Distinct zircon U-Pb and O-Hf-Nd-Sr isotopic behaviors during fluid flow in UHP metamorphic rocks

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Fluid plays a key role in metamorphism and magmatism in subduction zone. Veins in high-pressure (HP) to ultrahigh-pressure (UHP) rocks are the products of fluid-rock interaction, and can thus provide important constraints on fluid processes in subduction zones. We carried out an integrated study of zircon U-Pb and O-Hf, as well as whole rock Nd-Sr isotopic compositions for a quartz vein, a complex vein, and their host eclogite in the Sulu UHP terrane to decipher the timing and source of fluid flow under HP-UHP metamorphic conditions. The inherited magmatic zircon cores from the host eclogite constrain the protolith age at *c*. 750 Ma, reflecting its protolith formed in a rift setting due to the breakup of the supercontinent Rodinia. The morphological and geochemical features of hydrothermal zircons indicate they precipitated from the fluids under HP eclogite-facies conditions. They yielded similar Triassic U-Pb ages, recording the timing of fluid flow during the exhumation of the UHP rock. Zircon O and whole rock Nd isotopic compositions imply that the fluids might be internal and localized. For O and Nd are major and trace components in minerals involved in metamorphic reactions during HP-UHP conditions, they are useful to identify the source of fluid, On the other hand, model calculation suggests that the Hf was derived from the breakdown of major rock-forming minerals and recycling of the inherited magmatic zircon. The variable whole rock initial $^{87}Sr/^{86}Sr$ ratios might be caused by subsequent retrograde metamorphism after the veins formation.