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

[S-SS10]Seismic wave propagation: Theory and Application

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Seismic wave propagation provides rich information of earth's heterogeneities and the excitation sources. In order to extract the information, integrated studies are needed among mathematical/numerical studies based on the wave theory, miniature physical experiments using rock specimens, and practical data analyses. Furthermore, it is greatly beneficial to conduct comparative studies of various kinds of waves, such as elastic, acoustic, traveling ionospheric disturbances, and oceanic waves. This session widely invites presentations about the theories and applications related to seismic and other geophysical waves.

[SSS10-P03]Secular and Coseismic velocity change of S-wave in Tokai region detected by ACROSS

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Keywords:seismic velocity change, secular change, coseismic change, artificial seismic source, ACROSS, The 2011 off the Pacific coast of Tohoku Earthquake

Introduction

We have discovered a secular change in the travel time of direct S-wave over the 10 years observation period by means of continuous operation of an artificial and stable seismic source, called ACROSS, which is deployed in the central part of Japan along the Nankai trough. This is the first finding of the secular change of seismic velocity ranging over 10 years.

Method

We used 13 Hi-net (High Sensitivity Seismograph Network Japan) stations around the ACROSS source to monitor the temporal variation of travel time. We calculated Green's function for each station for each day from March 29, 2007 through October 30, 2017. The temporal variation in the travel time we observed shows secular advance for whole terms as well as step-like delay at the occurrence of the 2011 Off the Pacific Coast of Tohoku Earthquake (Tohoku Earthquake) at most of the stations. Figure shows travel time variation of the direct S wave at three representative stations. We estimated the rate of secular change and the magnitude of co-seismic step by comparison to the model, simplified with a linear trend and a step at the time of the 2011 Tohoku earthquake.

Results and Discussion

We obtained positive secular change of 0.0 -1.4 ms/yr and the coseismic step at the Tohoku Earthquake of -4.0 - 0 ms. The step at the Tohoku Earthquake is the same order of magnitude as that obtained in the previous study (Brenguier et al., 2014). To confirm the existence of the secular change, we estimated the secular change rate by using data before the Tohoku Earthquake only, and obtained again positive rates. To discuss the causes of these changes, we investigated the distance and azimuthal dependence of the temporal changes. For the distance dependences, a pattern, which is explained as a combination of common bias of seismic velocity and random dispersion for each station, was obtained for both the secular and

coseismic changes. The results can be interpreted as a randomly distributed increase or decrease of seismic velocity over the range of observation region. For the azimuthal dependence, the magnitude of the both changes at the stations in NE-SW direction from the ACROSS source are larger than NW-SE direction, suggesting the effect of the stress change.

Figure Caption

The travel time deviation at each station. The vertical axis shows advance of travel time. Blue dots and red line show daily and estimated travel time deviation, respectively. The map shows location of the ACROSS source and Hi-net stations we used.

Acknowledgements

We have used continuous waveform data observed by Hi-net operated by the NIED (National Research Institute for Earth Science and Disaster Resilience). We also used the daily precipitation data and JMA 2001 travel-time table obtained by JMA (Japan Meteorological Agency). We thank the JMA and NIED.