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Miocene tectonic motions in the Central Anatolia Plateau interior: a seismo-structural study in the Tuz Gölü Basin

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The Miocene Central Anatolian Orogenic Plateau (CAP) is a semi-arid nearly-flat elevated terrain flanked by the Pontides and the Taurides. This outstanding tectonic and topographic feature, part of the Alpine-Himalayan orogenic belt, is seen as a small orogenic plateau when compared with larger and better-studied orogenic plateaux around the world, i.e. Tibet or Puna-Altiplano. The CAP is thus a privileged area to study the kinematics and geodinamics of orogenic plateaux buildup. This, understanding the formation and growth of the CAP, is the main goal of the Vertical Anatolian Movement Project (VAMP), sponsored by ESF. In the central domains of the CAP-interior, located at an average elevation of 1-1.2km-asl, several Neogene basins discordantly lay on top of high-grade metamorphic rocks. Amongst these marine-to-continental basins stands the Tuz Gölü Basin (TGB). This more-than-100km long NW-SE-trending depression, filled with a Neogene sedimentary sequence several kms thick, is presently bounded by faults to the east and west. These two SW-dipping NW−SE-striking normal fault systems, the Tuz Gölü Fault (TGF) in the east and the Sultanhanı Fault Zone (SFZ) in the west, are considered to be basin-forming structures in the available literature for the area. Seven seismic reflection lines, located at the eastern and southern boundaries of the present Tuz Gölü Lake, were conceded by Turkish Petroleum Corporation (TPAO) and interpreted in this contribution. Analysis of these seismic profiles shows that the Miocene TGB was broader than previously documented and neither the TGF nor the SFZ were bounding the depression in Miocene times. However, these fault systems (TGF/SFZ) accommodated as much as 3.5 km of post-Paleogene sediments during regional subsidence that preceded surface uplift during latest Miocene-Pliocene. The seismic lines further show that a shortening event disrupted the Miocene extensional tectonics sometime during Late Miocene, as seen by partial reactivation of the TGF and, more importanly, by a previously unreported thrust rooted in it. A roll-over anticline with a harpoon structure seen in the TGF reveal extensional inversion of contractional structures, indicating that the younger extensional tectonism ongoing in the present-day TGB superseded the previous phase of contraction and erosion. A regional 3D geologic model for the tectonic evolution of the Tuz Gölü Basin (TGB) and surrounding areas during the Miocene is here proposed on the base of the study of sediment geometries and tilted blocks in depth-converted profiles in combination with the analysis of subsidence curves, isopach maps and a restored cross-section.