Developing a Prototype System for Earthquake Early Warning Using Tau_c Method

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We developed a real-time processing system using local seismic network to test a different algorithm for earthquake early warning.

The real-time data we used is recorded by the strong motion seismometers which are installed by the Disaster Prevention Research Institute in Kyoto University. The data is win format (Urabe, 1992) with 1 second time interval, and the data latency is the order of a few seconds, which is quick enough for the purpose of real-time testing. Using this strong motion records, the magnitude and location for the earthquake is estimated by tau_c method (Kanamori, 2005; Wu and Kanamori, 2005).

Our system includes three modules, which works as follows: 1) Receive the win data in real time and write on shared memory. We use the program recvt in the win system (Urabe, 1992) for this module. 2) Read the win data in shared memory and compute the P-arrival time, tau_c period, and maximum acceleration, velocity, and displacement. These data information is written in the shared memory. 3) Compute the earthquake magnitude and location from the data information. Output the earthquake information as earthquake early warning report.

Before we run this real-time processing system, we obtained a new relationship for the magnitude and tau_c period, and the attenuation relationship for maximum displacement in Japan by using K-NET and KiK-net archives. Based on this new relationship, we can estimate the earthquake magnitude and location in real time.

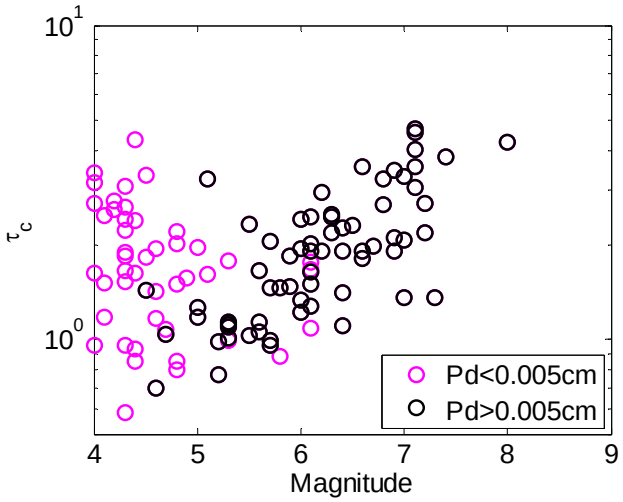

Figure 1: Relationship between tau_c and magnitude for 110 Japanese earthquakes. The dataset with Pd<0.005cm has large uncertainty due to low S/N ratio.