

Formation and destruction of a thickened lower continental crust: Evidence from the southeastern North China Craton

JING-LIANG GUO*¹, SHAN GAO¹, WEN-LIANG XU²,
PENG-YUAN HAN¹, ZONG-QI ZOU¹

¹ State Key Laboratory of Geological Processes and Mineral Resources, School of Earth Sciences, China University of Geosciences, Wuhan 430074, China (J.L. Guo: jl.guo@cug.edu.cn)

² College of Earth Sciences, Jilin University, Changchun 130061, China

Delamination of the dense arc root may have played a crucial role in cultivating the andesitic chemical composition of the continental crust as well as the continental MOHO^[1]. However, possible delamination processes at the root of continental crust is still much less understood. A rare suite of lower crustal xenoliths (e.g., eclogites, garnet clinopyroxenites and garnet granulites) reported from the Xu–Huai region, southeastern North China Craton (NCC), have been suggested to represent an ancient dense lower continental crust, which was possibly foundered and recycled back into the mantle during the Mesozoic^[2,3]. Nevertheless, it is still unclear the nature of this dense lower crust as well as when and how it was formed and delaminated.

We carried out a detailed petrological, geochronological and geochemical study of the Xu–Huai xenoliths. The results suggest that although these xenoliths were overprinted by Paleoproterozoic and/or Triassic high-grade metamorphism (up to high-pressure granulite- or eclogite-facies), the majority of them may still represent ancient igneous arc cumulates, with mineralogy and chemical compositions similar to those from the lowermost part of the Kohistan arc, Pakistan. Thus, the thickened lower continental crust in the southeastern NCC may have formed much earlier than we thought. The foundering of such a dense lower crust must have occurred in the Jurassic–Cretaceous in order to explain the present-day seismic velocity structure characterized by a sharp Moho, overall slow velocities in the lower crust, and a thin crustal thickness in the Xu–Huai area and other parts of the eastern NCC. We also suggest that the Jurassic–Cretaceous foundering was related to the Pacific subduction, which provided the heat and water required for the growth of density instability in the lower continental crust.

[1] Jagoutz, O., Behn, M.D., 2013. *Nature* 504, 131-134.

[2] Gao, S., et al., 2004. *Nature* 432, 892-897.

[3] Xu, W.L., et al., 2006. *Geology* 34, 721-724.