Tracking Anatolian Lithosphere Evolution with 'Tectonochemistry'

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The transition from subduction to collision creates complex and evolving regions of heat and mass transfer in continental lithosphere. In the case of Anatolia in the Cenozoic, collision with Arabia resulted in a transition from distributed to highly localized deformation in the ~20 million yrs following collision. This transition was accompanied by magmatism that tapped different mantle sources regions, and localized exhumation of mid- to deep crustal rocks, particularly in zones of extension/transtension. Plate boundary processes and subducted-slab dynamics drove uplift and associated landscape reorganization, driving feedbacks between tectonics, climate, and surface processes owing to uplift of an orogenic plateau and growth of mountain ranges (orographic barriers) at plateau margins. The magnitude and pattern of vertical and lateral displacement of orogenic crust, sedimentary basins, and surficial deposits through time has been investigated with a regional campaign of thermochronology: $^{40}Ar/^{39}Ar$ (hbl, bt, ms, fsp in metamorphic, plutonic, and volcanic rocks), fission track and U-Th/He (apatite, zircon in metamorphic/plutonic rocks and detrital material), and cosmogenic dating. Ages for sedimentary deposits have also been determined using magnetostratigraphy, coupled with stable isotope (O, C) analyses to track changes in paleoenvironment related to growth of the orographic barrier interpreted to have formed as a result of slab-breakoff below Anatolia. The integration of results from geochemical/geochronological techniques from metamorphic, magmatic, and sedimentary rocks/deposits across a wide swath of central Anatolia – as well as data from seismology and MT – allows reconstruction of the evolution of the lithosphere from mantle to surface from ~30 Ma to the present.