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# Detrital mica 40Ar/39Ar dating approach for provenance and exhumation of the Eastern Alps.

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The use of thermochronological techniques on detrital minerals, such as (U-Th)/He on apatite and zircon, zircon fission-tracks and Ar-dating on mica and microcline, can be used to constrain the lateral variation of the exhumation rate and the sediment provenance of large sectors of an actively deforming mountain belt. Analysis of modern river sands yields an inventory of ages of rocks currently cropping out and eroding in the hinterland of a river drainage basin. So far, only few studies have focused on testing the consistency of the detrital mineral age distributions and the surface bed-rock thermochronology.

We present here new detrital 40Ar/39Ar biotite and muscovite age distributions for nineteen modern river sands from rivers draining the Eastern Alps north of the Periadriatic line. The ages, interpreted to reflect cooling of the source rock under the closure temperature of muscovite and biotite respectively, were compared with the in-situ ages for the bedrock in the hinterland from literature. The results were generally comparable with the bedrocks ages for both the target minerals and represent three main clusters of ages that record the main exhumation pulses in this sector of the Alps.

We have applied two numerical methods to the cooling ages to a) quantify the rates of exhumation of the Tauern Window during Paleocene-Miocene period of the Alpine orogeny, b) linearly compute the spatial variability of the present-day exhumation rates of a set of 4 detrital mineral sample drainage basins along the Inn river stream. Our results suggest a 0.17-0.52 mm/yr range in exhumation rates for the Tauern Window since the Miocene. The results from modelling constrained the downstream evolution of the detrital signal in the Inn river and realistically predicts higher erosion rates in the downstream basin where young cooling ages from the Penninic units of the Tauern are drained into the system, forming a characteristic peak.

Our data define more inclusive trends in regional mica cooling ages in the source rocks and can be used to assess sediment provenance and drainage basin averaged bedrock exhumation in different sectors of the Eastern Alps.