Amplification characteristics in Kanto district estimated from waveforms of the 2015 Ogasawara Deep earthquake with Mw8.0

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A deep large earthquake with Mw8.0 took place beneath the Ogasawara islands on May 30, 2015. This earthquake caused a large shaking in Kanto district in Japan with the JMA intensity of 4 to 5 major, which provides an opportunity to investigate the amplification characteristics in the region.

We analyzed waveforms of 56 KiK-net sites in Kanto district and investigated the spectral ratio of the observed waveforms at stations on the surface and on the bedrock in the borehole at each site. We first picked arrival times of P and S waves and cut the waveforms from -10.00 to 30.95 s after the arrivals. We then calculated spectra of the waveforms and obtained the spectral ratios of P and S waves. We calculated average values of spectral ratios in the frequency band from 0.1 to 1 Hz (Fig. 1a) and attributed them to amplification factors at each KiK-net station.

We first investigated the relationship between the observed amplification factors and distances of surface and borehole seismometers. The relationship showed a good proportionality with a correlation coefficient of 0.744, indicating that the factors have a strong correlation with the thickness of the sediments the same as results of previous studies. We then calculated the normalized amplification factors (NA factors) for every 100 m of the distance between surface and bedrock stations to remove the effect associated with different thickness of sediment at each site (Fig. 1b). The NA factors were around 1 for sites at mountain regions as expected. In the Kanto plain, only sites around the Tone river had high NA factors.

Acknowledgements: We used KiK-net waveform data.

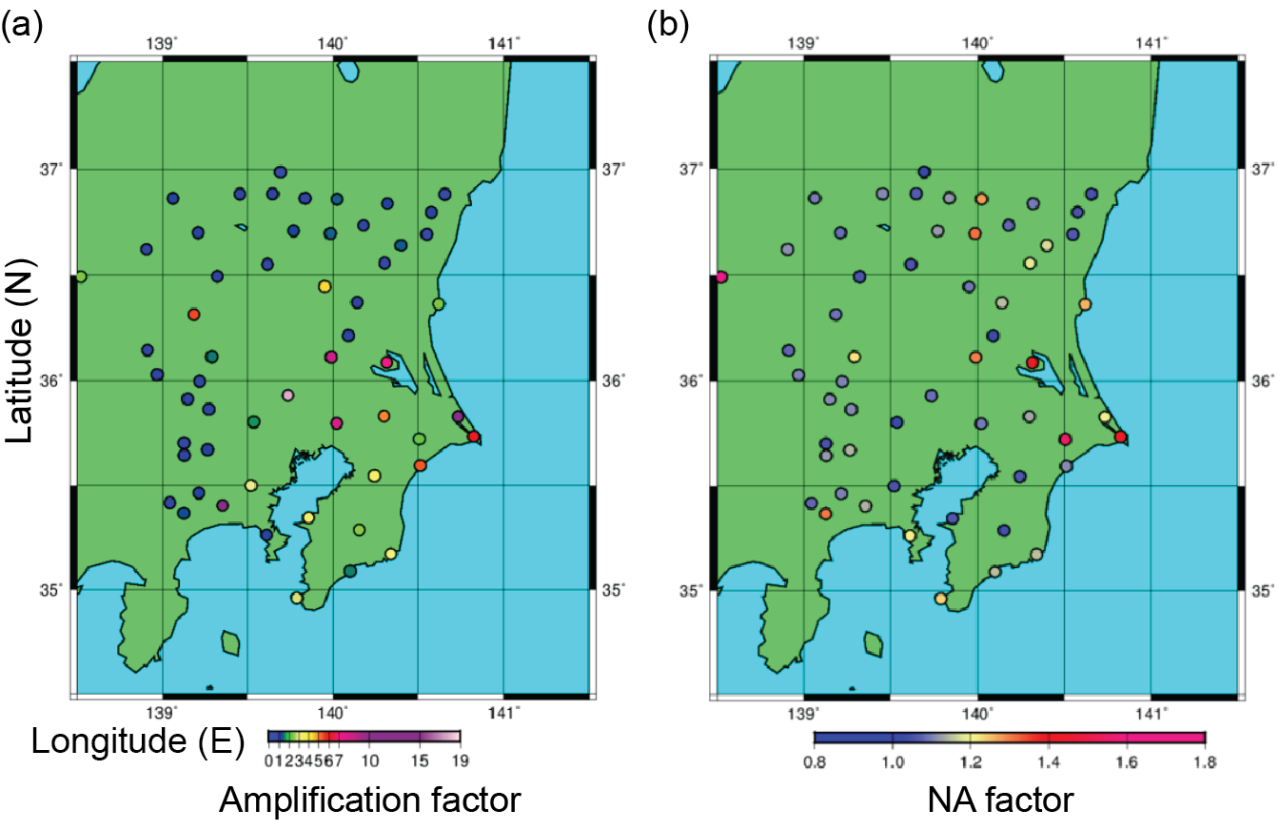Keywords: Spectral ratio, KiK-net, Kanto district

Fig. 1 (a) Amplification factors at KiK-net sites. (b) Normalized amplification factors.