Geophysical Research Abstracts
Vol. 13, EGU2011-12599, 2011
EGU General Assembly 2011

Kinematic modelling at the triple junction between the Anatolian, Arabian, African plates (NW Syria and in SE Turkey).

Mustapha Meghraoui (1), Ziyadin Cakir (2), Frédéric Masson (1), Yasser Mahmood (1), Semih Ergintav (3), Abdulmutalib Alchalbi (4), Sedat Inan (3), Mohamad Daoud (4), Onder Yonlu (5), and Erhan Altunel (5)

(1) EOST - Institut Physique du Globe, Geodynamics and Active Deformation, Strasbourg, France (m.meghraoui@unistra.fr, +33 (0)368 850 125), (2) Istanbul Technical University, Dept of Geological Sciences, Turkey, (3) Earth & Marine Sciences Institute, Tubitak, Gebze, Turkey, (4) National Earthquake Center, Damascus, Syria, (5) Osmangazi University, Dept of Geology, Eskisehir, Turkey

We model the GPS velocity field around the Maras-Antakya triple junction(where the Anatolian, Arabian, African plates meet) using the elastic block approach in which the lithosphere is considered as finite elastic blocks bounded by faults (McCaffrey, 2002). The model faults are based on active tectonics and paleoseismic studies, andare defined in 3D space by along-strike and down-dip nodes. A bilinear interpolation is used to estimate slip magnitude and coupling values at every patch using the program DEFNODE (McCaffrey, 1995). Repeated GPS surveys between 1991 and 2010 allow us to determine horizontal velocities at 22 network stations and 59 fault crossing profileslocated across the East Anatolian Fault (EAF) andthe Dead Sea Fault System (DSFS) in NW Syria and in SE Turkey. Field observations indicate that toward the southwest at Maras the EAF branches into the SW-NE trending Karatas – Osmaniye Fault segment (KOFS) and the SSW-NNE Karasu Fault (KF) that meets the DSFS around Hatay to the south. The tectonic and geodetic field investigations indicate the existence of the Iskenderun block between the Anatolian and African plates.The best-fit model is determined through minimization of misfit between 32 observed and predicted GPS vectors using a simulated annealing algorithm with a downhill simplex method.We have tested three possible plate configurations in the region: 1)The strike-slip rates deduced for the EAF and DSF are 8.1$\pm$0.2 mm/y and 7.2$\pm$0.2, respectively. While the EAF is predicted to be nearly purely strike-slip, the DSF displays a significant component of opening, i.e. 2.6$\pm$0.2 mm/y, consistent with the geology and morphology of the region.2) The DSF is ignored in this case and the EAF is assumed to continue straight and connect the northern Cyprus arc through Osmaniye-Karatas fault;this model predicts again a nearly pure strike slip faulting, but relatively higher slip rate (i.e. 9.3$\pm$0.3 mm/y) for the EAF, and compression along the OKF. 3) The triple junction between left lateral EAF, DSF and OKF is located near the city of Maras adding the African plate between the Anatolia and Arabia;this final model predicts 8.9$\pm$0.4 mm/y, 5.6$\pm$1.7 and 3.8$\pm$2 mm/y strike slip rates for the EAF, OKF and DSF.The kinematic modeling that combines GPS and tectonic results reveals the predominance of the westward movement of the Anatolian block with the Karasu Valley acting as a large pull-apart basin, and the DSFS acting as a real transform fault.