Radiometric dating for the timescale of UHP metamorphism in the Dabie orogen of China

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The peak age and duration of UHP metamorphism are very important issues with respect to geodynamic interpretation of continental collision. Triassic ages for UHP metamorphism in the Dabie-Sulu orogen have generally been accepted, but the exact timing of UHP event is still in controversy between Late Triassic and Early-Middle Triassic. While eclogite mineral O isotope studies suggest a short duration of 5 to 10 Ma for the peak UHP event, peridotite mineral Sr-O isotope studies indicate that a bulk recycling on the order of 12 to 26 Ma for continental subduction, UHP metamorphism at mantle depths and exhumation. A resolution to these necessitates comprehensive investigations concerning not only a combined study of zircon growth history and U-Pb dating but also a correct understanding of O, Pb, Sr and Nd diffusivity in radiometrically dated minerals during prograde and retrograde metamorphic processes. This study of zircon U-Pb, mineral Sm-Nd and Rb-Sr dating for low-T/UHP eclogite at Huangzhen has provided insight into these aspects.

The SHRIMP zircon U-Pb dating yielded two groups of age at 242±3 Ma and 222±4 Ma, respectively. In combination with petrologic study, these ages are interpreted to date zircon growth and overgrowth in the two episodes of dehydration, respectively, in response to decomposition of water-bearing minerals such as glaucophane, epidote and paragonite during deep subduction and lawsonite breakdown during initial exhumation. The mineral Sm-Nd and Rb-Sr isochron dates gave the concordant ages of Middle Triassic at 236.1±4.2 Ma and 230±7 Ma, respectively. O isotope equilibria were achieved and preserved between the isochron minerals, providing a test of Nd and Sr isotopic equilibria in them. Although the closure temperatures of O diffusion may not simply correspond to those of Sr or Nd diffusion in eclogite minerals formed at different P-T conditions, Sr and Nd isotopic equilibria are evident from the consistent ages. Thus the timescale of bulk continental subduction and exhumation in the HP-UHP-HP regimes may range from ca. 245~240 Ma to 225~220 Ma, on the order of 10 to 15 Ma, for the peak UHP event. The termination age of peak UHP metamorphism is probably different in different slices of deep-subducted slab in the Dabie-Sulu orogen.

The geochemistry and implications of clastic sedimentary rocks of the Baiyun-Zhashui subunit from the South Qinling orogenic belt

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The trace element, REE and Sm–Nd analyses of Middle and Late Devonian metasedimentary rocks from the Baiyun-Zhashui subunit along the Jinqian River section (South Qinling, China) in conjunction with previously published data are used to trace the crustal evolution. The εNd(t) values of the Middle Devonian are within the range of the metasediments from Qinling complex. In contrast, Late Devonian samples are above the ranges of the Qinling complex, being higher in Cr/Th ratios and lower in Th/Sc ratios. It allows us to speculate that samples from Late Devonian Formations were derived from the arc materials from the Erlangping Formation, north of the Qinling terrain. It is indicated that there is a significant provenance change between the Late Devonian and Middle Devonian clastic sediments in the Baiyun-Zhashui subunit. A further modeling using immobile elements Th, Co and REE were also made to calculate proportions of the DTT gneiss, mafic volcanic, granite as 3 possible source components, it shown that the Devonian metasediments from the Baiyun-Zhashui subunit are mainly the first-cycle erosion products of the 60% metasediments of the Qinling complex in the North Qinling. plus 30% of Early Paleozoic granites and 10% volcanics.

We propose that the South Qinling as the passive margin of the Yangtze Craton had been in a close proximity and accreted to the North China at least in the Middle Devonian times.

Acknowledgements

This research is co-supported by the National Nature Science Foundation of China (grants 40173018, 49625305, 40234052)