



Geochronological and geochemical characteristics of zircon from Lower Cretaceous pegmatites of the Pelagonian Unit, N. Macedonia

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Modern interpretations of the geological evolution of the Balkan terranes frequently correlate the Pelagonian unit with the Drina-Ivanjica and East Bosnian-Durmitor units, considering them as the fragments of the Adriatic plate margin. The Pelagonian massif is approximately 420 km long and about 60 km wide, extending in a NNW-SSE direction, representing a part of the central Hellenides. It is located between the Vardar zone and the Dinaride (West Vardar) ophiolite belts, across the territories of North Macedonia and Greece (Florina terrane).

Here, we document Lower Cretaceous magmatic zircon crystallization ages in this sector of the basement (Boev *et al.*, 2024). In the investigated localities, the pegmatites are structurally and genetically linked to distinct plutonic suites: syenites in the village of Alinci and two-mica granitoids in the village of Čanište. Geochemical and U-Pb geochronological results reveal that this magmatic episode is split into two highly distinct temporal and compositional groups. The Čanište occurrences yield an older, syn-collisional S-type signature at ca. 130 Ma. Conversely, the Alinci pegmatites yield a significantly younger age of ca. 105 Ma, characterized by an alkaline A-type chemistry marked by the presence of alkaline amphibole (arfvedsonite).

These geochronological data have potential to provide critical regional geodynamic constraints. Within the adjacent Rhodopian section of the Balkans, active subduction-related magmatism and high-pressure metamorphism peaked during the Middle Jurassic to earliest Cretaceous between ca. 150–130 Ma, recording the early amalgamation of internal terranes (Kounov & Gerdjikov, 2024). Our new data may indicate that the eastern Pelagonides followed a distinct, diachronous continuation of this mobile boundary along the European margin, rather than remaining a passive domain across a wide, open Vardar Ocean at 120 Ma as depicted by widely accepted paleogeographic models (Gallhofer *et al.*, 2015, van Hinsbergen *et al.*, 2020). The ca. 130 Ma to 105 Ma magmatic pairing broadly fits into this active margin migration tectonics: the ca. 130 Ma S-type melting aligns with the onset of external Pelagonian collisional anatexis between ca. 130–110 Ma, reported also in the Greek Pelagonian zone at 117 ± 8 Ma (Schenker *et al.*, 2014). The younger, ca. 105 Ma post-collisional A-type signature records subsequent crustal thinning and extension, being a late-stage event completely absent within the older Rhodopian structural architecture.

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