



## Earthquake early warning for Romania – most recent improvements

Alexandru Marmureanu (1), Luca Elia (2,3), Claudio Martino (2,3), Simona Colombelli (2), Aldo Zollo (2,3), Carmen Cioflan (1), Victorin Toader (1), Gheorghe Marmureanu (1), George Marius Craiu (1), and Constantin Ionescu (1)

(1) National Institute for Earth Physics, Seismic Network, Romania, (2) Department of Physics, University of Naples Federico II, Naples, Italy, (3) AMRA scarl, Naples, Italy

EWS for Vrancea earthquakes uses the time interval (28-32 sec.) between the moment when the earthquake is detected by the local seismic network installed in the epicenter area (Vrancea) and the arrival time of the seismic waves in the protected area (Bucharest) to send earthquake warning to users. In the last years, National Institute for Earth Physics (NIEP) upgraded its seismic network in order to cover better the seismic zones of Romania. Currently the National Institute for Earth Physics (NIEP) operates a real-time seismic network designed to monitor the seismic activity on the Romania territory, dominated by the Vrancea intermediate-depth (60-200 km) earthquakes. The NIEP real-time network consists of 102 stations and two seismic arrays equipped with different high quality digitizers (Kinematics K2, Quanterra Q330, Quanterra Q330HR, PS6-26, Basalt), broadband and short period seismometers (CMG3ESP, CMG40T, KS2000, KS54000, KS2000, CMG3T, STS2, SH-1, S13, Ranger, gs21, Mark 122) and acceleration sensors (Episensor).

Recent improvement of the seismic network and real-time communication technologies allows implementation of a nation-wide EEWS for Vrancea and other seismic sources from Romania.

We present a regional approach to Earthquake Early Warning for Romania earthquakes. The regional approach is based on PRESTo (Probabilistic and Evolutionary early warning SysTem) software platform: PRESTo processes in real-time three channel acceleration data streams: once the P-waves arrival have been detected, it provides earthquake location and magnitude estimations, and peak ground motion predictions at target sites.

PRESTo is currently implemented in real-time at National Institute for Earth Physics, Bucharest for several months in parallel with a secondary EEWS. The alert notification is issued only when both systems validate each other. Here we present the results obtained using offline earthquakes originating from Vrancea area together with several real-time detection of significant earthquakes from Vrancea and Transylvania areas that occurred in the last months. Currently the warning notification is sent to several users including emergency response units from 12 counties, a big bridge located in Bucharest, a nuclear sterilization facility in Măgurele city and to the nuclear power plant from Cernavoda.