Geophysical Research Abstracts
Vol. 18, EGU2016-7604-1, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

Moho depth and crustal thinning in the Marmara Sea region from gravity data inversion

Julia Kende (1), Pierre Henry (1), Gaye Bayrakci (2), Sinan Özeren (3), and Céline Grall (4)

(1) CEREGE, CNRS-Aix Marseille Université, Marseille, France, (2) National Oceanography Centre, University of Southampton, OES, United Kingdom, (3) Jeoloji Bölümü, İstanbul Teknik Üniversitesi, Maden Fakültesi, İstanbul, Turkey, (4) Lamont - Doherty Earth Observatory Columbia University, Marine Geology and Geophysics, New York City, USA

With a width comparable to the brittle crust thickness, the Sea of Marmara strike-slip basin appears as an intermediate case between two much studied end-member cases of basin-width-to-brittle-crust-thickness ratio: the Dead Sea and the Death Valley. But geophysical studies have shown evidences of at least 5 km of mantle uplift under the Marmara Sea, much larger than in the two other cases.
We compiled data from reflection, refraction and tomography seismic studies to correct satellite and survey vessel gravity data (acquired during MARSITE cruise of Ifremer R/V Pourquoi Pas ?) from the effect of topography and sedimentary basins. Assuming that no other crustal mass heterogeneity affects the gravity measurement, we inverted the residual, with constraints from seismic studies, to calculate the topography of the Moho.
The 3D model obtained shows a mantle uplift broadly correlated with the Marmara deep basins, but the crustal thinning spreads southward further than the basin limits, This is explained by ductile flow in the lower crust between a northern zone where the thinning is closely related to the Marmara Fault strike-slip basins and a southern zone where extension appears associated with older crustal detachment systems.
Finally, we estimated the extension budget in the area during the Marmara Sea formation by comparing our 3D crust volume with an initial crust of constant thickness. The increase in surface area, 2100±300 km2, is compatible with present day GPS velocity field measurement assuming steady state and an initiation of extension in the area about 5 Myr ago. We conclude that although the zone went through tectonic reorganizations during the Pliocene as the North Anatolian Fault system propagated westward, the overall extension rate in the area could have been stable, or decreasing with time, and thus should be understood in a broader geodynamic framework comprising the Aegean subduction.