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# SHRIMP U-Pb Zircon Dating from Eclogite as Block in Marble, Shuanghe Area, Dabie Terrane: Restriction on the Prograde, Uhp and Retrograde Metamorphic Ages

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Laser Raman spectroscopy and cathodoluminescence (CL) images show that zircons from eclogite as block in marble from Shuanghe, Dabie UHP metamorphic belt, are characterized by inherited (detrital) zircons, prograde, UHP and retrograde metamorphic zircon domains. The inherited (detrital) zircons contain Pl + Ap and Qtz + Pl in the white-luminescent core and the dark-luminescent rim, respectively. While the prograde metamorphic domains (with grey-luminescent CL images) preserve quartz eclogite facies mineral assemblage of Qtz + Grt + Omp + Phe + Dol + Ap, formed at 588-668°C and 1.7-1.8 GPa. In contrast, the UHP metamorphic domains (with white-luminescent CL images) retain index UHP mineral assemblage of Coe + Grt + Omp + Arg + Mgs + Ap, and record UHP condition of T = 784-849°C and P $>$ 5.5 GPa. The outmost retrograde rims (with dark-luminescent CL images) however, contain low-P minerals such as quartz and calcite, related to the regional amphibolite facies retrogression with T = 550-720°C and P = 0.8-1.4 GPa. SHRIMP U-Pb dating on these zoned zircons identify four discrete and meaningful age groups: 2701-1753 Ma of 207Pb/206Pb age is recorded in the inherited (detrital) zircons derived from Archean-Proterozoic protolith, the prograde metamorphism of quartz eclogite facies in the prograde domains occurred at 249-241 Ma of 206Pb/238U age, the UHP metamorphic event in the UHP mineral-bearing domains was at 239-231 Ma, and the late amphibolite facies retrogressive overprint in the outmost rims was limited at 222-215 Ma. Thus, Archean-Proterozoic continental materials of the Dabie UHP terrane were subducted to 55-60 km depth at Early Triassic and occurred quartz eclogite facies metamorphism simultaneously. Then these quartz eclogite facies metamorphic rocks continued subduction to 165-175 km deep mantle depth at Middle Triassic and experienced UHP metamorphism; The peak pressures are based on the equilibrium calculation of the reaction dolomite = magnesite + aragonite. This UHP metamorphism recorded a lower geotherm step of 4.7°C km-1 which is located what was previously considered a 'forbidden' condition within earth. Finally these UHP metamorphic rocks were exhumed to mid-crustal levels (about 30 km) in the Late Triassic and overprinted regional amphibolite facies metamorphism. The subduction and exhumation rate deduced from the SHRIMP data and metamorphic P-T conditions is 9-10 km Myr-1 and 6.4 km Myr-1, respectively. Fast subduction and rapid exhumation has been considered to be one of the most important factors for the preservation of prograde, UHP and retrograde metamorphic minerals in zircons. Such a fast exhumation suggests that the Dabie UHP metamorphic rocks returned towards the crustal depths as dominant part of a buoyant sliver, caused as a consequence of slab breakoff.