Geophysical Research Abstracts
Vol. 19, EGU2017-14057, 2017
EGU General Assembly 2017

High-resolution Terrestrial Laser Scanning surveys for quantifying surface ruptures of the 2016 seismic sequence in Central Italy

Pierrick Bornemann (1,2), Julien Point (1), Grzegorz Skupinski (2), André Stumpf (1), Jean-Philippe Malet (1), Jérôme van der Woerd (1), Jules Fleury (3), Lucilla Benedetti (3), Eugénie Pérouse (3), Magali Rizza (3), and Jim Tesson (3)

(1) Institut de Physique du Globe de Strasbourg UMR 7516, CNRS / Université de Strasbourg, Strasbourg, France, (2) Laboratoire Image Ville Environnement UMR 7362, CNRS / Université de Strasbourg, Strasbourg, France, (3) Aix-Marseille Université, CEREGE, Labex OT MED, CNRS-IRD UMR 34, Aix en Provence, France

From August to October 2016, a sequence of seismic events took place in Central Italy. Major shocks occurred on August 24 (Mw=6.0), October 26 (Mw= 5.9) and October 30 (Mw=6.5). The events created surface ruptures particularly visible along the southern segment of the Monte Vettore fault with vertical co-seismic deformation along the fault plane reaching up to ∼2.2 m (cumulated after the October 30 earthquake). The surface ruptures affected morphological features (gullies) and surficial formations (colluvial and talus deposits) which makes them suitable markers for quantifying the co-seismic displacement.
High resolution terrestrial laser scans were acquired on rupture outcrops after each of the two largest events using a long-range RIEGL VZ-2000 device during two campaigns in September and November 2016. Further, very-high resolution optical satellite imagery (tri-stereo Pléiades, 50 cm spatial resolution) were acquired before and after the October 30 event, and digital surface models were calculated with the DSM-OPT service of the ESA GeoHazard Exploitation Platform.
We present the long-range (1.0 to 1.5 km) terrestrial laser scanner point clouds acquired along the largest rupture trace on four areas of the Monte Vettore Western and Southern slopes. We document the geometry of the surface ruptures at high point cloud density (up to ∼1500 pts.m-2) for an approximate length of 4.2km and an approximate area of 9.6 km^2. The laser scanner point clouds are co-registered and georeferenced using GNSS RTK surveys on reference targets. High-resolution surface models are created for each dataset, by meshing the point clouds.
For two areas, bi-temporal point clouds are available allowing the quantification of the spatial variability of the vertical deformation. The high-resolution topographic measurements allow (1) quantifying the vertical displacement caused by the October 30th shock and (2) comparing the accuracy of the different surveying methods. The vertical displacement measured in the field and determined from the satellite surface models are further compared and integrated for a better understanding of the surface rupture geometry and mechanisms.