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Evolution of the Adria–Europe plate boundary in the northern Dinarides: from continent-continent collision to back-arc extension

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The Sava Zone of the northern Dinarides in Former Yugoslavia is part of the Cenozoic Adria-Europe plate boundary. Late Cretaceous subduction of remnants of Meliata-Vardar oceanic lithosphere led to the formation of a suture, across which upper-plate European units were juxtaposed with Adria-derived units of the Dinarides. Late Cretaceous siliciclastic sediments were incorporated into an accretionary wedge that evolved during the initial stages of continent-continent collision. Structurally deeper parts of the exposed accretionary wedge underwent amphibolite-grade metamorphism. Grt-Pl-Ms-Bt thermobarometry and multi-phase equilibria indicate temperatures between 550 and 630 °C and pressures between 5 and 7 kbar for this event. Peak-metamorphic conditions were reached at around 65 Ma. Relatively slow cooling from peak-metamorphic conditions throughout most of the Paleogene was possibly induced by hangingwall erosion in conjunction with southwest-directed propagation of thrusting in the Dinarides. Accelerated cooling took place in Miocene times, when the Sava Zone underwent substantial extension that led to the exhumation of the metamorphosed units along a low-angle detachment. 40Ar/39Ar sericite and zircon and apatite fission track ages from the footwall allow bracketing the timing of this extensional unroofing between 25 and 14 Ma. Footwall exhumation started under greenschist-facies conditions and was associated with top-N tectonic transport, indicating exhumation from below European-plate units. Extensional unroofing clearly postdates the emplacement of a 27 Ma old granitoid that also underwent solid-state deformation under greenschist-facies conditions. This extensional phase is hence clearly linked to the Miocene evolution of the Pannonian basin, which represents a back-arc basin formed due to Neogene subduction roll-back in the Carpathians.