

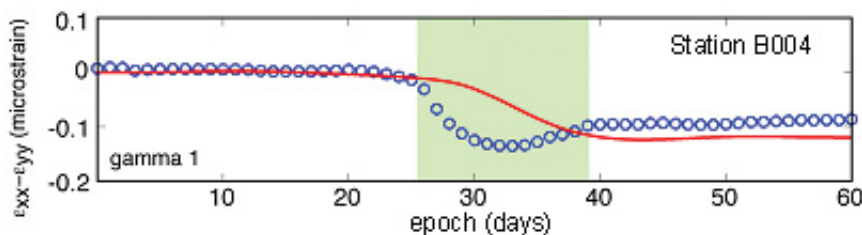
# Investigations of Slow Slip Along the Cascadia Subduction Zone Using GPS and Strainmeter Time Series

**David Schmidt** » Department of Geological Sciences, University of Oregon

**Haiying Gao** » Department of Geological Sciences, University of Oregon

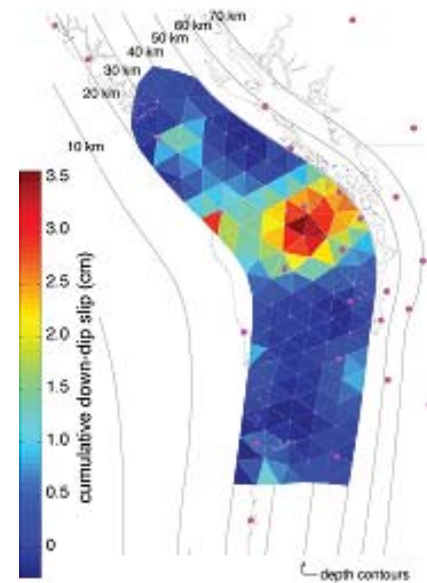
We are studying the kinematic slip history of slow slip events on the Cascadia Subduction zone. Since the first discovery of transient slow slip by Dragert et al. (2001), several more recent aseismic slip events have been observed. GPS time series data are analyzed using the Extended Network Inversion Filter, which is an implementation of a Kalman filter (Segall and Matthews, 1997). The Extended Network Inversion Filter estimates a time-dependent signal on a buried dislocation by filtering uncorrelated station displacements. We have analyzed GPS time series for slip transients from 2003 to 2005 (Gao and Schmidt, 2006; Schmidt, 2006a). Initial results indicate that the release of strain from one event to the next is not uniform along-strike. In addition, the regular recurrence interval observed beneath southern Vancouver Island is not observed with a slip patch located beneath southern Puget Sound.

Prior to the 2005 event, PBO installed tensor strainmeters on the northern Olympic Peninsula. The observed strain transients are compared to predicted strain time series to cross-validate these new instruments. Generally, the magnitude and sign of the transient is in rough agreement between the observed and predicted time series (see figure below). Based on simulations, the rollback from -0.15 to -0.1 microstrain late in the observed time series can be explained by the passage of a nodal plane in the strain field over the instrument. This finding indicates that the strainmeters provide greater resolution of slip propagation on the plate interface (Schmidt, 2006b).



## References

- Dragert, H., Wang, K., and T. S. James (2001), A silent slip event on the deeper Cascadia subduction interface, *Science*, 292, 1525-1528.
- Gao, H., and D. A. Schmidt (2006), The slip history of the 2004 slow slip event on the northern Cascadia subduction zone, *EOS Trans. AGU*, 87 (52), Fall Meet. Suppl., Abstract T41A-1540.
- Schmidt, D. A. (2006a), Comparative study of recent aseismic slip events on the Cascadia subduction zone from GPS, US-Japan Research Panel on Earthquake Research, Tokushima, Japan, Abstract with Program.
- Schmidt, D. A. (2006b), The 2005 Cascadia ETS event inferred from PBO tensor strainmeters and GPS, *EOS Trans. AGU*, 87 (52), Fall Meet. Suppl., Abstract T41A-1545.
- Segall, P., and M. Matthews (1997), Time dependent inversion of geodetic data, *J. Geophys. Res.*, 102, 22391-22409.
- This work was supported by NSF Grant EAR-0346037.



**Figure 1.** Cumulative slip distribution of the 2005 slow slip event inferred from GPS time series data. The event is centered below Port Angeles, WA. Fine lines show the depth contours of the subduction interface. Pink circles indicate the locations of GPS benchmarks.

**Figure 2.** Comparison of observed tensor strain (blue circles) for station B004 compared to predicted strain (red line) inferred from the slip model shown to the left. The green background indicates the period when transient displacement was identified on the GPS time series.