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Integration of two line-of-sights classical DInSAR and GPS data to study the 2004-2006 Tenerife volcanic unrest

J. Fernandez (1), S. Samsonov (2) and TENERIFE team

(1) Instituto de Astronomia y Geodesia (CSIC-UCM), Madrid, Spain, (2) Institute of Geological and Nuclear Sciences Ltd., Avalon, New Zeland (jft@mat.ucm.es)

3D deformation field in volcanic areas can be constructed using a novel analytical optimization technique using DInSAR and GPS deformation [Samsonov et al., 2007]. We construct various 3D deformation solutions using a set of stacks of ascending and descending differential interferograms using ENVISAT ASAR images and surveyed GPS deformation measurements. We study several periods before and during the 2004-2006 volcanic unrest at Tenerife Island (Canary Islands). This episode is the first observationally documented unrest on the island, marked with an increment in seismic activity. The most marked activity began in April 2004, with more than 3000 seismic events over the following twenty two months. The inversion of the displacement data illuminate sources of deformation whose horizontal position, depth, radius, pressure and mass evolve over time. The displacement of these sources is produced along zones with a lower density and around the more dense material. There are two stable sources associated with deformation areas detected previously to the studied period. In 2001 there was observed a change in the deformation rate in those areas which could be considered as a possible precursor phenomena of the studied crisis. Our results have allowed to confirm the previous interpretation obtained using seismic, gravity and geochemical anomalies, as well as to quantify the characteristics and location of the sources and their variation with time. These results reinforce the importance of employing this DInSAR-GPS optimization technique as a routine feature of a geodetic volcanic monitoring system.

Samsonov, S., Tiampo, K.F., Rundle, J.B., Li, Z., (2007). Application od DInSAR-GPS optimization for derivation of fine scale surface motion maps of southern California. IEEE Transactions on Geoscience and Remote Sensing, 45 (2), 512-521.