

# Common Pb Isotope Mapping of UHP Metamorphic Zones in Dabie Orogen, Central China: Implication for Plumbotectonics in Subducted Continental Crust

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We report Pb isotopic compositions for feldspars separated from 57 orthogneisses and 2 paragneisses from three exhumed UHPM slices as North Dabie zone (NDZ), Central Dabie zone (CDZ) and South Dabie zone (SDZ) in Dabie orogen, central China. Precursors of the orthogneisses are products of bimodal magmatic events at Neoproterozoic, those in the NDZ emplaced into the lower crust and those in the CDZ and SDZ into middle or upper crust, respectively. On a  $^{207}\text{Pb}/^{204}\text{Pb}$  vs  $^{206}\text{Pb}/^{204}\text{Pb}$  diagram, almost all orthogneisses data plot along the model mantle evolution curve with the major portion of the data plotting below it. On a  $^{208}\text{Pb}/^{204}\text{Pb}$  vs  $^{206}\text{Pb}/^{204}\text{Pb}$  diagram the data extend in elongate arrays along the lower crustal curve or between the lower crustal curve to near the mantle evolution curve. This pattern demonstrates that the orthogneiss protoliths principally were dominated by reworking of ancient lower crust with some addition of juvenile mantle in the Neoproterozoic rifting tectonic zone. The identification of ancient lower crust is consistent with previous investigations based on zircon U-Pb dating and Hf model ages of the Dabie orthogneisses and Archean basement of the Yangtze Block. A four-stage Pb isotope evolution model including a long time evolution between 2.0 Ga and 0.8 Ga with a lower crust type U/Pb ratio ( $\mu = 5-6$ ) suggests that magmatic emplacement levels of the protoliths of the orthogneisses in the Dabie orogen at 0.8 Ga also play an important role in the Pb evolution of the exhumed UHPM

slices, corresponding to their respective Pb characters at *ca.* 0.8-0.23 Ga. For example, the NDZ requires low  $\mu$  value (3.4-9.6), while the CDZ and SDZ require high  $\mu$  value (10.9-17.2). On the other hand, Pb isotopic mixing between the NDZ and CDZ or SDZ during pre- or retro- grade metamorphism has also been observed in the  $^{208}\text{Pb}/^{204}\text{Pb}$  vs  $^{206}\text{Pb}/^{204}\text{Pb}$  diagram. With regard to the plumbotectonics model of Zartman and Doe (1981) and Zartman and Haines (1988), our data provide additional supplement of Pb evolution within subducted continental crust. Although common Pb compositions of Dabie orogenic UHPM rocks are significantly distinct from the model orogen, mainly on account of an over-estimated contribution from pre-existing upper crust into the orogen, above conclusions imply that the disparities and interacting do exist not only among an orogen system in plumbotectonics model, but also within sole subducted continental crust and exhumed UHPM slices.

A combined study of common Pb isotopic compositions of Dabie orthogneisses and Sulu UHPM rocks in the Chinese Continental Scientific Drilling (CCSD) project demonstrates that a slab marked by extremely unradiogenic Pb observed in the CCSD was absent in the Dabie orogen. However, occurrence of some post-collisional granitoids with such unradiogenic character in the Dabie orogen suggests that the absent unradiogenic unit may be buried as the source of the granitoids below the NDZ unit.