Origin of postcollisional mafic-ultramafic rocks in the Dabie orogen: Implications for recycling of the deeply subducted continental crust

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Recycling of the deeply subducted continental crust has bearing on crust-mantle interaction during its subduction to mantle depths, which is known to cause ultrahigh-pressure (UHP) metamorphism in the stability fields of coesite and diamond. UHP metamorphic slices are generally considered as an exhumed product from the mantle depths, which provides a reference to the recycled crust. However, it is critical to find petrological and geochemical records that bear the recycling of deeply subducted continental crust and the consequent crust–mantle interaction in continental subduction zones.

The Dabie orogen was built by the Triassic continental collision between the South and North China Blocks, with subduction of the continental crust to mantle depths. It is intriguing whether the recycled continental crust is recorded in postcollisional mafic igneous rocks. Whole-rock major–trace element and Sr-Nd isotopes and zircon Hf isotopes were determined for postcollisional mafic-ultramafic rocks of Early Cretaceous age in the orogen. The results show arc-like patterns of trace element distribution, high initial $^{87}Sr/^{86}Sr$ ratios of 0.7065 to 0.7077 and very negative $\varepsilon_{Nd}(t)$ values of −19.9 to −15.3 for whole-rock. Zircon Hf isotope analyses gave negative $\varepsilon_{Hf}(t)$ values of −26.3±0.6 to −7.0±0.5 with two-stage Hf model ages of 1.62 to 2.83 Ga. These trace element and radiogenic isotope compositions are similar to those in UHP rocks, suggesting that the mafic-ultramafic rocks were derived from an enriched mantle source with incorporation of crustal component. It may be generated by interaction between the subcontinental lithospheric mantle and the felsic melt derived from the subducting continental crust. In other words, there would be melt-peridotite reactions during the continental deep subduction, forming the orogenic lithospheric mantle composed of peridotite, pyroxenite and hornblendite. Partial melting of the orogenic lithospheric mantle gave rise to the postcollisional mafic-ultramafic rocks, recording the recycling of continental crust in the continental subduction zone.

The evolution of the Tarim Craton in Archean and Proterozoic: Zircon U–Pb and Hf isotopic evidence from the Kuruktag area, NW China

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The Tarim Craton is one of the three major cratons in China. Compared with Yangtze Craton and North China Craton, only limited age data of the basement rocks in Tarim have been published. Presently, there is still great uncertainty about the formation and crustal growth of the Tarim Craton. Kuluktag Uplift is located in the northeast of Tarim Basin. Basement rocks crop out widely in Kuluktag and are unconformably overlain by Sinian strata. Three Proterozoic detrital zircon samples (F3, F7, F10) and one Neoproterozoic Granite sample (F4) have been collected and LA-ICPMS U-Pb zircon dating as well as Hf isotopic analysis have been carried out. The results show that the granite sample was formed in ca. 832Ma, probably related to the break of Rodinia Supercontinent. The three detrital zircon samples reveal identical age spectra. Two events are recorded: 1) Ca. 2000Ma metamorphism, which caused the reworking of old crustal materials; 2) Tectonic activity between ca. 2350Ma to ca. 2750Ma, which involved both juvenile and old crustal materials. Two stage model ages of all four samples vary from ca. 3.8Ga to ca.2.5Ga, indicating the crustal growth of Tarim Craton lasted from the Paleoarchean to the earliest Palaeoproterozoic, which is comparable with Yangtze and North China Cratons.

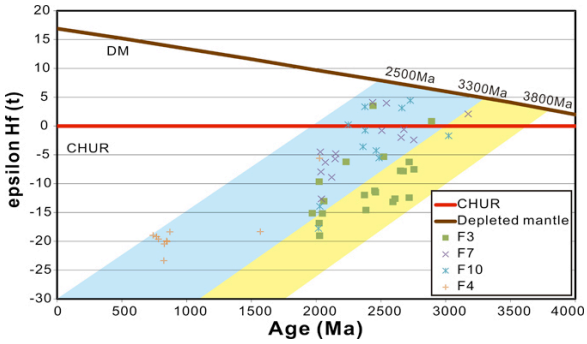

Figure 1: Diagram of εHf(t) values vs. $^{207}Pb/^{206}Pb$ ages for zircons of samples from Kuruktag, NE Tarim in this study.