Geophysical Research Abstracts
Vol. 14, EGU2012-10386, 2012
EGU General Assembly 2012

Uprising of the Iranien plateau: Inferences from (U-Th)/He and AFT thermochronology

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We herein present Apatite (U-Th)/He and fission track (FT) thermochronology results to reconstruct the Cenozoic tectonic evolution of the Iranien plateau and quantify the age and amount of vertical movements. The Iranian plateau, located at the rear of the Zagros mountains, is a high region with smooth, average elevation of c. 1.5 km. Its formation results from the collision between the Arabian and Eurasian lithospheres since ∼30 Myrs, following a long-standing subduction (Agard et al., 2011), and represents an interesting analogue to the so far better documented Tibetan plateau. A number of recent studies suggested the implication of a recent (10-5 Ma) slab break-off below Central Iran to explain the formation of the Iranian plateau.
Single [U+2010] grain cooling age data were collected from the different plutonic rocks from the Sanandaj-Sirjan Zone, the Urumieh-Doktar magmatic arc and Central Iran, for which crystallization ages were already available (Chiu et al., 2010). Four families of cooling/denudation ages have been obtained from these plutonic samples, which tentatively relate to the major geodynamic events of the Zagros orogeny as follows:
(1) A lower Eocene (∼50 Ma) cooling age from the Sanandaj Sirjan zone, corresponding to the early Zagros formation during the main phase of subduction of the Arabian plate beneath the central Iranian Plate.
(2) An Oligocene-Eocene age (30-40 Ma), for samples from Central Iran alone; this period indeed witnesses extensional tectonics in central and east central Iran, marked by distributed extension and the formation of Eocene metamorphic core complexes, possibly driven by an episode of slab retreat.
(3) A pulse in exhumation at 20-22 Ma, which closely follows the onset of collision, is obtained for several samples.
(4) A range of significantly younger cooling ages (5-10 Ma) is obtained from the Urumieh-Doktar Arc. This cooling age is coeval with the amplification of collisional movements in the upper plate (since ∼7-5 Ma; e.g., Ballato et al., 2010) and could correspond to the hypothesized, recent slab breakoff and/or mantle delamination under Central Iran.

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