

# Structural Variations of Inner Lithospheric Discontinuities beneath the North China Craton: Implications of the craton stability and destruction

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The North China Craton (NCC), namely the Sino-Korean Craton, is one of the ancient Archean cratons with the crust rocks as old as ~3.8 Ga. Similar to other Archean cratons worldwide, the western part of NCC has retained its cratonic nature and stability over long periods of geological time, and presently is characterized by a thick and cold root with a negative mid-lithosphere discontinuity (MLD) marking the vertical heterogeneity of the mantle lithosphere. However, the detailed structural features of the MLD and the related low-velocity layer (LVL) below remain unclear. On the other hand, the eastern NCC has experienced severe destruction since Mesozoic, as manifested by the transformation from a thick, cold and refractory lithosphere in the Paleozoic to a thin, hot and fertile one in the Cenozoic. Thus the NCC is an ideal laboratory to investigate the influences of the MLD on the evolution, particularly destruction of cratons.

The implementation of numerous portable seismic array observations in the past two decades within the NCC makes it possible to obtain more high-resolution images of the deep structure of the region than ever. In this study, we used the seismic data from 8 linear portable arrays of densely-deployed stations and the network of ~300 permanent stations within the NCC and surrounding areas to image the elaborate lithospheric structure with various seismological methods. Our results show that a negative MLD and an underlying LVL widely exists within the mantle lithosphere of the Ordos Block, namely the cratonic nuclei of the western NCC. The depth of the MLD varies mainly in the depth range of 80-120 km, uncorrelated with the depth variations of the Moho and LAB. An obvious deepening of the MLD and the LVL was observed beneath the orogenic belts surrounding the Ordos Block, which may reflect the modification of the lithospheric mantle structure by the associated orogenic processes. The depth of the MLD beneath the Ordos Block is comparable to that of the LAB in the eastern NCC where the lithosphere has been thinned and destroyed. Based on this observation, we propose that the MLD and the LVL may have acted as a mechanical weak layer in the lithospheric mantle, facilitating the destruction of the eastern NCC. Finally, we also observed a LVL in the mid-crust of the Ordos Block. It may be another clue to decipher the evolution of the craton.

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