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Active tectonics and kinematic modeling at the triple junction between the East Anatolian Fault, the Dead Sea Fault and the Cyprus Arc

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We investigate the kinematics and slip rates of active faults at the Maras-Antakya triple junction in southern Turkey (where the Anatolian, Arabian, African plates and Iskenderun microplate meet) using GPS measurements, active tectonics, paleoseismology and block modeling. Repeated GPS surveys between 1991 and 2004 allow us to determine horizontal velocities at 22 stations located across the East Anatolian Fault (EAF), the Dead Sea Fault (DSF) and the Cyprus Arc (CA). 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 DSF and the CA around Hatay to the south. The tectonic and geodetic field investigations indicate the existence of the Iskenderun block between the Anatolian and African plates. By using a simple kinematic model, we estimate that the relative left-lateral plate motion is 8.9$\pm$0.4 mm/yr across the EAF, 5.6$\pm$1.7 mm/yr across KOFS and 3.8$\pm$2 mm/yr across the Karasu fault. We also determine 1.8$\pm$1.1 mm/yr for the Karasu normal-component. However, modeling suggest that additional GPS benchmarks are required and in consequence we have recently installed 25 new GPS points (4 permanent and 21 campaign) at the triple junction. Geomorphological and paleoseismic studies yield left-lateral slip rates of 10.8$\pm$1 mm/yr and 6.0$\pm$0.3 mm/yr, respectively for the EAF and DSF, comparable with those obtained from GPS and deduced from block modeling. 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. Furthermore, we observe that the DSF transforms the Cyprus arc subduction into transpressive tectonics on the East Anatolian fault.