Contrasting plutonic bodies in the northern Dinarides-south Pannonian basin: petrogenetic and tectonic implications inferred from the study of Mt. Cer granitoids (West Serbia)

Koroneos A.[1], Poli G.[2], Cvetković V.[3], Christofides G.[1], Krstić D.[4] and Pécskay Z.[5]

[1]*Department of Mineralogy, Petrology, Economic Geology, Aristotle University of Thessaloniki, GR-54124 Thessaloniki, Greece, koroneos@geo.auth.gr, christof@geo.auth.gr*

[2]*Department of Earth Sciences, University of Perugia, 06100 Perugia, Italy, polig@unipg.it*

[3]*University of Belgrade, Faculty of Mining and Geology, Đušina 7, 11000 Belgrade, Serbia, cvladica@rgf.bg.ac.rs*

[4]*Geospec Consultants Ltd, 4632 151 Street, Edmonton, AB, Canada, dkrstic@gpu.srv.ualberta.ca*

[5]*Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI), Bem ter 18/c, 41001 Debrecen, Hungary, Pécskay@namafia.atomki.hu.*

The central parts of the Balkan Peninsula in Serbia are characterized by extensive Tertiary calc-alkaline magmatism. Along with widespread volcanic rocks, there are numerous granitoid plutons occurring within the composite terranes of the Vardar Zone and Serbo-Macedonian Massif. They represent part of a regional Tertiary plutonic-volcanic belt stretching from the Periadriatic tonalite line in the North, through Serbia and further to the SSE in the F.Y.R.O.M. (Former Yugoslav Republic of Macedonia), south Bulgaria and northern Greece. Oligocene plutons are predominant in the area and they are mainly of I-type characteristics. They originated during post-orogenic dextral transpressional movements associated with wrench tectonics and formation of lacustrine basins along the central axis of the Balkan Peninsula.

The Miocene Mt. Cer and Mt. Bukulja plutons are located in the southern Pannonian area. These rocks show both I- and S-type characteristics and are distinguished from the Oligocene granitoids of the Dinaride suite on the basis of age, petrography, geochemistry, and metallogeny.

The Mt. Cer pluton is a complex laccolith-like intrusion (~60 km^2), comprising both I- and S- type granitoid rocks. It intrudes Palaeozoic metamorphic rocks causing weak to strong thermal effects. It is situated at the junction between the northern Dinarides and the southern margin of the Pannonian Basin, and is, hence, a key point for elucidating the geodynamic significance of the Tertiary granitoid magmatism in this part of the Balkan Peninsula.

Based on modal and chemical compositions four rock-types can be distinguished: (1) metaluminous I-type quartz monzonite/quartz monzodiorite (QMZD), (2) peraluminous S-type two-mica granite (TMG), which intrudes QMZD, (3) Stražanica granodiorite/quartz monzonite (GDS), and (4) isolated mafic enclaves (ME), found only in QMZD. ^{40}K-^{39}Ar dating and geological constraints indicate that the main QMZD body of Mt. Cer emplaced not later than 21 Ma, whereas the emplacement ages of the GDS and TMG are estimated at around 18 and 16 Ma, respectively. The Mt. Cer pluton is similar to the Mt. Bukulja pluton occurring some 80 km southwestwards.

Genesis of QMZD cannot be interpreted by fractional crystallization coupled with mixing or assimilation. It is best explained by a convection–diffusion process between a mantle derived minette/leucominette magma and a GDS-like magma followed by two end-member magma mixing. The composition of GDS rocks suggests that GDS-like magmas could have formed by melting of lower crustal lithologies similar to amphibolite/metabasalts. The geochemistry of TMG is reproduced by an AFC model with an assimilation/fractionation ratio (r) of 0.4, using the compositions of the least evolved TMG of the Bukulja pluton and adjacent metamorphic rocks as proxies for the parental magma and contaminant, respectively.

The origin and evolution of the Mt. Cer and adjacent Mt. Bukulja plutons provide new constraints on the Tertiary geodynamics of the northern Dinarides-southern Pannonian region. The QMZD is interpreted as a result of the Oligocene post-collisional Dinaride orogen-collapse, which included a limited lithosphere delamination, small-scale mantle upwelling, and melting of the lower crust. By contrast, the TMG and GDS magmas formed via melting in shallower crustal levels during the extensional collapse in the Pannonian area.