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Development and Testing of an Earthquake Early Warning System in Southern Italy

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With about six million of inhabitants the Campania region in southern Italy, is a zone at high seismic potential, due to a frequent moderate to large magnitude earthquake activity occurring on several active fault systems along the southern Apenninic belt. In the framework of an ongoing project, a prototype earthquake early warning system is being developed and tested, based on a dense, wide dynamic seismic network installed in the southern Apenninic chain (ISNet, Irpinia Seismic Network). We illustrate the system architecture and operating principles of the seismic Early Warning System in Campania Region, focusing on its innovative technological and methodological aspects. A probabilistic, evolutionary approach for the real time location and magnitude estimation is adopted, based on a general strategy, where the computation starts when few seconds of data from a small number of recording stations are available, and the source parameters estimations along with their uncertainties are progressively updated with time. Probability density functions (pdfs) for earthquake location, magnitude and attenuation parameters are therefore combined to predict with a quantified confidence a ground motion intensity at a distant target site. We analyze the system performances and evaluate the expected lead times and peak ground motion amplitudes at distant sites, by describing the results of a numerical experiment, where synthetic records from a number of large magnitude events have been computed and injected through the system, thus simulating the real-time data streaming and processing.