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∼100 Ma Lu-Hf eclogite ages from Koralpe and Saualpe (Austroalpine nappes, Austria): New constraints for the kinematics of Eoalpine subduction

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The Koralpe and Saualpe complexes are part of the Austroalpine basement nappe system. They represent the largest region in the Eastern Alps exposing high-pressure metamorphic rocks from the Cretaceous Eoalpine orogenic event and also contain the type locality for eclogite. The grade of the Cretaceous metamorphism in the Eastern Alps increases to the southeast, with maximum pressures and temperatures reaching up to 3.5 GPa and 850 °C in the Pohorje Mountains (Janak et al., 2015). The estimated P-T-conditions for the eclogites from Saualpe and Koralpe are 2-2.2 GPa and 600-740 °C (Miller & Thöni 1997, Thöni et al. 2008).

Here we present a new Lu-Hf isotopic study of the eclogites from the Hohl locality in the southern Koralpe, and from the Grünburgerbach and Wolfsberger Hütte localities in the southern Saualpe. Two-point isochrones from samples of Hohl and Wolfsberger Hütte based on one whole rock and one garnet separate yield ages of 99.2 ± 1.1 Ma and 101.7 ± 2 Ma, respectively. Two eclogite samples from Grünburgerbach give garnet-omphacite-whole rock ages of 100.3 ± 1 Ma and 101.79 ± 0.92 Ma, identical within error. The garnets in the eclogite from Hohl display a homogenous composition with no zoning of major elements, whereas the garnets of the samples from Grünburgerbach show an enrichment of Mn in the cores and lower contents towards the rims, which indicates prograde garnet growth during increasing P and T. The ages are therefore related to burial during subduction.

These new Lu-Hf garnet ages are slightly older than the Lu-Hf garnet age data from Pohorje (∼95 Ma; Sandmann et al. 2011, Thöni et al. 2008), which also date burial. If Koralpe/Saualpe and Pohorje would belong to one continuous crustal unit subducted and exhumed “en bloc” in a southeast-dipping subduction zone, the opposite age difference would be expected. Our results show that this is not the case and represent important constraints for a more realistic kinematic model.

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