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Constraints on the Timing of Surface Uplift of the Iranian Plateau (Arabia-Eurasian Collision Zone) from Clumped Isotope Thermometry on Pedogenic Carbonates

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Orogenic plateaus are extensive, elevated, arid, generally internally drained, morphotectonic provinces of low internal topographic relief that represent a striking and enigmatic feature of Earth's continental landscapes. They are located along convergent plate boundaries and have a profound impact on regional and global climate, erosional processes, local- to far-field deformation mechanisms and the long-term distribution of biomes and biodiversity. Although the paramount role of large orogenic plateaus in shaping our planet is widely appreciated, the question of why, where, and how some orogenic systems develop large plateaus remains a first-order problem in our understanding of lithospheric evolution and orogenic processes.

Here, we present a clumped isotope paleoaltimetry study to document the elevation history of the Iranian Plateau, with the goal of understanding the rates and mechanisms of orogenic plateau rise. This plateau is in the Arabia-Eurasia collision zone, has a mean elevation of ~ 1.8 km, steep margins with mountain peaks higher than 4 km, and experienced surface uplift sometime after the middle Miocene as documented by the occurrence of ca. 17-My-old marine deposits in the plateau interior.

Preliminary results from Early Miocene to Quaternary pedogenic carbonates on the plateau interior and the adjacent, less elevated, intermontane Tarom basin suggest that surface uplift must have occurred sometime between 12-11 and 8 Ma. The lack of significant crustal shortening and thickening during this time interval and the occurrence of a renewed phase of adakitic volcanism by ca. 11 Ma suggests that surface uplift may have been driven by deep-seated processes associated with asthenospheric flow.