

Stratigraphy and Age of the Timok Magmatic Complex (TMC)

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The data acquired in the frame of the SCOPES Project, along with already published data, enable a synthesis for the TMC stratigraphy and age. The synthesis reveals that the Timok Magmatic Complex (TMC) consists of the following and stratigraphical units: (i) Albian-Cenomanian sediments, (ii) Turonian-Senonian sediments and epiclastic rocks, (iii) Turonian-Campanian andesites, (iv) Senonian basaltic andesites and andesites, (v) plutonic rocks, (vi) latites, and (vii) Campanian-Maastrichtian sediments.

Andesitic volcanism occurred in the eastern parts of the TMC. It was predominantly characterized by effusive and shallow intrusive activity, which produced coherent and autoclastic andesitic facies. These volcanic rocks overlie the Turonian and Alb-Cenomanian sediments, while their cover consists of Senonian sediments and epiclastites. U/Pb zircon analyses showed that the shallow intrusions in the Krivelj area crystallized from 86.29 ± 0.32 to 84.26 ± 0.67 Ma, and that similar dykes in the Majdanpek area emplaced between 84.0 ± 0.4 and 82.73 ± 0.03 Ma. The Ar/Ar analysis of the lava flow facies in the Bor area gave an age of 89.0 ± 0.6 Ma. Mineralization age was determined by Re-Os data which gave around 84 Ma for the Majdanpek, 86 Ma for the Bor and 88 Ma for the Krivelj area. Mineralized fluids which formed huge copper deposits in Majdanpek, Bor and Krivelj were likely genetically related to the Turonian volcanism.

During the Senonian the volcanic front migrated towards the central and western part of the TMC. The Senonian volcanic activity was predominantly represented by linear subaquatic effusions. The most abundant rocks are basaltic andesites and andesites, represented by lava flows (coherent or autobrecciated), hyaloclastic deposits, and rarely shallow intrusions. The basaltic andesites and andesites overlie Coniacian-Santonian sediments and underlie Campanian clastic and Campanian-Maastrichtian reef sediments. The only available radiometric data for these volcanic rocks are an U/Pb zircon age of the subvolcanic dyke occurring in the Brestovac area. They revealed an age between 82.27 ± 0.35 Ma.

Plutonic rocks are represented by diorites and monzodiorites. Along with latitic dykes, they occur in the western part of the TMC as intrusions within the Senonian volcanites. The U/Pb age zircon analysis of the Valja Strž intrusive rocks gave an age of 78.62 ± 0.44 Ma. The age of mineralization in the western part of the TMC (Crni Vrh area) is dated by a Re-Os analysis which gave around 80 Ma.

The available stratigraphic and age data lead to the conclusion that the volcanic activity in the TMC continuously lasted for around 10 m.y. Non-explosive extrusive and shallow intrusive facies were predominant, followed by thick deposition of syn- and post-eruptive resedimented volcanoclastic rocks. The volcanic front in the TMC continuously migrated from east to west. The volcanic activity in the TMC was followed by volcanic processes in the Ridanj-Krepoljin Zone at around 70 Ma.