Geophysical Research Abstracts
Vol. 21, EGU2019-5788-1, 2019
EGU General Assembly 2019

Characterizing interseismic aseismic slip along the 1999 Izmit earthquake rupture (Turkey) from GPS, InSAR and creepmeter measurements

Gokhan Aslan (1,3), Cécile Lasserre (2), Ziyadin Cakir (3), Semih Ergintav (4), Seda Ozarpaci (5), Ugur Dogan (5), Roger Bilham (6), François Renard (1,7)

(1) Université Grenoble-Alpes, Institut des Sciences de la Terre (ISTerre), Grenoble, France (gokhan.aslan@univ-grenoble-alpes.fr), (3) Department of Geological Engineering, ITU, Maslak, 34469, Istanbul, Turkey (cakirz@itu.edu.tr), (2) Université de Lyon, UCBL, ENSL, CNRS, LGL-TPE, 69622, Villeurbanne, France (cecile.lasserre@ens-lyon.fr), (4) Department of Geodesy, Kandilli Observatory and Earthquake Research Institute, Bogazici University, Istanbul, Turkey (semih.ergintav@boun.edu.tr), (5) Department of Geomatic Engineering, Yildiz Technical University, Istanbul, Turkey (seda.ozarpaci@gmail.com, ugurdogan71@yahoo.com), (6) CIRES and Department of Geological Sciences, University of Colorado, Boulder, Colorado, USA (Roger.Bilham@colorado.edu), (7) The Njord Centre, PGP, Department of Geosciences, University of Oslo, NO-0316, Oslo, Norway (francois.renard@geo.uio.no)

A better characterization of seismic and aseismic slip behaviors of active faults is a crucial challenge for the seismic hazard estimation because it can influence the size and timing of large earthquakes. Geodetic and terrestrial measurements can provide a better picture of the fault slip budged and spatio-temporal evolution of creep mechanism. A number of studies based on Interferometric Synthetic-Aperture Radar (InSAR) and Global Positioning System (GPS) satellite observations until 2012 have found that the central segment of the August 17, 1999 Mw 7.4 Izmit earthquake on the North Anatolian Fault started slipping aseismically following the earthquake. In this study, we used new InSAR time series, obtained from TerraSAR-X and Sentinel 1A/B radar images acquired over the period 2011-2017, with near field GPS measurement campaigns performed every 6 months from 2014 to 2016. The mean velocity fields reveal that creep on the central segment of the 1999 Izmit fault rupture continues to decay, more than 19 years after the earthquake, in overall agreement with models of postseismic afterslip decaying logarithmically with time for a long period of time. Along the fault section that experienced supershear velocity rupture during the Izmit earthquake creep continues with a rate up to $\sim$ 8 mm/yr. A significant transient accelerating creep is detected in December 2016 on the Sentinel-1 time series, near the maximum creep rate location, associated with a total surface slip of 10 mm released in one month only. Additional analyses of the vertical velocity fields show a persistent subsidence on the hanging wall block of the Golcuk normal fault that also ruptured during the Izmit earthquake. Our results demonstrate that afterslip processes along the North Anatolian Fault, east-southeast of Istanbul are more complex than previously proposed as they vary spatio-temporally along the fault.