**Real – Time earthquake location and estimation of magnitude from the early P and S wave displacement peaks**

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An effective early-warning system must provide probabilistic estimates of the location and magnitude of a potentially destructive earthquake within a few seconds after the event is first detected. Real-time location technique based on an equal differential time (EDT) formulation and a probabilistic approach for describing the hypocenter estimation. The algorithm, at each time step, relies on the information from triggered arrivals and not-yet-triggered stations. With just one recorded arrival, the hypocentral location is constrained by the Voronoi cell around the first triggering station constructed using the travel times to the not-yet-triggered stations. With two or more triggered arrivals, the location is constrained by the intersection of the volume defined by the Voronoi cells for the remaining, not-yet-triggered stations and the EDT surfaces between all pairs of triggered arrivals. As time passes and more triggers become available, the evolutionary location converges to a standard EDT location. The technique (RTMag) is based on empirical prediction laws correlating the low-frequency peak ground displacement measured in a few seconds after the P and/or S phase arrival and the final event magnitude We developed a technique to estimate the probability density function (PDF) of magnitude, at each time step after the event origin. The predicted magnitude value corresponds to the maximum of PDF, while its uncertainty is given by the 95% confidence bound. The method has been applied to the 2007 (Mjma = 6.9) Noto Hanto and 1995 (Mjma = 7.3) Kobe earthquakes.

References

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