



The nature and location of the plate boundary between the Anatolian and African plates

Ali Değer Özbakır, Rinus Wortel, and Rob Govers

Utrecht University, Faculty of Geosciences, Utrecht, Netherlands (ozbakira@geo.uu.nl)

Overall convergence of the African, Arabian and Eurasian plates, and the westward escape of Anatolia has resulted in an evolving plate boundary zone since the Miocene. In the Eastern Mediterranean, the current location and nature of the plate boundary between the Anatolian and the African plates is difficult to trace due to the scattered crustal earthquakes, and the absence of deeper earthquakes. In this study we aim to better constrain the nature and the location of the plate boundary. GPS-derived velocity field and stresses from earthquake mechanism solutions comprise the datasets which short time scale (elastic) models can be compared to. We model the stresses and deformation on the overriding plate by incorporating convergence of Africa and Arabia towards stable Eurasia, and rollback of the Hellenic trench. Investigation of the plate boundary consists of constraining the directions of motions over the segments which make up the boundary. We assume various types and locations for the plate boundary within the observational limits. We use a spherical plane stress finite element model to test these possibilities.

We find that stresses and displacements are sensitive to both the location and the nature of the plate boundary. We obtain the minimum misfit with the data in a model where we assume the following: (1) the segment between Hellenic and the Cyprus arcs have both down-dip and fault parallel motions, (2) the connection between the Cyprus arc and Arabia–Eurasia collision zone is pure strike-slip. In all our models, an extra pull force on Anatolia is required to explain the high velocities in southwest Anatolia. This force may be related to return flow around the lateral edge of the Aegean slab.