Study on attenuation relations focused on near source region -Evaluation of their applicability for earthquake early warning-

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In the current earthquake early warning from JMA, the anticipation of seismic intensity is based on an empirical attenuation relation for peak ground velocity (Si and Midorikawa, 1999). This method uses Mw converted from Mj by empirical relation (Utsu, 1982), and seismic intensity converted from peak ground velocity by empirical relation (Midorikawa et al., 1999). Therefore the predicted seismic intensity contains uncertainties of these two empirical relations. Using a seismic intensity empirical attenuation relation with Mj (e.g., Matsusaki et al., 2005), as these two empirical relations are not used, the improvement of prediction accuracy can be expected. In this study, we evaluated availability of the seismic intensity empirical attenuation relation within near source region with comparing the prediction method in current usage of EEW. We used inland 45 earthquakes shallower than 30 km with magnitude Mj greater or equal 5.5. Seismic intensity data were used within 100km from hypocenter or fault plane. Nine earthquakes were used shortest distance to the seismic fault plane. We adopted Morikawa et al. (2007) and Matsusaki et al. (2006) as a seismic intensity empirical attenuation relation. The amplification factor of stations was not applied to the anticipation. Seismic intensity residuals (O-C) derived by Morikawa et al. (2007) and Si and Midorikawa (1999) had the distance dependences. When the distance dependence of O-C exists, it leads to inappropriate influence when estimating the empirical site amplification. Morikawa et al. (2007) and Matsusaki et al. (2006) had about the same RMS of O-C for all data. Matsusaki et al. (2006) had constant O-C with distance, and it was available for earthquakes which do not hold good for the empirical relation of Utsu (1982) for the case that Mj is much larger than Mw.

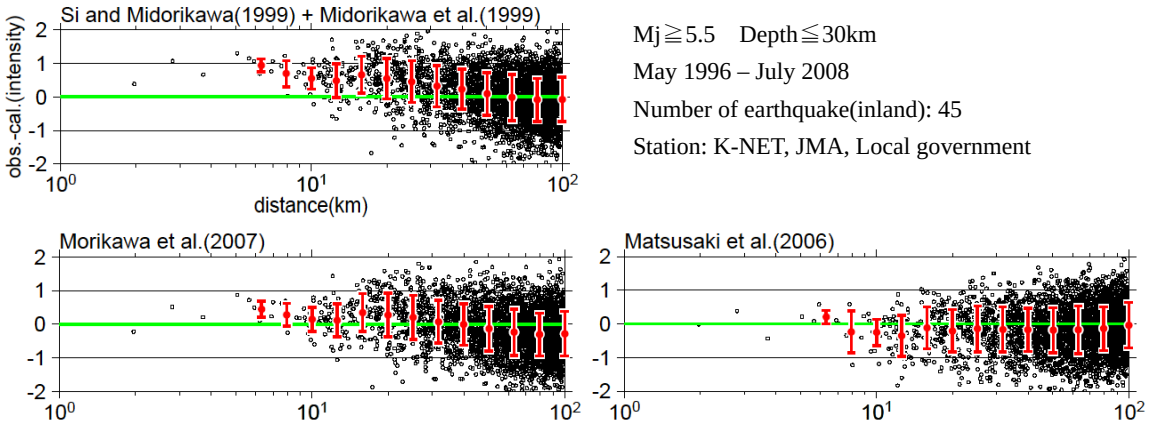

Fig. Relationships between residual and fault or hypocentral distance. The solid circle and the vertical bar show an average of a sectioned area and the range of ± standard deviation, respectively.