

EARTHSCOPE SEMINAR
DISCUSSION SUMMARY
MARCH 6, 2007
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Paper title: Episodic Tremor and Slip on the Cascadia Subduction Zone: The Chatter of Silent Slip

Authors: Rogers and Dragert

This paper shows a correlation between GPS motions and Episodic Tremor and Slip (ETS). ETS is characterized by low-frequency (1-5 Hz) seismic signals which occur over a 6-20 day period, repeating at 13 to 16-month intervals. The implication is that ETS activity is indicative of subduction zone slip and stress loading of the crust and is possibly due to fluid migration in the subduction zone. The authors speculate that the onset of ETS activity might signal a higher probability of megathrust earthquakes in the Cascadia subduction zone.

There was some discussion of the source depth determination for the ETS activity. The paper indicates that the activity occurs at depths of 20-40km, but the method for determining the source depth was not explicitly described. Some group members thought that array methods might be used for determining source depth.

GPS movement eastward related to ETS activity was characterized as “two steps forward, one step back”, repeated in a sawtooth pattern.

One point discussed was that the authors used the GPS movements in order to determine when to look for ETS seismic activity. It would be more useful to be able to use ETS seismic activity as the primary indicator. Group consensus was that having once determined the seismic signature of ETS activity, it could then be detected without requiring GPS data.

This paper was published in June 2003, and consequently does not show any data for subsequent ETS periods. We viewed additional data for September 2005 and January 2007 ETS episodes, from

www.pnsn.org/WEBICORDER/DEEPTREM/summer2005.html and
www.pnsn.org/WEBICORDER/DEEPTREM/fall2006.html.

Methods and areas identified by the group for further studies are:

- InSAR (to detect uplift and movement of the surface)
- Electromagnetics (to detect fluid movement below the surface)
- Gravity studies (no specific reason mentioned)
- Gas chemistry and thermal variations in hot springs and/or boreholes (these should change if the deep fluids and shallow fluids are interconnected systems)

Several group members questioned how ETS correlated with large earthquakes. ETS-type activity was seen before the 1960 Chile earthquake, but doesn't seem predictive of earthquake activity as ETS activity is seen in many subduction zones where earthquakes have not (yet) occurred. Speculation was put forward that the cessation of ETS activity might be a predictor of large earthquakes. Since ETS activity is being observed in a number of subduction zone areas, this possibility should be testable at some point in the not-too-distant future.

We speculated whether it might not be possible to integrate the moment of the ETS over the slip period, and figure out how large a single event would be equivalent to the ETS period-wide moment.