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Detrital zircon geochronology and sedimentary provenance of the Lower Danube River

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The Danube River with a length of 2,800 km is the second longest European river after the Volga. As the Danube River crosses multiple sedimentary basins (Vienna, Pannonian, Dacian) its drainage basin covers a variety of geological units of the Alps, Carpathians, Dinarides and Balkans; hence, its tributaries contain a large sedimentary diversity. Detrital zircon (DZ) studies are appropriate for understanding the pattern of orogenic erosion, sediment routing and mixing of different signals during the transport and preservation of the river sediments. This work presents U-Pb geochronology data obtained from modern sediments of seven tributaries in the Lower Danube: Cerna, Topolnița, Jiu, Olt, Argeș, Ialomița and Siret. Additionally, 1 sample was collected from the Danube Delta front.

The studied samples exhibit several main peaks, which are from oldest to newest: (i) Cambro-Ordovician, linked to the backarc basins and island arcs of Peri-Gondwana subduction (600 – 440 Ma); (ii) Lower to Middle Carboniferous from Variscan magmatic and metamorphic rocks (350 – 320 Ma), showing significant values in most analysed samples; (iii) Alpine, younger than 100 Ma, most probably related to the Southern Carpathian Late Cretaceous Banatitic arc and to the Neogene volcanism of the Eastern Carpathians and Apuseni Mountains. The obtained ages on the DZ geochronology show downstream mixing, similarly to recent published data focused on the sediment provenance studies (Balintoni et al., 2014; Ducea et al., 2018).

For the Lower Danube western investigated samples, 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). Some larger tributaries in the eastern (downstream) Lower Danube 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 are the Variscan metamorphites.

The results suggest that the sediments of the western studied tributaries, characterized by small drainage basin, are mainly composed by igneous and metamorphic rocks. The eastern tributaries with larger drainage basins and therefore a much-varied type of rocks show a more complex DZ distribution; probably, only a small amount of DZ grains indicates the “primary” source rock. The

sample from the Danube Delta Front yielded a wide DZ distribution, mirroring the huge amount of sedimentary material from various sources belonging to all basins crossed by the Danube.

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