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Rain shadow development and paleoenvironmental change in the southern Central Anatolian Plateau

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Ongoing Arabia-Eurasia convergence in the eastern Mediterranean region has led to the westward escape of the Anatolian microplate and the formation of the Central Anatolian Plateau (CAP). The US-NSF CD-CAT (Continental Dynamics-Central Anatolian Tectonics) project aims at understanding the surface-to-mantle coupling during the transition from collision to escape tectonics and plateau formation in Anatolia. Within the CD-CAT project, this study aims at determining the paleoenvironmental conditions and the age of plateau (margin) uplift by integrating stable isotope geochemistry and absolute dating techniques (^{40}Ar/^{39}Ar geochronology and magnetostratigraphy) on middle Miocene to Pliocene lacustrine sedimentary rocks.

The low-relief CAP ($\sim$1.5 km average elevation) is characterized by high-relief mountain ranges at its southern and northern margins. The Tauride mountain belt forms the southern plateau margin of the CAP with a relief of up to 3 km. Uplift of Tortonian marine sediments in the central Taurides to modern elevations of up to 2 km constrain the onset of surface uplift of the southern plateau margin to $\sim$8 Ma (Schildgen et al. 2012a,b).

Proxy records of oxygen isotopes (δ^{18}O) in precipitation allow to reconstruct the development of the present-day Tauride rain shadow and hence the surface elevation history of the southern plateau margin. Here we evaluate δ^{18}O and δ^{13}C records of seven lacustrine basins situated along a SW-NE swath in the lee of the modern Tauride mountains in order to track the development of a Tauride rain shadow and changes in open to closed lake conditions through the late Miocene to Pliocene. We focus on lacustrine sections with available mammal ages and integrate these with ^{40}Ar/^{39}Ar geochronology of widespread volcanics of the Central Anatolian Volcanic Province and magnetostratigraphy where possible. Our results from seven sections of $\sim$12-4 Ma in lacustrine deposits and pedogenic soil carbonates of $\sim$3-2.5 Ma show a decrease of δ^{18}O values between $\sim$12 and $\sim$6 Ma of ca. 3‰ followed by a period of remarkably stable δ^{18}O values around 21.5‰ until about 2.5 Ma. The latter coincides with modern δ^{18}O values of the least-evaporative rinds of modern pedogenic carbonate. The observed 3‰ decrease in δ^{18}O of lacustrine carbonate accounts for about 50 % of the present-day effect of orographic rainout on δ^{18}O of precipitation (Schemmel et al. 2013) along the southern plateau margin. This might indicate the presence of a $\sim$1000m high plateau prior to the formation of the Tauride chain.

Schildgen et al., EPSL 317-118, 2012a; Schildgen et al., Tectonics 31, 2012b; Schemmel et al., AJS 313, 2013