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Surface uplift due to thermo-rheological changes in the crust: The case of the southern margin of the Central Anatolian Plateau (S Turkey)

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Late Miocene uplift of the southern margin of the Central Anatolian orogenic plateau (SCAP) can be explained with our proposed surface uplift mechanism. This new model is based on the dynamic interactions between the growth of the Anatolian accretionary subduction margin and thermo-rheological changes at the base of its crust. Our thermo-rheological uplift mechanism fits newly obtained structural data, as well as compiled geological and geophysical data along a 550km-long arc-perpendicular transect. This transect runs between the Cyprian Arc trench and central Turkey through the area of the Anatolian upper-plate with larger uplift, i.e. central south Turkey. Observed deformation patterns and associated vertical motions along this transect indicate distributed shortening in relation to the subduction of the Cyprus slab, which still underlies this area. In the middle sectors of the transect a pre-Miocene basement gently dipping southward underwent regional subsidence since Early Miocene times. After $\sim$8 Ma, surface uplift took place in the area of the future SCAP, as recorded by disruption of marine deposition and the onset of erosion, whereas subsidence persisted to the south of it, in the Cilicia Basin. Overall N-S shortening during this period developed regional contractional structures along the margin: the S-verging Kyrenia thrust system in N Cyprus, the S-dipping thrusts in the center of the Cilicia Basin, and the large-wavelength S-dipping monocline in S Turkey. We tested our proposed mechanism with 2D thermo-mechanically coupled finite elements models. The models demonstrate that sediment accretion and deposition in the central Cyprus accretionary forearc basin system led to crustal thickening of the Anatolian upper-plate, which in turn forced a sedimentary "blanketing" effect. This sedimentary "blanketing" effect controlled the temperature gradient in the crust, with decreased temperatures within the blanket and increased underneath it. Higher temperatures drove thermal weakening and activated viscous deformation at the base of the crust, which subsequently propelled the surface uplift that created the modern Central Taurus. Our simulations not only clarify the formation of the Central Taurus forearc-high but also reproduce the modern sedimentary thicknesses and geometries along the margin. Our alternative thermo-rheological uplift mechanism solves discrepancies between geologic evidences, and models based on isostatic causes.