CONTROL ID: 947898
TITLE: InSAR time series analysis of the 2006 slow slip event on the Guerrero Subduction Zone, Mexico
PRESENTATION TYPE: Assigned by Committee (Oral or Poster)
CURRENT SECTION/FOCUS GROUP: Geodesy (G)
CURRENT SESSION: G11. Earthquake Source Imaging Using InSAR and Other Geodetic Data

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ABSTRACT BODY: 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. 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. We estimate the long wavelength component of the atmospheric signal in each interferogram from it’s correlation with topography, and DEM errors from their correlation with perpendicular baseline. Residual master atmospheric signal is estimated as the weighted mean unmodeled signal. In a first iteration of the estimation process we weight each inteferogram only by it’s noise characteristics. Using these results and by selecting a non-deforming area, we re-estimate the weights to include also the variance of the residual slave atmospheric signal. Using the new weights in a second iteration we improve the estimation of the secular velocity and displacement due to the 2006 slow slip event.

For modeling of the slow slip, we used both our InSAR results (downsampled) and the available GPS data. We divided the subduction interface into a number of rectangular patches and applied weighted least-squares using the full variance-covariance matrix, with Laplacian smoothing, to estimate the magnitude of slip on each. The degree of smoothing was estimated using a Bayesian framework with the prior probability for the slip distribution given by the probability of the Laplacians. The GPS data serve to constrain the long wavelength errors in the InSAR data and the InSAR data themselves constrain the distribution of slip at a higher resolution than possible with GPS alone.

INDEX TERMS: [1240] GEODESY AND GRAVITY / Satellite geodesy: results, [8170] TECTONOPHYSICS / Subduction zone processes, [9350] GEOGRAPHIC LOCATION / North America, [1207] GEODESY AND GRAVITY / Transient deformation.
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