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Tracing the Alpine collision zone towards east: the Sava Zone - a Late Cretaceous to Paleogene suture between Tisza and the Dinarides

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The widespread occurrence of regionally metamorphosed rocks all across the Alps is one of the most obvious manifestations of the Mesozoic to Cenozoic convergence between the Adriatic and the European plate. While this collision zone is well-known throughout the Alps itself, it becomes less clear how it continues eastward from the Eastern Alps, where the orogen plunges underneath the Neogene Pannonian Basin fill. This combined structural, petrological and geochronological study aims at defining kinematics, metamorphic conditions and timing of tectonic events in the so-called "Sava Zone", at the south-western margin of the Pannonian Basin. This zone is believed to host a suture formed by the closure of a Late Cretaceous oceanic remnant of the Alpine Tethys and the subsequent collision of Tisza and the Dinarides. This collision saw Tisza in an upper plate position and led to regional metamorphism of mostly terrigeneous, often volcano-detritic forearc sediments of Late Cretaceous to Early Paleogene age. However, both P-T-estimates and radiometric ages of this metamorphism are lacking completely.

The area investigated is situated in northernmost Bosnia-Hercegovina, where outcrops of pre-Neogene rocks are restricted to a few inselbergs. The regional metamorphic overprint in the forearc sediments ranges from diagenetic conditions at the top of the sediment pile to lower amphibolite-facies conditions in its lowermost exposed parts. Amphibolite-facies lithologies encompass both metapelites and amphibolites sensu stricto. The common peak-metamorphic assemblage in the metapelites is Grt, Pl, Bt, Ms, Qtz $\pm$ St. Application of Grt-Bt thermometry, Grt-Pl-Mu-Bt thermobarom-

etry, and multi-phase equilibria calculated with Thermocalc (Powell & Holland 1988) provide temperatures between 540-630 °C and pressures between 5-6 kbar. Metamorphism was synchronous with the formation of a regional foliation and associated stretching lineations. Quartz-mylonites with a pronounced shape-preferred orientation reveal dynamic recrystallisation by grain boundary migration, also indicative of upper greenschist facies to lower amphibolite facies conditions. Top-to-the-S-directed senses of shear are consistent with the assumption that the internal Dinarides were overthrusted by the Tisza unit.

Accessory monazites from higher-grade metapelite samples from Mt. Motajica were studied by means of the electron microprobe. Two groups of monazites could be distinguished on the basis of textural and morphological criteria. A first group includes a few relatively large anhedral grains. A second group comprises abundant small (10-30 μm), euhedral to subhedral grains, which are included in micas or pinned at grain boundaries and often aligned parallel to the foliation. The larger monazites gave Permian Th-U-Pb ages and are interpreted as detrital grains. They have often very high Y contents of ca. 3 wt.% Y2O3. This suggests a high-temperature formation (Heinrich et al. 1997, Pyle et al. 2001), possibly in a granitic rock. The smaller monazites yielded chemical Th-U-Pb average ages of 60$\pm$17 Ma and 63$\pm$19 Ma, respectively (two samples). Their moderately high Y values (1.6-2.2 wt.% Y2O3) indicate a growth at lower (-middle) amphibolite-facies conditions. Based on these data it is suggested that the Alpine regional metamorphism recorded in this area occurred in the Late Cretaceous or Early Paleogene.

References:

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