An on-site alert level early warning system for Italy

Alessandro Caruso, Simona Colombelli, Luca Elia, and Aldo Zollo

University of Naples Federico II, Department of Physics, Naples, Italy (alessandro.caruso@unina.it)

An Earthquake Early Warning (EEW) system is a real-time seismic monitoring infrastructure that has the capability to provide warnings to target cities before the arrival of the strongest shaking waves. In order to provide a rapid alert when targets are very close to the epicenter of the events, we developed an on-site EEW approach and evaluated its performance at the nation-wide scale of Italy. We use a single-station, P-wave based method that measures in real-time two ground motion quantities along the early P-wave signal: the initial Peak Displacement (Pd) and the average period parameter (τc). In output, the system provides the predicted ground shaking intensity at the monitored site, the alert level (as defined by Zollo et al., 2010) and a qualitative classification of both earthquake magnitude and source-to-receiver distance. We applied the on-site EEW methodology to a dataset of Italian earthquakes, recorded by the Italian accelerometric network, with magnitude ranging from 3.8 to 6, and evaluated the performance of the system in terms of correct warning and lead-times (i.e. time available for security actions at the target). The results of this retrospective analysis show that, for the large majority of the analyzed cases, the method is able to deliver a correct warning shortly after the P-wave detection, with more than 80% of successful intensity predictions at the target site. The lead-times increase with distance, with a value of 2-6 seconds at 30 km, 8-10 seconds at 50 km and 15-18 seconds at 100 km.