Geophysical Research Abstracts
Vol. 20, EGU2018-10764-1, 2018
EGU General Assembly 2018

Exhumation and Uplift History of the Central Apennines, Italy: New Constraints from Thermochronology and Stable Isotopes

Malwina San-José (1), Jeremy Caves Rugenstein (2), Giuditta Maria Fellin (2), and Claudio Faccenna (1)
(1) Roma Tre, Roma, Italy (malwina.sanjose@uniroma3.it), (2) ETHZ, Zurich, Switzerland

The topography of mountain belts results from interactions between surface processes, lithospheric thickening, and mantle dynamics. However, what determines the contributions of each mechanism has yet to be quantified. The Apennines (Italy) provide a study area where all of these processes are at play. The central part of the Apennines is an orogenic wedge formed by the westward subducting Adriatic microplate during Miocene-Pliocene, and overlies an area of local slab detachment. Recent studies indicate anomalously high uplift rates in this area (Faccenna et al., 2015), as well as a simultaneous onset of post-orogenic extension at $\sim$2 Ma (Cosentino et al., 2017). These observations have been interpreted as an expression of dynamic topography due to the slab break-off and inherent mantle upwelling.

Here, we aim to test this hypothesis by reconstructing the uplift history of the orogen. We expect crustal thickening due to faulting in the accretionary wedge to show diachronous exhumation from SW to NE. On the contrary, a rapid, large scale wave of uplift would instead reflect a mantle-driven event. To test these competing hypotheses, we use low-temperature thermochronology to date the exhumation, and stable isotopes ($^{18}O/^{16}O$ on carbonates) to reconstruct paleoelevations. We present a set of 21 new (U-Th)/He cooling ages on apatites sampled from widespread syn-orogenic flysch basin deposits, including one high-resolution vertical profile. We also present 145 oxygen isotope measurements, mainly from lacustrine sediments covering modern to Pliocene depositional ages.

Mean apatite He ages range from 1.62 ($\pm$ 0.38) Ma to 6.5 ($\pm$0.02) Ma, excluding samples that were not reset due to insufficient burial depth, and their spatial distribution suggests an early uplift of the Thyrennean coast around 6.5 Ma. A different uplift event at 2-3 Ma affecting both the centre and east of our area, shows extremely high exhumation rates (>1 mm/year), and may be related to the opening of the Adriatic slab window. Isotopic compositions of surface water show increasingly low $\delta^{18}O$ over the last 3 Ma. We assume this decrease is due mainly to orographic rain-out fractionation, thus reflecting increasing topography since Pliocene, matching with the suggested timing of slab break-off. Pending analyses are expected to allow us to better quantify climatic and diagenetic processes involved.