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Unravelling sediment pathways and volcanic spikes in the East Carpathians: a fission track thermochronology provenance study

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Single grain age dating of detrital sediments is a well established technique to obtain constraints on thermal history and sediment provenance of source areas. The reconstruction of major changes in the source area, due to past and ongoing tectonic activity, is of paramount importance since these changes control transport and deposition in the adjacent sinks.
Since the late Neogene an unusual exhumation history has been seen in most of European orogens. Most of the current research has inferred the coupling between tectonics, climate and surface processes as responsible for topographic changes. In the same time, the Neogene volcanic activity in the Carpatho-Pannonian, with a west-to-east age progression, has major implications in basins connectivity within the source to sink Danube system.
In the SE Carpathians, in an environment setting that is marked by tectonic, climatic and volcanic overprint, we apply the robust detrital zircon fission track method to constrain the sediment pathways and temporal resolution of the source area and adjacent basins.
The river system draining the SE Carpathians shows a grain age distribution similar to that in the source areas. Zircon fission-track provenance ages from the foreland basin correlates to specific tectonic events in the orogen. All our zircon fission-track samples have non-reset age peaks and suggest uplifting and eroding of the more internal nappes. An eastward decreasing pattern of individual peaks has been seen, with age clusters of about 60 Ma, 100 Ma and also well defined older ones.
Strong volcanic age peaks have been found for the latest Miocene samples, where the youngest age components are almost identical to the stratigraphic age of sediments. Moreover, analyzed grains clearly show inclusions, euhedral morphometry and zonations. They are likely derived from the Neogene volcanism situated in eastern margin of Transylvanian basin, and dated by K-Ar method as young as Quaternary up to 10.5 Ma.
In this study we provide significant constraints on the timing of basin connectivity within the Paratethys domains that had bordered the East Carpathians Mountains. Moreover, our well defined zircon fission track age clusters are of importance for better understanding of the dynamic source to sink Danube system that controls most of the current topography of central Europe.