Partial melting of UHP metamorphic rocks in the Sulu orogen, China: zircon and garnet evidence from felsic vein and its host granitic gneiss

YUJIE ZHAO[1] AND YUANBAO WU[1]

[1] State Key Laboratory of Geological Processes and Mineral Resources, School of Earth Sciences, China University of Geosciences, 430074, Wuhan, China; *zyj799486401@163.com

A comprehensive understanding of partial melting in subduction zone is a crucial task for the study of high to ultra-high pressure (HP-UHP) metamorphism. However, due to the overlapping between multiple episodes of metamorphism and partial melting, it is difficult to constrain the exact timing and mechanism of partial melting for HP-UHP rocks.

Here, we report a combined study of zircon and titanite U-Pb ages, zircon Hf-O isotopic compositions, as well as O isotope of major minerals for a felsic vein and its host granitic gneiss at the Hushan outcrop from the Sulu UHP terrane. The inherited magmatic zircon cores from the host granitic gneiss constrain the protolith age at ca. 750 Ma. The low $\delta^{18}O$ values, negative $\varepsilon_{Hf}(t)$ values and corresponding T_{DM2} suggest the protolith was derived from reworking of Paleoproterozoic crust in a Neoproterozoic rift. Broad metamorphic garnet cores/mantles and narrow peritectic garnet rims have been recognized in the studied samples. Large differences in $\delta^{18}O$ values between magmatic zircon and metamorphic garnet suggest negative $\delta^{18}O$ fingerprints might result from post-magmatic hydrothermal alteration or multi-episodes of rift magmatism after the formation of the protolith. Zircon and titanite from the felsic vein yield similar U-Pb ages of 212 ± 3 Ma and 215 ± 3 Ma within analytical uncertainties, recording the timing of melt activity during the exhumation of the UHP rocks. The approximately consistent $\delta^{18}O$ values of metamorphic zircon and metamorphic garnet indicate that the melt was sourced from the surrounded gneiss in a close system, which might be triggered by the breakdown of phengite. According to a compilation of partial melting of UHP rocks in the Sulu orogen, there exists a clear spatio-temporal variation. Such a variation might be dictated by tectonic evolution of rocks in different UHP slices. Accordingly, we suggest that the whole partial melting process in the Sulu UHP terrane might have lasted for about 27 Myr.