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Two anisotropic layers in the central zone of the north China craton inferred from teleseismic shear-wave splitting analysis

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The Chinese continent consists of three oldest cratons: the Yangtze, Tarim, and north China (also called the Chinese part of the Sino-Korean). The tectonic and geodynamic evolution processes of the north China craton (NCC) attract much attention because it has exceptional crust and mantle structure in contrast with other ancient continental nuclei. In this study, we investigate the upper mantle anisotropy beneath NCC from teleseismic share-wave splitting analysis of temporary stations which are deployed during a period between October 1999 and November 2003 as a part of the Ocean Hemisphere network Project. When a seismic wave propagates through an anisotropic medium, two share waves with different polarizations will have different velocities. In order to determine the fast polarization direction (FPD) and the delay time between the fast and slow components, we utilize a shear-wave splitting method of Silver and Chan (1991) for individual earthquakes and a multievent stacking procedure of Wolfe and Silver (1998) to stack the error surface at each station. We measure a total of 28 apparent splitting parameters from SKS phases at epicentral distances of 85^o to 115^o. Small to large values of delay time (0.56 s to 1.52 s), and abrupt variation of FPD (-67^o to 86^o) are found, indicating the distinct regimes of seismic anisotropy in the study area. In the eastern block, the observed FPDs are approximately parallel to the absolute plate motion, indicating that the observed anisotropy in this area mainly presents the current strain within the subcratonic asthenosphere related to the interactions between the surrounding plates. In contrast, in the central orogenic belt, the FPDs vary along with the strike of the surface faults. It is likely that the shear-wave splitting analyses show two anisotropic layers with different polarizations: one is attributed to the present-day asthenospheric flow down to 120 km depth (Chen, 2009) and another one is due to past orogenies in the lithosphere.