

Tracing collisional route of the Danubian terranes (South Carpathians, Romania), using detrital U-Pb isotopic record

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The Danubian Realm of the South Carpathians, Romania, comprises a set of Alpine tectonic units exposed in a large tectonic window, under the Getic Realm. Each of the Danubian tectonic unit has a pre-Alpine basement composed mainly of high-grade metamorphic rocks, several Neoproterozoic granitoids (e.g. [1]), and low-grade Paleozoic formations. The whole basement is intruded by Variscan plutons. Two pre-Variscan metamorphic rock sequences of Pan-African origin [2] have been identified in the Danubian basement: The Drăgşan and Lainici Păiuş. The relation between these two groups is purely tectonic, since they are separated by a Variscan thrust fault. An oceanic crust fragment, (i.e. Tisoviţa terrane), of presumably Early Devonian age separates the Drăgşan and Lainici-Păiuş pre-Variscan terranes by the Poiana Mraconia terrane fragment of presumably Getic affinity. Generally, most of the doubts in what concern the origin and provenance of the two main terranes, Lainici-Păiuş and Drăgşan, have been cleared up [3]. According to the latest review, the large metasedimentary Lainici-Păiuş tract, extensively crosscutted by a network of heterogranular leucogranite and pierced by Cadomian granitoid plutons correspond to a continental margin volcanic arc of Ganderian origin and Peri-Amazonian provenance. The time of formation is constrained, based on the presence of ca 600 Ma granitoid plutons which is Late Neoproterozoic [3]. On what concerns the Drăgşan terrane, its main lithology (i.e. banded amphibolites) has oceanic island arc isotopic and geochemical signatures [3]. In fact, its lithostratigraphic composition – a lower orthogneiss assemblage, a median metabasic-ultrabasic assemblage and an upper mica gneiss unit – recommends it as of rather composite nature. One of the key points in constraining the age of the Drăgşan terrane basement is the 808 Ma, age recorded by an augen gneiss zircons and the 811 Ma age recorded by some meta-rhyolite inherited zircons [3]. Based on the analysis of two detrital zircon age patterns, an Avalonian-type origin and a peri-Amazonian provenance is suggested. In addition to these arguments, the absence of any Cadomian intrusion was used as strong point to constrain the location of Drăgşan terrane outside the Cadomian arc.

Beyond the terranes origin, provenance and tectonic setting, the evolution of the Danubian terranes starting with their formation at the Gondwana margin up to the final Variscan continental collision remains still undisclosed. In order to trace the collisional route of the two Danubian terranes, a comparative analysis is done on 12 detrital zircon samples from the Dragsan terrane and 15 detrital zircon samples from Lainici-Paius terrane has been carried out, in terms of the detrital zircon U-Pb age distribution. The two aggregate age distributions show similarities, sharing common maxima within 600-300 Ma. Based on these similarities, a sequence of events is proposed. Following the formation of the two Danubian terranes (i.e. minimum 800 Ma for the Dragsan terrane and 622-600 Ma for the Lainici-Paius terrane, respectively), age peaks falling within 630-580 Ma might represent the accretion and collision of the Dragsan arc to the Gondwanan margin represented by Lainici-Paius terrane. The 570 Ma peak, common for both distributions and identified also in a set of metamorphic zircons from the Lainici-Paius terrane, possibly represent the age of metamorphism for both terranes. The age minima observed within the 450-430 Ma interval, might suggest the separation of the Danubian terranes from the Gondwana mainland. Finally, the Variscan collision is clearly recorded by the 320 Ma peak

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References

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