Geophysical Research Abstracts
Vol. 18, EGU2016-15222, 2016
EGU General Assembly 2016

A P-wave based, on-site method for Earthquake Early Warning

Aldo Zollo and the RISSC-Lab Early Warning Development Team
Department of Physics, University of Naples, Federico II (aldo.zollo@unina.it)

Can we rapidly predict the potential damage of earthquakes by-passing the estimation of its location and magnitude? One possible approach is to predict the expected peak ground shaking at the site and the earthquake magnitude from the initial P-peak amplitude and characteristic period, respectively. The idea, first developed by Wu and Kanamori (2005), is to combine the two parameters for declaring the alert once the real-time measured quantities have passed pre-defined thresholds.
Our proposed on-site early warning method generalized this approach, based on the analysis of strong motion data from modern accelerograph networks in Japan, Taiwan and Italy (Zollo et al., 2010). It is based on the real-time measurement of the period (τc) and peak displacement (Pd) parameters at one or more co-located stations at a given target site to be protected against the earthquake effects. By converting these real-time proxies in predicted values of Peak Ground Velocity (PGV) or instrumental intensity (IMM) and magnitude, an alert level is issued at the recording site based on a decisional table with four entries defined upon threshold values of the parameters Pd and Tc. The latter ones are set according to the error bounds estimated on the derived prediction equations. A near-source network of stations running the onsite method can provide the event location and transmit the information about the alert levels recorded at near-source stations to more distant sites, before the arrival of the most destructive phase. The network-based approach allows for the rapid and robust estimation of the Potential Damage Zone (PDZ), that is the area where most of earthquake damage is expected (Colombelli et al., 2012).

A new strategy for a P-wave based, on-site earthquake early warning system has been developed and tested on Japanese strong motion data and under testing on Italian data. The key elements are the real-time, continuous measurement of three peak amplitude parameters and their empirical combination to predict the ensuing peak ground velocity. The observed parameters are compared to threshold values and converted into a single, dimensionless variable. A local alert level is issued as soon as the empirical combination exceeds a given threshold. The proposed methodology provides a more reliable prediction of the expected ground shaking and improves the robustness of a single-station, threshold-based earthquake early warning system.