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The Plankogel detachment of the Eastern Alps: petrological evidence for an orogen-scale extraction fault

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The so-called Plankogel detachment is an east-west trending, south-dipping low-angle structure that juxtaposes the high-pressure rocks of the eclogite type locality of the eastern European Alps against amphibolite facies rocks to the south. It occurs in both the Saualpe and Koralpe Complex in eastern Austria. During Cretaceous intracontinental subduction, the footwall and the hangingwall units of the Plankogel detachment were buried to different crustal levels as inferred by pseudosection modelling and conventional thermobarometry: ∼23–24 kbar and 640–690 °C for the eclogite facies units in the footwall of the detachment and ∼12–14 kbar and 550–580 °C for the amphibolite facies metapelites in the hangingwall. Despite the different peak metamorphic conditions, both sides of the detachment display a common overprint at conditions around 10 kbar and 580–650 °C. From this, we infer a two-stage exhumation process and suggest that this two stage process is best interpreted tectonically in terms of slab extraction during Eoalpine subduction. The first stage of exhumation occurred due to the downward (southward) extraction of a lithospheric slab that was localized in the trace of the Plankogel detachment. The later stage, however, is attributed to more regional erosion- or extension-driven processes. Since the Plankogel detachment is geometrically related to a crustal-scale shear zone further north (the Plattengneiss shear zone), we suggest that both structures are part of the same extraction fault system along which the syn-collisional exhumation of the Eoalpine high-pressure units of the Eastern Alps occurred. The suggested model is consistent with both the mylonitic texture of the Plattengneiss shear zone and the overall ambiguous shear sense indicators present in the entire region.