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Alpine tectonic evolution of the Northern Serbo-Macedonian sub-unit: inferences from kinematic and petrological investigations

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The Serbo-Macedonian Massif represents a belt of medium to lower amphibolite facies metamorphics situated along the European continental margin between the Pannonian Basin in the north and the Aegean Sea in the south. Structurally, it comprises the innermost segments of the Dacia mega-unit of the European affinity and is juxtaposed against the Adria-derived units of the Dinarides across the Adria-Europe zone of collision. The peak metamorphic event in the Serbo-Macedonian Massif is Variscan in age, while its magmatism had a complex pre-Alpine evolution, with the youngest stage being related to the crustal extension during the Triassic opening of the northern branch of Neotethys Ocean (or the Vardar Ocean). The subsequent Late Jurassic–Paleogene closure of the Vardar Ocean led to the E-ward subduction of the Neotethys oceanic lithosphere beneath the upper European plate (i.e., the Sava subduction system). The retreating and steepening of subducting lithosphere during the Late Cretaceous triggered syn-subductional extension in the upper plate of the Sava subduction system. The Late Cretaceous extension exhumed and structurally juxtaposed the high-grade Serbo-Macedonian metamorphics against the low-grade metamorphics of the Carpathians Supragetic Unit. The contact is marked by the E-dipping shear zone that can be traced along the eastern margin of Serbo-Macedonian Massif, from the Vršac Mts in the north, across the Jastrebac Mts and further towards the south in the Central Serbo-Macedonian sub-unit of south-eastern Serbia. The Late Cretaceous extension exhumed the Serbo-Macedonian metamorphic core, concurrently creating subsidence in a forearc basin along the frontal part of the European continental margin.

Due to its unique position in the interference zone of the two retreating Carpathian and Dinaridic slabs, the Northern Serbo-Macedonian sub-unit between the Vršac Mts in the north and the Jastrebac Mts in the south was strongly influenced by processes associated with the Oligocene–Miocene Pannonian extension. Hence, large segments of the Northern Serbo-Macedonian sub-unit including its contact with the Supragetic Unit were buried beneath the Neogene sediments of the Morava Valley Corridor, as the southern prolongation of the Pannonian Basin. In order to segregate and quantify the effects of the Oligocene–Miocene extension we have conducted a coupled kinematic, petrological and thermochronological study in the segments of Northern Serbo-Macedonian sub-unit adjacent to the Dinarides and Carpathians. The recent tectonic uplift of the Vršac Mts occurred in the Middle to Late Miocene along the WSW-dipping normal faults that control deposition in the adjacent Zagajica depression. The ENE-WSW oriented

extension, which was triggered by the retreat of Carpathian slab, exhumed the core of the mountains and exposed the Late Cretaceous Serbo-Macedonian\Supragetic extensional contact. South from the Vršac Mts such exhumation was hampered by the presence of rigid Moesian indenter. Tectonic exhumation of the Jastrebac Mts, together with a cluster of Serbo-Macedonian gneiss domes that emerge from the surrounding Neogene sediments in the western-central part of the Morava Valley Corridor, was induced by corrugated detachment faults during the Oligocene–Miocene E-W oriented Dinaridic extension.