Geophysical Research Abstracts
Vol. 14, EGU2012-11308, 2012
EGU General Assembly 2012

Seismic swarm detection by satellite DInSAR technique in the south-west Peloponnese, Greece

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In the period June-October 2011 a seismic swarm of shallow earthquakes occur in the Messenia prefecture at the south-west of the Peloponnese peninsula. The area interested by the seismic swarm is of approximately 15 x 15km and located about 25 km north-west of the city of Kalamata and more precisely close to the Ichalia, Meligalas and Katsarou villages. In order to detect the deformation field caused by the seismic swarm we use Differential SAR Interferometry (DInSAR), a technique commonly used to measure co-seismic ground displacements, providing spatially dense deformation fields with great accuracy. The used data are 4 SAR images from the ENVISAT satellite missions, acquired on the period interested by the earthquakes swarm, spanning from July 2011 up to October 2011 (July 3, August 2, September 1 and October 1). We computed all possible combinations of interferograms in order to single out in which period the higher surface deformation occurred. The topographic contribution in all interferograms, which have perpendicular baselines in the order of 100 m, has been removed using the SRTM digital elevation model. An increase of deformation has been detected starting from August, 2-3 cm, with a sensible augmentation in the period between September and October, in which reached 6-7 cm. The observed deformation pattern (subsidence) seems to confirm the E-W extensional tectonic regime of the area. A NNW-SSE striking and west dipping normal fault zone is likely responsible for the measured deformation. The retrieved Line Of Sight (LOS) displacement is subsequently modeled with standard methods in order to retrieve the swarm related slip distribution on the fault plane.