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Exhumation mechanisms of SE Carpathians assessed by detrital zircon fission-track thermochronology

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Radiometric dating of detrital minerals has been more and more used in the recent years to better understand the long-term evolution of mountain belts and their topography. Low temperature geochronology studies of European orogens such as Swiss and Western Alps, Apennines or Betics show an unusual exhumation history since the late Neogene. Most of the current research has inferred the coupling between tectonics, climate and surface processes as responsible for topographic changes.
In the south-eastern part of Romanian Carpathians recent thermochronological studies revealed that up to 5 km of sediments were exhumed during the two post-collisional exhumation stages: first around 5 Ma and a second phase during Quaternary times.
We aim to unravel the mechanism(s) and improve the temporal resolution controlling the exhumation by applying detrital zircon fission-track thermochronology (DZFT) to key stratigraphic layers of the foreland basin, archive of the long-term orogenic exhumation.
A large data-set of DZFT ages have been obtained for samples along three river profiles perpendicular to the strike of the East Carpathian orogen. The full grain age spectrum have well defined components around 70, 100 and >134 Ma which correlates with Laramian and Austrian (in Romanian nomenclature) tectonic phases. All the youngest components (P1) of each sample are non-reset and preserve the source provenance as well as the recent exhumation history. We suggest a climatic control on the exhumation and erosion of the SE Carpathians since late Neogene time, with significant peak accelerations that are correlated in space and time with the Messinian Salinity Crisis event ($\sim$5 Ma) and with the Quaternary stages of enhanced exhumation.
However, a striking feature is the presence of few thermochronological age components situated in the very close temporal proximity to the stratigraphic age which 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. This has significant inferences for constraining the timing of basin connectivity within the Paratethys domains that have bordered the East Carpathians Mountains.