An Oligocene to Miocene cooling pulse in the easternmost Alps detected by thermochronology – a result of thrust tectonics and/or deep mantle processes?

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Thermochronology has seen widespread application in the Eastern Alps. Tracking upper crustal cooling has focused mainly on the Tauern Window, the core of the collisional orogen, where exhumation has been most prominent. Further to the east, mostly fission track work is concentrated along fault zones and thermochronometers with lower closure temperatures, such as apatite (U-Th)/He dating, have hardly been applied to higher elements of the nappe pile. Due to the scarcity of the dataset and preferential application of fission track dating uppermost crustal cooling below ca. 80 °C remains undetected. In this contribution, we present new low-T thermochronological ages from the easternmost Eastern Alps from the vicinity of the Vienna basin. We carried out apatite (U-Th)/He dating on clastic units, i.e. Gosau Group, Rhenodanubian Flysch and Lunz Formation sandstone. Additional apatite fission track analysis was performed on a smaller subset of these samples. A compilation of existing as well as new vitrinite reflectance data was used for estimating burial paleotemperatures. These served as criteria for sample selection, as sites with temperatures sufficient to reset at least the apatite (U-Th)/He system (> ca. 80 °C) and potentially the apatite fission track system (> ca. 110 °C) were preferentially targeted. We find reset AHe and subordinately reset AFT ages, that monitor a so far un(der)appreciated phase of prominent cooling between ca. 18 to 25 Ma. For flysch sandstones from the Wienerwald both thermochronometers yield similar ages, implying an exhumation phase, which removed 4–6 km of overburden. Similar results were found for Lunz sandstone samples from the area around Lilienfeld. Apatite (U-Th)/He ages from Gosau sandstones along the western border of the Vienna basin were mostly reset with single grain ages clustering around 20 Ma. Our new results are difficult to reconcile with geodynamic models that imply tectonic quiescence during largescale subsidence and widespread deposition of Augenstein clastics. Interestingly, the sedimentary archive of the eastern part of the Molasse basin records a change in the sedimentation pattern and onset of rapid basin infill at ca. 19 Ma, too. We discuss our findings in the light of postcollisional thrust wedge evolution and potential impact of margin architecture and the Bohemian spur. Slab detachment beneath the Eastern Alps has recently been proposed based on results from the AlpArray initiative. We suggest that the newly detected cooling pulse may constitute the surficial expression of this slab break-off.