How Has GPS Velocity Field Changed Along the 1999 Izmit Rupture 20 Years After the 1999 Izmit, Turkey Earthquake?

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A seismic gap along the western segment of the North Anatolian Fault, in the Marmara-Izmit region, was identified before the 1999 M7.6, Izmit and M7.4 Duzce earthquakes, so the region along the coseismic fault has been monitored with geodetic techniques for decades, providing well defined pre-, co- and post-seismic deformations. Here, we report new continuous and survey GPS measurements with near-fault (~2 – 10 km to the fault) and far-fault (~50 – 70 km from the fault) stations, including 7 years (2013 – 2019) of continuous observations, and 5 near-fault campaigns (every six months between 2014 – 2016) to further investigate postseismic deformation. GPS observations were processed with the GAMIT/GLOBK (v10.7) GNSS software. We used these observations to estimate the spatial distribution of current aseismic after-slip, along the 1999 Izmit rupture. We also searched for spatiotemporal changes of shallow creep events along the surface trace. With elastic models and GPS observations, we determined a shallow creep rate that reaches a maximum around the epicenter of the 1999 Izmit earthquake of about 12.7 ± 1.2 mm/yr, consistent with published InSAR results. Creep rates decrease both east and west of the epicentral region. Moreover, we show that broad-scale postseismic effects that diminish logarithmically, continue at present. (This study is supported by TUBITAK 1001 project no: 113Y102 and 117Y278)