**From static to kinematic to kinematic**

GPS application of the real time Earthquake Early Warning

**Abstract**

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Earthquake early warning (EEW) is the rapid detection of an earthquake and prediction of the expected ground shaking within seconds. Such systems are implemented in Japan and Southern California, and beginning tested in Asia and Europe, also in Taiwan. Previously, the EEW methodologies use just a few seconds of P-wave data to estimate the magnitude of the event. However this methodology might be fail when the earthquake is large (M >7). For example the March 11, 2011 M9 Tohoku-oki earthquake, which triggered the existing Japan earthquake early warning system (JMA), but the seismically based magnitude for the warning system peaked at M8.1.

The real-time GPS take advantage on the permanent surface displacement and the large surface wave, while it would never saturate during the large shaking. It provides another way to detect earthquake and estimate the magnitude of the event. By applying a simple algorithm, a static off can be extracted shortly after the S-wave arrival. A dislocation model can be used to determine the slip distribution on the fault and to estimate the magnitude by the moment magnitude relation immediately. However such method may be suffered from the lack of constrain of the fault geometry, in the other words, the earthquake can occur on previously unidentified faults. A source inversion model is preferred in the immediately application. The real-time GPS base magnitude which is closer to the true magnitude and successfully determine an event before the strong shaking coming.

**References**

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