The westernmost Late Miocene-Pliocene volcanic activity in the Vardar Zone (North Macedonia) – geochronology, petrology and geochemistry of Pakoševo, Debrište and Šumovit Greben volcanic centers

Kata Molnár¹, Stéphane Dibacto², Pierre Lahitte², Marjan Temovski¹, Samuele Agostini³, Zsolt Benkó¹, Artur Ionescu⁴,⁵, Ivica Milevski⁶, and László Palcsu¹

¹Isotope Climatology and Environmental Research Centre, Institute for Nuclear Research, Debrecen, Hungary
²GEOPS, University of Paris-Sud, Orsay, France
³Institute of Geosciences and Earth Resources, National Research Council of Italy, Pisa, Italy
⁴Department of Physics and Geology, University of Perugia, Perugia, Italy
⁵Faculty of Environmental Science and Engineering, Babeş-Bolyai University, Cluj-Napoca, Romania
⁶Institute of Geography, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University, Skopje, North Macedonia

Late Miocene to Pleistocene volcanism within the Vardar zone (North Macedonia) covers a large area, has a wide range in composition and it is largely connected to the tectonic evolution of the South Balkan extensional system, the northern part of the Aegean extensional regime. The scattered potassic to ultrapotassic volcanism developed south from the Scutari-Peć fault zone since 6.57 Ma [1]. The focus of this study is on three volcanic centers located on deep structures or thrust faults along the western part of the Vardar zone, for which there is none to very little geochronological and geochemical data available. Pakoševo and Debrište localities are represented as small remnants of lava flows cropping out at the southern edge of Skopje basin and at the western edge of Tikveš basin, respectively. Šumovit Greben center is considered as part of the Kožuf-Kozjak/Voras massif (6.5-1.8 Ma [1]), and it is located on its westernmost side, at the southern edge of Mariovo basin, which is largely comprised of volcanoclastic sediments. Here we present new eruption ages applying the unspiked Cassignol-Gillot K-Ar technique on groundmass, petrological and geochemical data, supplemented with Sr and Nd isotopes to complement and better understand the Neogene-Quaternary volcanism in the region. Obtaining the eruption ages of these volcanic centers could also help to better constrain the evolution of the sedimentary basins. All of the three centers belong to the shoshonitic series based on their elevated K-content. The oldest center amongst these three localities, as well as other Late Miocene centers within the region, is the trachyandesitic Debrište, which formed at ca. 8.1 Ma, and exhibits the highest Nd isotopic ratios (0.512441-0.512535). The trachybasaltic Pakoševo center formed at ca. 3.8 Ma and, based on its Nd isotopic ratio (0.512260), represents the strongest sign of crustal contamination. The rhyolitic Šumovit Greben center is a composite volcanic structure formed at ca. 3.0-2.7 Ma. Its youngest eruption unit has a slightly larger Nd isotopic ratio (0.512382), representing a less
evolved magma at the end of its activity.

This research was funded by the GINOP-2.3.2-15-2016-00009 'ICER' project, the French-Hungarian Cooperation Program TÉT-FR-2018-00018 and the HORIZON 2020 grant N 676564.

References: