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Detrital zircon geochronology and sedimentary provenance of the Lower Danube River

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A highly ranged spectrum of ages was identified by performing U-Pb geochronology on detrital zircons from the Danube River and from several sites located at 200 up to 300 m upstream the confluence with major tributaries, which deliver terrigenous material from the Southern and Eastern Carpathians. Most of the zircons exhibit three major populations ages, which are: i) Cambrian-Ordovician, associated to back-arc basins and island arcs, associated with the Peri-Gondwana subduction (600 – 440 Ma); ii) Lower to Middle Carboniferous, from magmatic and metamorphic Variscan units (350 – 320 Ma), represented by dominant peaks in most analyzed samples; iii) Upper Cretaceous to Tertiary, younger than 100 Ma, possibly related to the Southern Carpathian Late Cretaceous Banatitic arc and to the Neogene volcanism of the Eastern Carpathians and Apuseni Mountains.

For the Lower Danube western investigated samples, such as Cerna, Topolnița and Jiu, our results show as main source the metamorphic rocks characteristic for the Upper and Lower Danubian tectonic units of the Southern Carpathians (ca. 300 Ma). These Danubian units are identified as components of Dacia mega-unit (Roban et al., 2020) and consist of high grate metamorphic rocks (Medaris et al., 2003).

Weak signals of Variscan events (325-340 Ma) were identified by Ducea et al. (2018) and Roban et al. (2020), while in the present study above mentioned samples indicate a regional Variscan metamorphism. The analysis performed on both western samples (Cerna, Topolnița, Jiu and Olt rivers) and easternmost sample from Danube's sediments show a strong Variscan peaks that could corelate principally with the former Ceahlău-Severin oceanic basin (Roban et al., 2020).
Some larger tributaries in the eastern (downstream) Lower Danube, such as Olt, Argeș, Ialomița and Siret rivers show temporal disperse peaks on the DZ geochronology, feature probably reflecting successive processes of recycling. Notably, the most representative sources of DZ identified in the samples from easternmost Lower Danube tributaries (Siret and Prut rivers) are the Varistic metamorphites.

Major sources belonging to Variscan orogen and post-Variscan events are, additionally to those already mentioned, represented by different types of rocks encountered by Danube River and its tributaries in distinctive units:

a) the Danubian units (250-310 Ma) have late Variscan signatures and are litological defined by post-collisional granitoids (Balintoni and Balica, 2016); the Danubian units are crossed by westernmost rivers: Cerna, Topolnița, Jiu;
b) Nord Dobrogea units are considered post-Variscan intrusions aged 245-255 Ma (Krezsek et al., 2017) and outcrop South of Danube Delta;
c) Several areas involving Variscan relics along the Moessian platform (Roban et al., 2020) or Cimmerian nappe structures (Seghedi et al., 2004).

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