Can the dynamics of a subducted slab account for the Upper Cretaceous magmatism in the Sava-Vardar Zone and Timok Magmatic Complex? A Numerical Modelling Approach

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Nikola Stanković, Ana Mladenović, Dejan Prelević, Vesna Cvetkov, and Vladica Cvetković
University of Belgrade, Faculty of Mining and Geology, Belgrade, Serbia (nikola.stankovic@rgf.bg.ac.rs)

Many questions regarding the geodynamics of the Vardar Tethys have mostly been settled, including the timing of the ophiolite obduction in the Balkans and the configuration of oceanic domains during the Jurassic period. However, the terminal stages of the evolution of Vardar branch of the last Tethyan ocean in the Balkans, specifically the time of its final closure, remains controversial. Current consensus favors a late ocean closure during the Late Cretaceous [1]. Although the timing of the obduction of the Balkan ophiolites indicate a closure in the latest Jurassic/earliest Cretaceous, the discovery of Upper Cretaceous magmatic rocks in the Sava-Vardar suture, interpreted as ophiolites, lead some authors to extend the life of the last Tethyan ocean to the latest Cretaceous. However, more recent findings call into question the oceanic character of these rocks [2], and propose a possible intra-continental environment for their origin. Another strong argument for the existence of an active subduction during the Cretaceous is the presence of the Timok Magmatic Complex (TMC) as part of the larger Apuseni-Banat-Timok-Srednogorje metallogenic belt. In this communication, we present our preliminary results of numerical modelling of Cretaceous geodynamics in the Balkans. We adopt the perspective that the magmatic rocks in the Sava-Vardar Zone do not represent ophiolites, and argue for ocean closure by the earliest Cretaceous, consistent with our previous models of Jurassic ophiolite obduction in the Balkans [3]. We try to account for the Cretaceous magmatism in the Sava-Vardar Zone and TMC in the context of an already closed ocean at the surface. To this end, we model the dynamics of the already subducted slab that is still attached, whereas the ocean lithosphere is completely consumed. The slab consists of the subducted oceanic lithosphere and a smaller portion of the basement of Adria. This slab undergoes detachment which is followed by the rise of its shallower parts and delivery of subducted rock material into favorable conditions for partial melting. The models are based on both an idealized configuration as well as the spontaneous continuation of our previous models of the Tethys closure.

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