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Seismic hazard models for the central Apennines constrained by GPS and InSAR: mid-term review results of the ESA Pathfinder project CHARMING

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The contribution of space geodetic techniques to earthquake rate estimation, and thus seismic hazard modelling, has been recognized since two decades and made possible in more recent years by the increased availability and accuracy of geodetic measurements.
We present the mid-term review results of a feasibility study named "Constraining Seismic Hazard Models with InSAR and GPS (CHARMING)", funded by the European Space Agency's (ESA) Support to Science Element (STSE) Pathfinders 2013 project.
The area of interest considered at this stage of the project comprises a 200 km x 200 km area, covering the Abruzzi region (central Italy). In a later stage this area shall be extended to comprise a large portion of central and southern Italy, including most of the highest strain regions identified by recent studies.
We present the interseismic velocities derived by $\sim$60 permanent GPS stations and measurements derived from coast-to-coast strips of Synthetic Aperture Radar imagery from the ERS-1/2 AMI, ENVISAT ASAR and ALOS PALSAR sensors. The latter are processed with the Intermittent Small Baseline Subset (ISBAS) techniques, which greatly improves the measurement coverage compared to previous studies. Corrections are applied concerning tropospheric propagation errors, using ENVISAT MERIS precipitable water vapour maps and ERA-Interim numerical weather model parameters, as well as for the recently discovered oscillator drift of the ENVISAT ASAR sensor. Finally, measurements from individual SAR tracks are calibrated using GPS to ensure a common reference frame.
For a set of composite seismogenic sources extracted from the DISS v.3.1.1 catalogue (Database of Italian Seismogenic Sources), we use the kinematic finite element NeoKinema model to derive long term average velocity fields and slip rates. We then derive earthquake rates, i.e. the number of earthquakes in a given time period above an established magnitude threshold, following the Seismic Hazard Inferred From Tectonics (SHIFT) approach. Finally, state of the art PSHA modelling techniques are used to generate probabilistic models for Peak Ground Acceleration and other shaking parameters.
A statistical validation of the PSHA model output is carried out using data from national accelerometric and macroseismic intensity databases and the differences compared to existing PSHA models of Italy, based only on seismological data, are analyzed.