[JJ] Evening Poster | S (Solid Earth Sciences) | S-SS Seismology

[S-SS15]Fault Rheology and Earthquake Physics

convener:Hideki Mukoyoshi(Department of Geoscience Interdisciplinary Graduate School of Science and Engineering, Shimane University), Wataru Tanikawa(Japan Agency for Marine-Earth Science and Technology, Kochi Instutute for Core Sample Research), Takanori Matsuzawa(国立研究開発法人　防災科学技術研究所, 共同), Keisuke Yoshida(Tohoku University)
Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
The goal of this session is to integrate theoretical, experimental, observational, and numerical perspectives from various fields such as seismology, geodesy, geology, mineralogy, and so on, to define what is known about earthquake source processes and the physical and chemical elementary processes of faulting. This session welcomes studies that address such issues as pre-, co-, and post-seismic processes, the rheology of seismogenic faults and fault rocks, laboratory experiments on elementary processes, numerical models based on frictional laws, and estimates of the stress field in the seismogenic zones. We also welcome studies on fault-zone drilling projects and in situ stress measurements.

[SSS15-P10]Spatio-temporal Change of Seismic Wave Field Induced by Slow Earthquake Revealed from Seismic Interferometry

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Seismic interferometry is one of the most effective techniques to detect temporal variations in seismic velocity caused by a large earthquake. Some previous studies have been reported on seismic velocity reductions due to the occurrences of large earthquakes (e.g., Wegler et al., 2009; Zhen and Song, 2009; Sawazaki et al., 2016; Nimiya et al., 2017). Besides ordinary large earthquakes, a few previous studies have been reported in temporal variation of seismic velocity accompanying by occurrences of Slow Slip Events (SSE), which is one of members of slow earthquake family (Rivet et al., 2011, 2014).

Between the end of January and the occurrence of the largest foreshock on March 9 that preceded the 2011 Tohoku-Oki earthquake, SSE and low-frequency tremors have been detected off Miyagi (Ito et al., 2013, 2015; Katakami et al., 2016). We apply a technique in the seismic interferometry using ambient noise to data from 17 OBSs that were installed above the focal region before the 2011 Tohoku-Oki earthquake. We measure temporal variations in seismic wave field with measuring temporal variations of Auto-Correlation Function (ACF) calculated from ambient noise. All OBSs with three components have short-period seismometers with an eigenfrequency of 4.5 Hz and a sampling rate of 100Hz.

The method to calculate ACFs is as follows. First, we apply a band-pass filter of 0.25-2.0Hz in the frequency domain, and compared this with a one-bit technique in the time domain to the ambient noise signal. Second, we calculate 120 seconds ACFs in the time domain using continuous data for fifteen days of time series. Finally, we compare ACFs calculated from fifteen-day data to a reference ACF that calculated from all of the observed data.

As results, we successfully detected a temporal decrease and increase in seismic velocity at the landward

and trenchward of the SSE fault. These temporal variations may be related to the temporal variation of distribution of sources constituting ambient noise, owing to the occurrence of low-frequency tremors occurs. This suggests the possibility to detect low-frequency tremors based on a detection of ACF temporal variations.