

EGU22-2342, updated on 10 Aug 2022

<https://doi.org/10.5194/egusphere-egu22-2342>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Reexamining the temporal and spatial patterns of exhumation and erosion in the Northern Apennines: new insights from low-temperature thermochronometers

Erica Erlanger¹, Maria Giuditta Fellin², and Sean Willett²

¹GFZ Potsdam, Potsdam, Germany

²ETH Zürich, Zürich, Switzerland

We present published bedrock apatite fission track (AFT) and apatite (U-Th)/He (AHe) ages from the Northern Apennines to provide new insights into the spatial and temporal pattern of erosion across the mountain range. The spatial pattern of time-averaged erosion rates derived from AFT ages illustrates similar erosion rates on the Ligurian and Adriatic sides of the range. However, erosion rates derived from AHe ages are higher on the Adriatic side of the range, relative to the Ligurian side. The temporal pattern of time-averaged erosion rates illustrates an overall decrease in erosion through time on the Ligurian side, but suggests an increase in erosion through time on the Adriatic side. These results are corroborated by an analysis of paired AFT and AHe thermochronometer samples, which illustrate that erosion rates have generally increased through time on the Adriatic side, but have decreased through time on the Ligurian side. We infer that such regional scale-differences must be controlled by first-order features of the Northern Apennines, so we present an updated kinematic model to understand what could control these differences. Using imposed erosion rates on the Ligurian side that are a factor of two slower relative to the Adriatic side, we demonstrate that cooling ages and maximum burial depths are able to replicate the pattern of measured cooling ages across the orogen and estimates of burial depth from vitrinite reflectance data. These results suggest that horizontal motion is an important component of the overall rock motion in the wedge, and that the asymmetry of the orogen has existed for at least several million years.