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The Irpinia Seismic Network (ISNet): a modern facility for earthquake early warning

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The Irpinia Seismic Network (ISNet) is a modern infrastructure at the core of the ongoing Earthquake Early Warning System (EEWS), under development in Southern Italy. The main target of the ISNet is to provide alerts for moderate to large earthquakes (M$>$4) to selected target sites in Campania Region, and to rapidly estimate ground shaking in the whole region in the immediate post-event.

The network covers an area of about 100$\times$70 km2, corresponding to the Apenninic active seismic zone, where several large earthquakes occurred during the last centuries, including the Ms=6.9, 1980 Irpinia earthquake. ISNet comprises 29, 6-components seismic stations equipped with both accelerometers and velocimeters, with real-time telemetry. Following a distributed approach, the network is organized in 6 sub-nets: waveform data is collected and elaborated at local hubs (LCC, Local Control Centers), which, in turn send processed parameters to a Network Control Center (NCC) in Naples, 100 km away from the network center.

The network is designed to provide estimates of the location and size of a potential destructive earthquake within a few seconds from the earthquake detection, through a fully probabilistic approach, where the computation results are continuously updated with time.

The real time location technique (RTLoc) combines data coming from triggered sta-

tions with the information that, at the given time, the other stations have not yet triggered, thus reducing the possible hypocentral volume. This volume is described as a probability density function and is defined by equal differential time (EDT) surfaces, for each pair of triggered/triggered or triggered/not-triggered stations.

Magnitude is estimated by a real-time, evolutionary approach (RTMag) which makes use of empirical predictive models correlating the final event magnitude with the P-displacement amplitudes, measured on first 2-4 seconds of record after the first-P arrival. Following a Bayesian approach, at each time step, the method evaluates the conditional probability density function of magnitude using, as a-priori, the Gutenberg-Richter relationship and the results of the computation made at the previous step.

Evolutionary estimates of location and magnitude are the core elements of the real-time seismic hazard analysis: at each time step the system computes the probabilistic distribution, or hazard curve, of ground motion intensity measures (IM), including the peak ground acceleration (PGA) or the spectral acceleration (Sa) at selected sites.

The performances of the EEW system are evaluated through its application to earthquake simulated at the network sites.