Geophysical Research Abstracts
Vol. 21, EGU2019-10403, 2019
EGU General Assembly 2019
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2016 Italy seismic sequence: seismic source analysis from SAR-GPS and seimological data

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After more than two years from the 2016 Italian seismic sequence, geometries of the seismic sources are not satisfactory clear. The sequence was characterized by three main events of Mw 6.0, Mw 5.9 and Mw 6.5 occurred on 2016 August 24th , October 26th and 30th , respectively. It developed along NNW-SSE striking fault systems whose surface expressions correspond to the Mount Gorzano-Mount Vettore-Mount Bove fault systems. Fault plane solutions for the main events exhibit normal faulting consistent with the direction of active extension of ∼3–4 mm/yr in this sector of the Apennines. Concerning 24th August shock, joint inversion of interferometric synthetic aperture radar (InSAR), CGPS, High-Rates GPS and Strong Motions data reveals a bilateral rupture along a NNW-SSE striking fault systems (Mount Gorzano fault and Mount Vettore fault systems), whose northward propagation has been controlled by the presence of a rheological and structural barrier represented by an inherited reverse tectonic structure , namely Sibillini thrust front (Cirella et al., 2018), as previously hypothesized by Pizzi et al. (2017).
Concerning the 2016 October events, ground deformation measurements reveal a complex deformation pattern characterized by a subsidence extending 35 km along the NNW-SSE direction, with a local minimum displacement of in the northern sector due to the October 26th event, and a maximum in the surroundings of Castelluccio, due to the October 30th shock. An uplift of ∼15 cm was observed in the Norcia basin; where also a local maximum in westward movement is present; the absolute maximum in the westward movement is located in the hangingwall, near the fault. SAR and CGPS data inversion (Cheloni et al. 2017) and joint cinematic inversion of CGPS and Strong Motion data (Scognamiglio et al., 2018) highlight a complex rupture distributed along a main NNW-SSE oriented normal fault plane and a low angle NE-SW striking trastensional fault (the Sibillini thrust front). This is an inherited compressive structure, reactivated as normal fault. Further complexities in the seismic source activation are introduced by Walters et al. (2018), which reproduce geodetic and seismological data using a large number of normal (synthetic and antithetic) faults and inverted thrust planes.
In this work, we reanalyze the 2016 October sources inverting InSAR and CGPS data, constrained by geological and seismological data, in particular aftershock hypocenters and tomographic data, identifying the role of the structures in seismic sequence evolution.