

Carbonate metasomatism-induced Pb-isotope heterogeneity of the lower crust at southeastern margin of the North China Craton

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The Wuhe complex (WC) in the Bengbu and neighboring areas is located at southeastern margin of the North China Craton (NCC) and belongs to the Precambrian metamorphic basement resulted from the lower crust. It comprises garnet amphibolite, garnet granulite, rodingite, garnet-bearing mafic gneiss, granitoid gneiss, micaschist, marble, quartzite and meta-sandstone. The WC experienced the HP granulite-facies metamorphism [1], accompanying close-to-coeval partial melting and heterogeneous carbonate metasomatism.

Pb-isotope data from the WC display two contrasting compositions. The first are characterized by low $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$ ratios (16.632–17.606, 15.257–15.597 and 37.035–37.754), are similar to those of the typical Precambrian lower-crustal rocks in the NCC. In contrast, the second show significantly high Pb-isotope ratios with $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$ values of 18.207–32.048, 15.512–17.779 and 37.449–47.501. However, the whole-rock Pb-Pb dating for the marbles and various rocks yield isochron ages of 1911 ± 64 Ma and 1906 ± 61 Ma, in agreement with the granulite-facies ages of 1876 ± 18 Ma and 1918 ± 56 Ma defined by zircon U-Pb dating [2, 3]. Thus the ~ 1.91 Ga is interpreted as the peak metamorphic time during which Pb isotopes were homogenized. The coexisting garnet amphibolite in the marble was documented to be metasomatised by carbonate-bearing sediment melts/fluids at ~ 1.91 Ga, resulted in exceptionally high Pb-isotope compositions registered by some of the rocks in the WC. Therefore, the carbonate metasomatism was responsible for Pb-isotope heterogeneity of the lower crust in the region.

This study was supported by the National Basic Research Program of China (2015CB856104) and the PhD Foundation of the Ministry of Education of China (20133402130008).

[1] Liu et al. (2009) *JMG* **27**, 125-138. [2] Wang et al. (2013) *Geoscience Frontiers* **4**, 57-71. [3] Guo & Li (2009) *Sci China Earth Sci* **52**, 1039-1045.