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Integration of multiplatform InSAR and GPS measurements for the definition of the seismogenic source of 2016 Central Italy earthquake sequence

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We integrate a large geodetic data set of interferometric synthetic aperture radar (InSAR) and GPS measurements of Italian surveillance networks to determine the source parameters for the three main shocks of the 2016 Central Italy earthquake sequence. We consider InSAR data acquired by different satellites provided within the emergency activities of the Italian National Service of Civil Protection. In particular, we exploited two ascending and three descending interferograms, which involve the ALOS-2, the Sentinel-1 (S1), and the COSMO-SkyMed (CSK) sensors, to evaluate the ground displacement due to the 24 August Mw 6.1 Amatrice earthquake and two ALOS-2 interferograms to investigate the cumulative displacement pattern relative to the 26 October Mw 5.9 Visso and the 30 October Mw 6.5 Norcia earthquakes. Moreover, an additional ascending ALOS-2 interferogram, relevant only to the Norcia event, was also considered. The earthquake sequence occurred where several continuous and survey mode GPS networks were operating. Finally, the integrated information derived by the abovementioned surveillance tecniques allowed to performing the geodetic modeling using rectangular dislocations in an elastic, homogeneous, and isotropic half-space. Our results allow us to highlight that some extra slip occurred on a secondary fault structure; this may be related to the activation of a normal fault antithetic to the MGVB main fault system, and/or to a pre-existing compressional low-angle structure, extensionally active during the seismic sequence. These findings suggest a complex interaction in the activated crustal volume between the main normal fault system and the secondary structures, and a partitioning of strain release that may have important implications for the evaluation of the seismic hazard in this sector of the Central Apennines.