Geophysical Research Abstracts,
Vol. 11, EGU2009-5133, 2009
EGU General Assembly 2009

Mapping of the 2006 silent slow event in the Guerrero (Mexico) seismic gap by InSAR

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Aseismic slip, called Slow Slip Event (SSE), have been observed in the last decade by GPS in subduction zones. The SSE occurring in the Guerrero-Oaxaca Mexican subduction zone are among the largest recorded SSE in the world. They are monitored by 14 permanent GPS stations located in along a N-S transects between Mexico city and Acapulco and another E-W transect along the coast. This network allowed to detect recurrent transient motions, observed about each four years since 1998. This result bring new constrains about subduction dynamic and the seismic gap segment observed on the subduction zones. Nonetheless, improving the coverage of geodetic measurement in this area is essential to better determine the spatial distribution of the slip and, then, the released energy during these events. SAR interferometry (InSAR) has the potential to increase spatial density of geodetic measurements. However, detecting SSE by InSAR remains a challenge because the related ground deformations are distributed over long distance (hundreds of km) with small gradient and, in the Guerrero zone, crossing zones of low phase coherence. Here, we present the ground displacement map due to the SSE that occurred between April 2006 and December 2006. We first process interferograms along the descending track 255 (about 500 km * 100 km) covering the permanent GPS network. We compute 32 interferograms based on 12 Envisat images acquired between November 2004 and March 2007. To further improve the InSAR treatment, we then focuse on the correction for tropostatic delay that induced a correlation between phase and elevation. For that purpose, we use NARR (North American Regional Reanalysis), a meteorological model of re-analysis of atmospheric data. We show that NARR provides a good estimation of the tropostatic delay. Stacking 4 interferograms covering the 2006 event, we obtain the spatial distribution of the surface displacement. This study brings new constrains and a complement information obtained from GPS data. In particular, InSAR allows to map the end of the westward ground motion produced by the 2006-SSE. Moreover, this study will help to better record a future SSE that may occur in 2010.