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THE NATURE AND LOCATION OF THE PLATE BOUNDARY BETWEEN THE ANATOLIAN AND AFRICAN PLATES

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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, in particular the transition region from Hellenic arc to Cyprus arc.

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. Our models favor the plate boundary via Pliny/Strabo trench, Anaximander mountains, Eratosthenes seamount, Latakia/Larnaka/Kyrenia ridge. We obtain the minimum misfit with the data in a model where we assume the following: (1) Pliny/Strabo and Anaximander mountains have both down-dip and fault parallel motions, whereas the western edge of Rhodes basin is pure strike slip (2) the connection between the Cyprus arc and Arabia--Eurasia collision zone, Latakia - Larnaka - Kyrenia ridges, is pure strike-slip and (3) collision of the Cyprus arc. We found slip rates of 6 - 16 mm/yr along the Anaximander seamountains, highest rates being near to the western end. In all our models, a southeast directed pull force on the east Hellenic trench is required to explain the velocities in southwest Anatolia. This force may be related to return flow around the lateral edge of the Aegean slab.

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