Improvement of Earthquake Early Warning: P-wave Magnitude and high-precision evaluation of seismic intensity

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In the Earthquake Early Warning, first Mj is estimated with P-wave information and then Mw is evaluated from Mj using Utsu's formula (1982). Peak Ground Velocity (PGV) at a target site is calculated with the empirical PGV attenuation relation (Si and Midorikawa,1999) given as a function of Mw and source distance (r). Finally, Seismic Intensity is derived from the PGV. In this paper, we propose P-wave Magnitude(Mp)and seismic intensity directly estimated with P-wave information.

Mp is defined as a function of the maximum acceleration (or the maximum velocity) in the first three seconds of P-wave' onset and source distance. We found that Mp has a good correlation with Mw for intermediate earthquakes. It means that Mp might be a good parameter for estimating seismic intensity, instead of Mj. We also confirmed that seismic intensity has a good correlation with the maximum acceleration (or velocity). Then, seismic intensity at each target site is calculated from the maximum acceleration (or velocity) that is estimated from Mp and r.

Comparison between observed and estimated seismic intensities during the 2007 Mie-ken Chubu (the central Mie Prefecture) Earthquake shows that the method proposed here is useful for seismic intensity estimation for the Earthquake Early Warning.