indian and Eurasia plates during the Cenozoic may have also contributed to the present velocity structure and stress field of eastern China.