Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SSS29-05 Room:416 Time:April 28 15:15-15:30

Broad-band source image for the 2011 Tohoku earthquake constructed by strong-motion data

KUBO, Hisahiko[1*] ; ASANO, Kimiyuki[1] ; IWATA, Tomotaka[1] ; AOI, Shin[2]

[1]DPRI, Kyoto Univ., [2]NIED

From the comparison between slip model using long-period (10s˜) seismic waves and excitation zones of short-period (0.1-10s) seismic waves, it has been suggested that the 2011 Tohoku earthquake (Mw9.1) has the period-dependent spatial variation on the seismic-wave radiation and this variation would be caused by the spatial difference of slip behavior on the plate boundary (e.g., Koper *et al.*, 2011; Lay *et al.*, 2012). However, their studies were based on the qualitative comparison of the results obtained by different methods, and the quantitative comparison between source models having different period-bands has not been made. Therefore, the construction of the source models at different period-bands by a common method is important to further understand the source characteristics of the 2011 Tohoku earthquake. Kubo et al. (2013, Fall Meeting of SSJ) estimated the spatiotemporal slip models for the 2011 Tohoku earthquake on three different period bands (10-25s, 25-50s, and 50-100s). In this study, we estimate the source models for the 2011 Tohoku earthquake on five continuously-different period bands (10-25s, 17-33s, 25-50s, 33-67s, and 50-100s) using strong-motion data, and construct broad-band source image for the 2011 Tohoku earthquake.

The spatiotemporal rupture history is estimated by the kinematic linear waveform inversion using multiple time windows (Hartzell & Heaton, 1983). The Green's functions are calculated by the 3D FDM (GMS; Aoi & Fujiwara, 1999) using a 3D velocity structure model, Japan Integrated Velocity Structure Model Version 1 (Koketsu *et al.*, 2012). Three components of velocity waveforms at 25 stations of K-NET, KiK-net, and F-net of NIED are used in this analysis. Using waveform records at the stations for the middle-size events which occurred in the source area of the 2011 Tohoku earthquake, we confirmed the adequacy 3D velocity structure model at the analyzed period-band.

The source image for the 2011 Tohoku earthquake on the period band of 10-100s is summarized as follows: (1) (1st) Deep rupture off Miyagi rupture at 0-60s toward down-dip mostly radiating relative short period (10-25s) seismic waves. (2) Shallow rupture off Miyagi at 45-90s toward up-dip with long duration radiating long period seismic wave. (3) (2nd) Deep rupture off Miyagi at 45-90s toward down-dip radiating long period (25-100s) seismic waves. The dominant-period difference in the seismic-wave radiation between twice deep ruptures off Miyagi may result from the mechanism that the second rupture is smoother than the first one because small-scale heterogeneities on the fault are removed by the first one. (4) Deep rupture off Fukushima at 90-135s.

The broad-band source model on the period band from 5-100s is under construction and we will report this.

[Acknowledgments] The strong-motion data recorded by K-NET, KiK-net, and F-net of NIED was used for this analysis.

Keywords: The 2011 Tohoku earthquake, Broad-band source image, Source models on different period bands, Source inversion, Strong-motion data