

Presence of an intralithospheric discontinuity in the central and western North China Craton: Implications for destruction of the craton

With the support by the National Natural Science Foundation of China (Grant Nos. 41225016 and 91014006) and the Chinese Academy of Sciences, Prof. Chen Ling and her team at the Institute of Geology and Geophysics, Chinese Academy of Sciences, reported their finding of an intralithospheric discontinuity in the central and western North China Craton (NCC), which was published in *Geology* (2014, 42(3): 223–226).

From the teleseismic waveform data recorded by a dense seismic array across the central and western NCC, a negative velocity discontinuity (velocity decreasing with depth) has been identified at $\sim 80\text{--}100$ km depth within the thick lithosphere ($\sim 160\text{--}200$ km), similar to that observed in many other cratonic regions and roughly at the same depth as the base of the lithosphere in the eastern NCC. The intralithospheric discontinuity may indicate an ancient, mechanically weak layer within the overall strong cratonic lithosphere, and probably also existed beneath the eastern NCC before the Mesozoic. The presence of such a weak layer would have facilitated simultaneous lithospheric modification at the base and the middle of the lithosphere in the eastern NCC, especially under the strong influence of the Mesozoic Pacific subduction, leading to the severe lithospheric thinning and destruction recorded in this region. The weak layer probably did not strongly affect the stability and evolution of the central and western NCC and other cratonic regions, where the effects from the plate boundary processes were weak. Our seismic images, integrated with geological data, provide new insights into structural heterogeneities in the subcontinental lithospheric mantle and their roles in the dynamic evolution of continents.

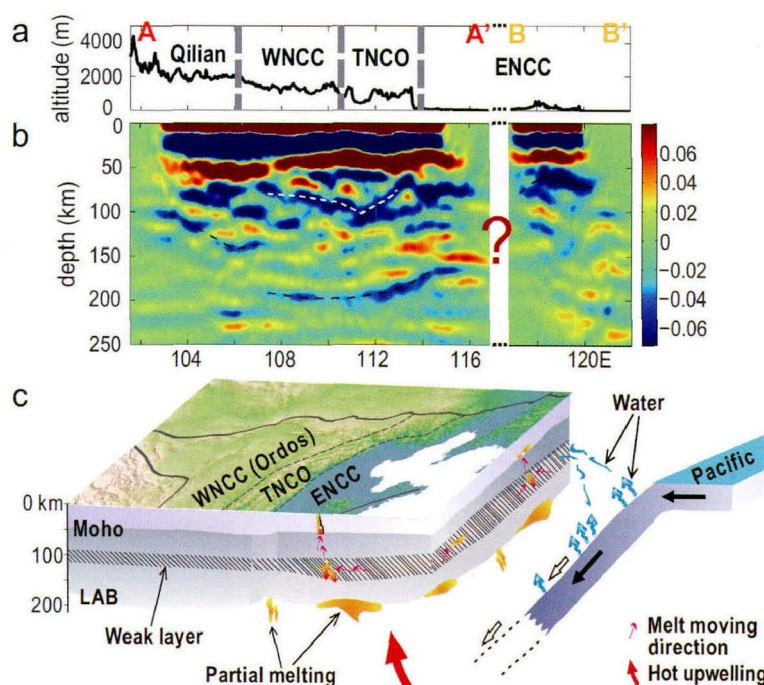


Figure Observation of an intralithospheric discontinuity beneath the central and western NCC and its implications for cratonic destruction. a, Surface topography along two roughly E-W profiles A-A' and B-B' across the NCC. TNCO, Trans-North China orogen; ENCC, eastern NCC; WNCC, western NCC. b, Migrated teleseismic S receiver function images for A-A' and B-B'. White dashed line, Intralithospheric discontinuity; black dashed line, lithosphere-asthenosphere boundary; question mark, the area where no data are available to extract lithospheric structure information. c, Schematic model for the Mesozoic reactivation and destruction of the NCC.