

## Broadband source spectrum of a slow slip event in the Cascadia subduction zone

TAKEO, Akiko<sup>1\*</sup> ; HOUSTON, Heidi<sup>2</sup> ; CREAGER, Kenneth<sup>2</sup>

<sup>1</sup>Hokkaido University, <sup>2</sup>University of Washington

Slow earthquakes have been discovered in various time scales: non-volcanic tremor at high frequency range of 1-10 Hz, very low frequency earthquake (VLFE) at intermediate range of 10-100 s, and slow slip event (SSE) at geodetic time-scale longer than one day. Since these phenomena occur simultaneously, tremor and VLFEs can be regarded as the high frequency components of SSE. Based on this idea and to discuss the source time function of a SSE for the first time, we estimated source spectrum of Mw 6.8 episodic tremor and slip (ETS) event in the Cascadia subduction zone in 2010 from tremor band to the VLFE band. The source spectrum in the tremor band can be simply obtained by correcting the effect of attenuation and geometric spreading. The source spectrum in the VLFE band is more complicated because the signal-to-noise ratio is about one. We first improved the signal-to-noise ratio by stacking waveforms at a period range of 20-50 s with an assumption that the VLFEs coincide with peaks of tremor amplitudes. We then obtained source spectrum at 30-100 s by dividing the spectrum of stacked waveforms by the spectrum of synthetic waveforms corresponding to the obtained focal mechanism. The obtained source spectrum is proportional to inverse of frequency in both tremor and VLFE bands. In addition, the spectrum in both bands could be roughly fit by a synthetic source spectrum corresponding to a boxcar shaped source time function whose duration is about ten hours and the total moment release is Mw 6.8. The apparent duration of ten hours is shorter than the observed duration of the ETS, one month. This result indicates that the moment release during the one-month ETS consisted of slip pulses with typical durations shorter than a day.

Keywords: very low frequency earthquake, tremor, slow slip event, Cascadia