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Vertical Anatolian Movements Project (VAMP): a collaborative research project of the TopoEurope initiative of ESF

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With elevations of several kilometers, low local relief and pronounced relief contrasts with surrounding regions, orogenic plateaus are first-order tectonic and topographic features of several Cenozoic mountain belts. The morphologic characteristics of plateaus may result from efficient tectonic uplift of mountain ranges that successively incorporate foreland domains into intermontane sedimentary environments. This process may ultimately lead to leeward aridification and a reduction of erosional power and inability of the fluvial network to keep pace with uplift. The combination of tectonic uplift and the decreasing ability of the fluvial system to keep pace with the tectonic processes causes a transition from externally to internally drained basins that eventually become overfilled and coalesce, causing low local relief at high elevations in the orogen interior.

Although many studies are being carried out on the Tibetan and Puna-Altiplano plateaus, very little attention has been devoted to the development of the smaller Central Anatolia Plateau (CAP). With its low local relief located at high elevations and with an arid interior compared to deeply incised, humid flanks, the CAP fulfills all characteristics of orogenic plateaus. Therefore, in order to understand the mechanisms controlling the topographic development of this region and to quantify the competing tectonic, geomorphic and climatic processes, we have developed a multidisciplinary project (VAMP) under the umbrella of the TopoEurope initiative of ESF. Our project integrates 11 research institutions from 7 countries.

We study a ∼400-km-wide strip from the Black Sea to the Mediterranean that includes CAP and its flanks, the offshore basins and Cyprus. The semi-arid CAP interior has a subdued topography at elevations of ∼1500m. The plateau interior comprises internally drained sedimentary basins that have helped reduce the refielf contrasts between individual ranges and intervening depressions. Infilling by Miocene to Quaternary continental sediments has created low local relief, where large shallow lakes occur. However, several basins have been captured by headward erosion and major rivers (Göksu River in the S and Kızılırmak River in the N) now expose basin-fill sediments and drain large areas of the CAP and form deeply incised gorges along the northern and southern margins, respectively. Miocene marine sediments, locally up to 2 km thick and deposited in a basin stretching, at least, from Antalya to Adana unconformably overlie rocks of the Taurus orogen in S Turkey. Northward, these units grade into a partly preserved erosional surface. To the south, correlative Miocene marine sediments are found in the Cilicia offshore basin and in the N Cyprus thrust-belt. These sediments provide a topographic datum for the beginning of plateau development. In addition these units provide information on the behavior of the Anatolian crust during subsidence. The end of marine sedimentation (∼Tortonian) provides a maximum age for the onset of CAP uplift. Thereafter, uplift was coeval with, and tectonically linked to subsidence in the offshore basins. Interestingly, other important events occurred at this time as well. This includes the Messinian salinity crisis and the onset of fragmentation of the Tethyan slab.

In our study, an interdisciplinary approach with a wide range of temporal and spatial scales of is adopted to (1) better constrain the kinematics of plateau (de)formation; (2) the timing of associated climatic changes; (3) to quantify patterns of sediment routing and deposition; and to (4) reconstruct the (deep) geometry of Anatolia and surrounding sedimentary basins. We furthermore assess the importance of crustal shortening, magmatic underplating and possible lithospheric segmentation and delamination with respect to plateau uplift and analyze the nature

of the interactions between tectonic forcing and changing climate. We will perform structural, geomorphological and sedimentological studies and will apply low-T geochronology, cosmogenic exposure dating of geomorphic surfaces, and stable isotope studies on paleosols. These studies are accompanied by numerical modeling and an analysis of geophysical data from the Black Sea and Mediterranean offshore basins in order to assess the deep structure and dynamics of the East Mediterranean.