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Geodetic evidence for tectonic activity on the Strymon Fault System (NE Greece)

Vasiliki Mouslopoulou (1), Michail Gianniou (2), Vasso Saltogianni (3), and Stathis Stiros (3)

(1) GFZ German Research Centre for Geosciences, Telegrafenberg, D-14473 Potsdam, Section 3.1, Germany (vasso@gfz-potsdam.de), (2) National Cadastre and Mapping Agency SA, Athens, Greece, (3) Department of Civil Engineering, University of Patras, Greece

Geological, seismological and geodetic data have provided so far limited evidence of crustal deformation in north-east Greece (Thrace and East Macedonia); hence, the active tectonics of this area remains largely unknown. Here, we use monthly GPS solutions from 21 permanent stations of the Hellenic GPS Network (HEPOS) to shed light in the kinematics of NE Greece. Analysis of our dataset, that collectively spans a period of five years, shows that displacement vectors that derive from either side of the natural depression of the Strymon (Struma) Valley differ significantly in orientation and magnitude. The latter testify to a clear left-lateral displacement along the Strymon Fault System (SFS) with a mean fault displacement rate of $\sim$3.7 mm/yr, while the area west of it behaves like a quasi-rigid tectonic block. The polarity of shear along the SFS appears to have changed, from right-lateral to left-lateral, during the last $\sim$5 Ma, a period that coincides with the onset of faulting along the prolongation of the fast-moving (>20 mm/yr) North Anatolian Fault into the north Aegean. Thus, left-lateral slip along the SFS may occur in conjunction with, and in response to, right-lateral oblique slip along the North Aegean Trough, indicating that faulting in north Aegean is intimately linked in space and time. If the interseismic strain stored currently across the SFS ($\sim$3.7 mm/yr) is released seismically through large magnitude earthquakes, it may have serious implications in the seismic hazard of this densely populated region, which also accommodates important civil infrastructure.