

InSAR time series analysis of slow slip events on the Guerrero Subduction Zone, Mexico

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Guerrero is a province in the southern part of Mexico adjacent to the Pacific Ocean. In the past, large thrust earthquakes have occurred along the interface between the subducting and overriding plates. However, there is a region with a “seismic gap” where no earthquakes have occurred since 1911. It is estimated that a rupture of the gap would result in a Mw 8.0 to 8.4 earthquake. In the past few years it has become apparent that the subduction zone is also very active in terms of slow slip events (SSEs). At least one event every four years has been observed since 1995. The area affected by the associated deformation of these SSEs is rather large, with the highest deformation near the coast and reaching as far as Mexico City, 300 km inland.

Up until now, most geodetic observations of the SSEs have been made using GPS techniques only. By using radar imaging, spatial resolution can be considerably increased, allowing subduction interface models to be much better constrained. Regular radar interferometry (InSAR) fails due to spatial and temporal decorrelation. We apply a time series InSAR technique that searches for pixels, or “persistent scatterers”, that have stable phase characteristics in all interferograms. With this time series analysis, we are able to extract the mean interseismic velocity and displacement of the 2006 SSE. In our processing the effect of atmosphere and DEM errors were estimated and subtracted. Continuous GPS data were used to constrain the long wavelength components of both secular motion and the SSE. Current GPS observations indicate a new SSE occurring. This SSE started in the summer of 2009. We are investigating this event using ALOS PALSAR (L-band) data. The ionosphere obscures the data, but first results indicate slow slip signal to be present.

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