The 2006 Slow Slip Event in Guerrero Constrained by Radar Interferometry

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At least one slow slip event occurs every four years on the Guerrero subduction zone. These events have been observed with GPS, however the sparsity of the network in the Guerrero region means that the slip is not well constrained. Radar interferopmetry (InSAR) has the potential to further constrain the slip but the data suffer from decorrelation and strong atmospheric contamination at the spatial wavelengths of the deformation. To overcome these issues we apply time series analysis to a series of radar images spanning the 2006 ETS event, and develop a new algorithm to reduce the long wavelength atmospheric signal. We use the correlation of the tropospheric delay with topography and account for lateral variation by estimating the relationship locally. We avoid incidental subtraction of any deformation signal by using only spatial frequencies where deformation is insignificant, in the estimation process. We then use the results together with GPS data to model the slip on the interface. We do this in a Bayesian manner, with the distribution of the smoothness acting as a prior constraint on the slip. The result is a full probability distribution for both slip and smoothness. We find that slip is placed further eastwards than by GPS alone, and with less slip reaching into the seismogenic zone. Thus there is very little reduction in the potential moment release of future earthquakes. Furthermore, the slip correlates well with regions of ultra-slow velocity found from seismic studies reinforcing the link between slow slip and high pore pressure.

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