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Session 6: Thermochronologic applications to large-scale plate tectonic processes, magmatism and

Thermochronological comparison between evolution of hinterland near field and far field of Zagros convergence margin

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To assess the tectonic response of near-field and far-field deformation in the upper plate of a subduction/collision system, we present here a thermochronological study on the subduction related-arc Sanandaj-Sirjan Zone (SSZ) and North Central East Iranian Microcontinent (CEIM), respectively as near-field and far-field of the upper plate of Neo-Tethys subduction margin.
Samples have been collected from late Middle Jurassic Kolah-Ghazi granitoid (KGg) (ca. 165-170 Ma) in central SSZ, from Upper Cretaceous Kasf granite (ca. 85-100 Ma) and Paleocene-Eocene Kashmar-Azghand Intrusive Complex (KAIC) (ca. 60-41 Ma) from North Doruneh fault which represents the northern mechanical boundary of CIEM.
Time-temperature (T-t) inverse modeling on the ZFT, AFT and AHe data has been performed through HeFTY V1.9 program to constrain the thermal/tectonics history of the SSZ and CEIM. Based on the geological field evidence, some independent T-t constraints such as crystallization ages, stratigraphic unconformities, present-day temperature, have been adopted.
The T-t inverse modeling of KGg shows: (i) an early episode of cooling in early Lower Cretaceous, during which the intrusive body has been exhumed to the surface (ii) a burial phase during which the KGg as a whole entered the PAZ in consequence of deposition of the Cretaceous successions, and (iii) a last stage corresponding to final exhumation-related cooling started since the Late Cretaceous-Paleocene boundary. The thermal modeling results of Kasf granite shows (i) an early episode of cooling at Upper Cretaceous-Paleocene during which the intrusive bodies and the hosting units have been exhumed to the surface, (ii) second stage corresponding to a burial phase when the Kasf granite as a whole entered the PAZ in consequence of the deposition of the Paleocene-Eocene succession, and (iii) a last stage corresponding to the final exhumation-related cooling, starting since the middle-late Eocene. The thermal modeling results of KAIC shows (i) an episode of enhanced cooling of KAIC at Eocene-Oligocene boundary, (ii) Second stage is characterized by burial phase to temperatures above the PAZ during the Oligocene, (iii) third stage corresponds to exhumation-related cooling during the early Miocene, and (iv) fourth stage corresponds to a renewed episode of enhanced cooling starting at the Miocene-Pliocene transition, during which the KAIC was finally exposed to the surface.
These results document that both hinterland near-field and far-field regions respond contemporaneously to the Neotethyan subduction-related exhumation at the Upper Cretaceous-Paleocene boundary. T-t modeling output for Kasf and KAIC also shows Middle-Late Eocene exhumation-related cooling related to the Middle-Late Eocene Zagros collision- related exhumation. T-t modeling output for KAIC also shows Early Miocene and Late Miocene-Pliocene exhumation-related cooling related to the Early Miocene and Late Miocene-Pliocene Zagros collision-related exhumation, respectively. As a general conclusion, our results demonstrate that entire upper plate of the subduction/collision system responds as a structural entity to the mechanical change along the plate margin.