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Neogene vertical movements in the Mut-Ermenek Basin, south Turkey: New insights from structural studies

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The Neogene Central Anatolia Plateau (CAP), being relatively small compared with homologous features around the globe, as the Andean Altiplano or the Tibet, meets all characteristics of orogenic plateaux, hence represents a great opportunity to study spatiotemporal mechanisms of plateau formation. As such, the CAP is the focus of the Vertical Anatolian Movement Project (VAMP), an ESF-founded project in the frame of TOPO-EUROPE initiative. The CAP has a dry and roughly-flat highland that is flanked by the Taurides and the Pontides mountains, in south and north. The sediment archives of the basins at CAP margins are fundamental in unravelling the vertical movements driving Plateau formation, as they accommodate most of the structures responsible of such movements. In the Taurus Mountains, in the south margin of the CAP, several marine Miocene basins formed during the Early to Mid-Oligocene, subsided since Early Miocene, and uplifted during latest Miocene to Pliocene. The Mut-Ermenek Basin, in the center fragment of the Taurus, is considered to have sedimentary linkage with contiguous basins, like Manavgat Basin in the west and Adana Basin, towards the east, being therefore key to understand the tectonic evolution of the area. The Mut-Ermenek Basin presents a more-than-2km-thick relatively undeformed marine infill, some of which was deposited at infraneritic depths (200-500m), being presently found at altitudes of 2000m at some points, evidencing subsidence-uplift.
In this contribution, using data from previous studies, cross-section data, basin analysis and structural fieldwork techniques, we aim to determine and quantify the character of Miocene to recent vertical movements and deformations underwent by the Mut-Ermenek Basin in relation with the formation of the southern flank of the CAP. In order to gain this goal, a detailed structural study of the post-Eocene succession is made. Cross-section data shows a pre-Cenozoic paleotopography in metamorphic basement, unconformably overlain by relatively undeformed marine Miocene sediments. As tested in the fieldwork, this paleosurface has an irregular distribution. Close to Mut city, there are basement paleohighs of hundreds of meters, against where the Miocene sediment onlaps, and around Erdemli town, where the paleotopography is flat or absent, the Miocene stata is parallel to the contact. This unevenly influenced the available accommodation space and caused diachronical deposition of sediments. However, not all basement relief was pre-Miocene, as it has being accentuated by younger shortening. Within the post-Eocene succession two different tectonic periods can be inferred; subsidence of the whole area during Miocene and post-Messinian uplift. Subsidence analyses of the area reveal basin tilting, with sediment deposition southwestwardly delayed. The stress analysis indicates NW-SE tension phase during subsidence, and subsequent E-W compression. However, normal syntectonic faults found during fieldwork are not enough to accommodate the subsidence underwent by the area and no important reverse or reactivated structure was found to explain the uplift phase. Our data discard upper crustal stretching as main contributor and points to lithospheric-scale processes, such as lithospheric buckling, as responsible for the vertical movements in the area.