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The pre-Cenozoic evolution of the Apuseni Mountains (Romania) in the light of new (thermo)geochronological data

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The Apuseni Mountains in Romania occupy a central position within the Alpine-Carpathian-Dinaride system between the Pannonian basin in the West and the Transylvanian basin in the East. Following the final Late-Jurassic obduction of the East Vardar ophiolites, a NW-vergent nappe stack formed, which involves from bottom to top: Tisza- and Dacia-derived units, overlain by the South Apuseni or Transylvanian ophiolite belt (i.e. East Vardar ophiolites according to Schmid et al., 2008). This study addresses the tectonometamorphic evolution of Tisza and Dacia during the Late Jurassic/Cretaceous by means of newly obtained Rb-Sr, Sm-Nd, Ar-Ar and fission track ages together with geothermometric estimates from the eastern part of the Apuseni Mountains. The Tisza unit experienced a polyphase metamorphic evolution (Variscan and Cretaceous) and shows mostly strong retrograde overprinting. Dacia, on the other hand, only underwent lower amphibolite-facies (545°C/7.3 Kbar) metamorphic overprint during the Cretaceous and later retrogression is very moderate. Only the Vidolm Unit, the uppermost nappe within the Dacia nappe stack directly underlying the South Apuseni Ophiolites, recorded a pre-Alpine peak metamorphic event of the uppermost amphibolite-facies (635°C/10.6 Kbar) and therefore yielded older ages. Thus, the Vidolm Unit has to be treated differently from the rest of Dacia, regarding its tectonometamorphic evolution. Garnets from the Iara valley (Tisza unit) yielded an Albian Sm/Nd age (103 Ma), which points towards Mid-Cretaceous peak metamorphism. Ar/Ar ages on muscovite (95-100 Ma) from adjacent samples confirm this observation and are in good agreement with age data from the literature (see Dallmeyer et al., 1999). For the Dacia unit on the other hand, Sm/Nd ages of garnet and Ar/Ar analyses of muscovite (110-117 Ma) yielded lower Cretaceous ages. Additional Rb/Sr analyses of biotite from the Tisza and Dacia units further support the distinct evolution of both units, although a possible minor influence of later normal faulting on the age distribution cannot be fully excluded and needs further evaluation. In contrast, fission track data show only minor differences between these two units (see Kounov and Schmid, 2012) and point to their mutual evolution since the late Upper Cretaceous. The known and exclusively brittle Cenozoic tectonic evolution did not substantially modify the pre-Cenozoic age (and thermal) pattern of the Tisza and Dacia units.

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