

EARTHSCOPE SEMINAR
PAPER SUMMARY
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PRESENTER: SHAJI NAIR

Paper title: Episodic Tremor and Slip on the Cascadia Subduction Zone: The Chatter of Silent Slip

Authors: Garry Rogers and Herb Dragert

Overview:

This paper outlines results from regional studies on unique non-earthquake signals that accompany the occurrence of slip. The tremor-like signals they identify correlate temporally and spatially with slip events identified from crustal motion data. They categorize the associated tremor and slip phenomenon as an episodic tremor and slip (ETS). The authors suggest that observation of such ETS activity could be an indication of stress loading, which in turn raises the probability of the occurrence of megathrust earthquakes in the Cascadia subduction zone.

Data:

This study uses data from a network of continuously recording Global Positioning System (GPS) sites (around Victoria and British Columbia) for measuring surface deformation. They also use digital seismic data recorded between 1999 to the end of 2003 at the regional seismic network to identify signatures from the tremor.

Methods:

The duration of the slips and the timing were estimated by cross-correlation of changes in the east-west component of the GPS site with a symmetric 180-day sawtooth function that replicates an average slip time series. Seismic data for corresponding times were checked to locate tremors associated with the slip.

Results:

- Sustained tremor activity on southern Vancouver Island coincides with the occurrence of slip.
- No substantial tremor activity found for southern Vancouver Islands outside the time window of slip events.
- Tremors migrate north along the axis of Vancouver Island for five of the slip events.

Implications:

- Large amplitude tremors recorded in northern and mid Vancouver Island, attributed to southern migration of tremors imply that ETS processes occur over the full length of the northern Cascadia subduction zone.
- The onset of ETS activity could lead to recognized times of higher probability for the occurrence of megathrust earthquakes in the Cascadia subduction zone.
- A slip event could trigger a large subduction thrust earthquake.

Additional Thoughts:

- Does ETS events differ from the dehydration of subducting slabs?
- If observation of slip from geodetic data is unavailable is it possible to locate these episodic seismic tremors?
- What could be the other possible sources of tremors if not fluids?