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Pleistocene aridification of the Eastern Taurides, Turkey revealed by (U-Th)/He ages of supergene mineralisation in Attepe iron deposits

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Key Points:

- Supergene Fe-oxide-oxyhydroxide from the Eastern Taurides mountains reveal (U-Th)/He ages between 1 and 5 Ma.
- Implied rock uplift rates (6 and 12 m/Ma) are low suggesting that the region was at or near the current elevation by 5 Ma.
- Aridification occurred in the last million years likely driven by regional climate cooling rather than tectonic uplift.

The Taurus Mountains form the southern margin of the Central Anatolian Plateau of Turkey and form an orographic barrier separating the cold, semi-arid interior to the north from the mild Mediterranean coast to the south. When and how they formed, and the extent which they have influenced the regional climate remains poorly constrained. The Attepe iron deposits sit on the northern part of the Eastern Taurus mountains at altitude of 1.5-2 km and consequently are ideally located to record interactions between climate and tectonics. (U-Th)/He ages of iron-oxide-oxyhydroxides from four mines within the Attepe iron deposits record ages of 1-5 Ma consistent with the persistence of hot humid climate conditions throughout the Pliocene and Pleistocene. In mines where samples are measured from different depths the age data are consistent with water table lowering rate of between 12.3 to 6.4 m/Myr. Translating these to rock uplift rates they are close to uplift/incision recorded within the Central Anatolian Plateau over the past 2 Ma, suggesting that the region was already at or close to its current elevation by the late Miocene. The latest goethite precipitation constrains the cessation of hot-humid climate to sometime in the last million years and implies that regional climate cooling, rather than surface uplift, was the main driver of aridification.