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Post-collisional Variscan granites in the Danubian Domain, Romanian Southern Carpathians.

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The South Carpathians of Romania represent a 300 km long segment of the European Alpine belt positioned between the East Carpathians and the Danube River, surrounding the northwestern part of the Moesian platform. They show an intricate nappe structure achieved during the Alpine (mid and late Cretaceous) crustal convergence and shortening, and consist of two systems of basement-cored nappes, with cover nappes sandwiched in between. From the lowest to the highest structural positions, the Alpine nappe pile in the South Carpathians is comprised of the Danubian nappe system (consisting of Neoproterozoic granitoids and metamorphic rocks, Paleozoic metasedimentary rocks and Mesozoic sediments), the Severin nappe complex (comprising Jurassic ophiolites, alkaline igneous rocks and flysch) and the Getic-Supragetic nappe system (corresponding to a mixture of pre-Alpine gneisses overtopped by a sedimentary cover). The basement of the Danubian domain is represented by two pre-Alpine terranes, namely Lainici-Paius and Dragsan, with the Tisovita-Iuti ophiolitic complex situated in between as a suture zone. The two terranes are heavily punctured by granitic plutons [1] some of them dated as late Carboniferous in age [2], emplaced during the Variscan orogeny. The lack of consistent trace elemental and the isotopic data hindered reliable inferences on their environments of generation and evolution.

Our preliminary major and trace elemental data as well as stable oxygen isotope data presented in this study sheds new light on the sources of the melts that eventually generated the Variscan granites. Parameters calculated based on major oxides analyses, both new and from earlier literature, (i.e. modified alkali index-MALI; aluminum saturation index – ASI; and *Fe*-number) put some initial constraints on the composition of the plutons as being mostly magnesian peraluminous (average ASI values of 1.15) to strongly peraluminous S-type granites (maximum ASI value of 2.25) calc-alkalic to alkali-calcic (MALI parameter ranging from 1.15 to 9.19). These data together with trace elements, especially rare earth elements (REE) support the hypothesis that at least partially the Variscan granitoids of the Danubian domain were derived from crustal melts or strongly influenced by crustal contamination. Furthermore, La/Yb ratios (ranging from 10.21 to 51.41, with an average of 30.3) show good correlations with the ages of the intrusions and their systematic increase can be correlated with the thickening of the crust in the early phases of the Variscan collision. The high $\delta^{18}O$ values measured on quartz separates (highest value of 13.82 ‰ and an average of 10.81 ‰) and the lack of evidence for subsolidus hydrothermal alteration processes support a strong crustal component involvement in the production of the melts or their intense contamination with crustal material. However, the presence of magmatic garnet and the REE contents for some of the plutons do not preclude the possibility that, at least in some stages, a mantle component was involved as well in the granite generation. Based on our preliminary assessments, it is safe to assume that the Variscan granites of the Danubian Domain have strong post-collisional features and, most probably, were emplaced during the crustal thickening caused by the Variscan orogeny.

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[2] Balica, C., H. P. Hann, F. Chen, I. Balintoni, and L. Zaharia. 2007. The age of the intra-Danubian suture (Southern Carpathians, Romania). Eos. Transactions of the American Geophysical Union 88, no. 52: Abstract T31B-0476.