



Recrystallization history and P-T-time-isotopic evolution of coesite-bearing eclogites: implications for exhumation processes (SW Tianshan, China)

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The Chinese Southwestern Tianshan high- to ultra-high pressure low temperature (HP-UHP/LT) metamorphic belt exhibits well-preserved mafic layers, tectonic blocks/slices and boudins of different sizes and lithology embedded within dominant meta-volcanosedimentary rocks. Despite a wealth of previous studies on UHP relicts, P-T paths estimates and age constraints for metamorphism, controversies still exist on P-T-t assessments and regional exhumation patterns (i.e., tectonic mélange versus internally coherent “sub-belt” model). Our study focuses on a group of coesite-bearing eclogite samples from a thick (~ 5 meters) layered metabasalt outcrop in order to unravel its detailed tectono-metamorphic evolution through space and time (both prograde, peak and exhumation). Using SIMS zircon U-Pb and oxygen isotope analyses, TIMS Sm-Nd multi-point isochron dating, in situ laser-ICP-MS trace-element analyses, classical thermobarometry and thermodynamic modeling, we link the multistage zircon growth to garnet growth and reconstruct a detailed P-T-time-isotopic evolution history for this UHP tectonic slice: from UHP peak burial $\sim 2.95 \pm 0.2$ GPa, $510 \pm 20^\circ$ around 318.0 ± 2.3 Ma to HP peak metamorphism $\sim 2.45 \pm 0.2$ GPa, $540 \pm 20^\circ$ at 316.8 ± 0.8 Ma, then, with eclogite-facies deformation $\sim 2.0 \pm 0.15$ GPa, $525 \pm 25^\circ$ at 312 ± 2.5 Ma, exhumed to near surface within ca. 303 to ca. 280 Ma. Our P-T-time-isotopic results combined to the exhaustive compilation of regional radiometric data and P-T estimates notably point to the existence of a short-lived period of rock detachment and exhumation (< 10 Ma, i.e. at ca. 315 ± 5 Ma) with respect to “long-term” subduction duration (> 50 -100 Ma).