More than 500 Ma of magmatic and tectonic evolution of the Serbo-Macedonian Massif (south Serbia, southwest Bulgaria and east Macedonia)

M. Antić[1], I. Peytcheva[2], A. von Quadt[3], A. Kounov[1], B. Trivić[4], T. Serafimovski[5], G. Tasev[5], and I. Gerdjikov[6]

[1] Geologisch-Paläontologisches Institut, Universität Basel, 4056 Basel, Switzerland
[2] Geological Institute, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria
[3] Institute of Geochemistry and Petrology, ETH-Zürich, 8092 Zürich, Switzerland
[4] Faculty of Mining and Geology, University of Belgrade, 11000 Belgrade, Serbia
[5] Faculty of Natural and Technical Sciences, University "Goce Delčev" - Štip, 2000 Štip, Republic of Macedonia
[6] Faculty of Geology and Geography, St. Kl. Ohridski University of Sofia, 1504 Sofia, Bulgaria

The Serbo-Macedonian Massif (SMM) represents a complex crystalline terrane situated between the two diverging branches of the Eastern Mediterranean Alpine orogenic system, the northeast-vergent Carpatho-Balkanides and the southwest-vergent Dinarides and the Hellenides. It can be followed from the Pannonian basin in the north, to the Aegean Sea in the south, along the central and southeastern Serbia, southwestern Bulgaria, eastern Macedonia and southern Greece. It's affiliation to European and/or African plate basement is still questionable due to the lack of reliable geochronological data and a detailed structural investigation. The SMM is the key area for understanding the bipolarity of the Alpine orogenic system, as well as the interaction of the Pannonian and Aegean back-arc extension during the Cenozoic time.

The SMM is generally considered to comprise an Upper (low-grade) and a Lower (medium to high-grade) unit (Dimitrijević, 1959). The protoliths of both units are reported as volcano-sedimentary successions, which have been later intruded by igneous rocks during several magmatic pulses. On our mission to discern the main magmatic episodes and the geodynamic evolution of the SMM we have analysed zircon grains of metamorphic rocks from both units, as well as undeformed igneous rocks. LA-ICP-MS analyses were carried out on zircon grains in order to obtain the protolith ages and geochemical analyses were carried out on the total of nineteen samples from different magmatic rocks.

Our first results reveal the presence of a Permo-Triassic (253±13 Ma) magmatic pulse in the Serbian part of the SMM; additionally, the Ordovician – Silurian (496-416 Ma) and the Ediacaran - early Cambrian (Cadomian ; 595-504 Ma) event complete the Pre-Mesozoic magmatic evolution in the Serbian part of the SMM. The new geochronological constraints, together with the field relationships, allowed us to conclude: a) The Lower SMM consists of a Cadomian (Ediacaran-early Cambrian) volcano-sedimentary sequences and magmatics, which were intruded by Ordovician magmatic rocks; b) The Upper SMM (Vlasina and Morava unit) contains a volcano-sedimentary sequence, which is intruded by the Cadomian magmatic rocks; c) In contrast to the Lower complex, no Ordovician age magmatics were documented in the Upper unit, and d) The Upper SMM is covered by Silurian-Devonian sedimentary sequence.

The youngest magmatic event in the SMM occurred in the late Eocene, it is related to the intrusion of Surdulica granodiorite and subsequent latitic volcanism.

Zircon fission track analysis together with apatite data modelling revealed two distinct cooling events. Late middle-Cretaceous rapid cooling through zircon and apatite closure temperature (300°-60°C) is detected along the lower complex of the SMM. To the east along the Vlasina Complex the rocks have probably followed the same late Cretaceous cooling whereas later they have been heated to the temperatures higher than 120°C (apatite closure temperature) during the Eocene - early Oligocene magmatic activities. The second cooling event in the Cenozoic was related to the formation of the Crnook-Osogovo-Lisets dome and the later, post magmatic, extensional phases.

References:

Dimitrijević, M. D, 1959, Osnovne karakteristike stuba Srpsko-makedonske mase, (Basic characteristics of the column of the Serbo-Macedonian Mass), First symposium of the SGD, Abstracts.