



DInSAR techniques for studying the October 23, 2011, Van earthquake (Turkey), and its relationship with neighboring structures

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We have investigated the possible causal relationship between three earthquakes occurred in Turkey. In particular the Mw 7.2 October 23, 2011 earthquakes occurred in the Van province, located in the Eastern Turkey near Lake Van, its aftershock occurred the November 9 few kilometers southward, and another major event ($Ms = 7.3$) occurred north of Van in East Anatolia on 24 November 1976 along the Caldiran fault. The Mw 7.2 Van event took place along a previously unrecognized east-west thrust fault. The largest aftershock has hit Van Province has a magnitude 5.5 at 4.3 km of depth very close to Van.

For the Van earthquake and its aftershock we used DInSAR measures for retrieving the faults parameters. A couple of COSMO-SkyMed images has been used to measure the coseismic deformation of the first event, while two TerraSAR-X interferometric images have been used for the second one. For both the topography contribution has been removed using the SRTM digital elevation model. Based on DInSAR outcomes we have then inverted the coseismic displacement field using the a novel approach [1], based on the Okada model and Neural Networks (NNs), to investigate the fault geometry of the two latest earthquakes. One of the advantages of this method is that it rapidly achieves a determination of the rupture plane. Concerning the earthquake occurred on 1976 the fault plane has been deduced using surface ruptures from ground survey [2].

Once defined the geometries of the three seismogenic fault planes we have investigated the role of the Caldiran earthquake in promoting the Van rupture, and the latter in promoting its aftershock, by evaluating the Coulomb Failure Function.

[1] Stramondo, S., Del Frate, F., Picchiani, M. & Schiavon, G. Seismic Source Quantitative Parameters Retrieval from InSAR Data and Neural Networks. *IEEE Transactions on Geoscience and Remote Sensing* 49, 96-104 (2011).

[2] M. NAFI TOKSÖZ*, ESEN ARPAT† & FUAT SARO&GLU, “East Anatolian earthquake of 24 November 1976”, *Nature* 270, 423 - 425 (01 December 1977); doi:10.1038/270423b0