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# Feasibility study on earthquake early warning application to schools: the example of the ITIS 'E. Majorana', Somma Vesuviana, Naples (Italy)

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One of the main objective of the WP7 (Strategic Applications and Capacity Building) in the framework of the REAKT-Strategies and tools for Real Time Earthquake RisK ReducTion FP7 European project, is to evaluate the effectiveness of EEW and real-time risk assessment procedures in reducing seismic risk to various industrial partners and end-users. In the context of the REAKT project, the AMRA-RISSCLab group is engaged in a feasibility study on the application of earthquake early-warning procedures in two high schools located in the Irpinia region (South Italy), an area that in the 1980 was struck by a magnitude 6.9 earthquake.
In this work we report on the activities carried out during the last 24 Months at the school ITIS 'E. Majorana', located in Somma Vesuviana, a village in the neighbourhood of Naples. In order to perform a continuous seismic monitoring of the site, which includes a rather complex structure building, 5 accelerometric stations have been installed in different part of the school. In particular, a 24-bit ADC (Sigma/Delta) Agecodagis-Kefren data-logger has been installed with a Guralp CMG-5TC accelerometer with a 0.25g full-scale in the school courtyard, while 4 SOSEWIN sensors have been also installed at different locations within the building. Commercial ADSL lines provide transmission of real-time data to the EEW centre. Data streams are now acquired in real-time in the PRESToPlus (regional and on-site, threshold-based early-warning) software platform [1].
The recent December 29, 2013 M 5.1 Monti del Matese Earthquake, gave us the unique opportunity to use real strong motion data to test the performance of threshold-based early warning method at the school. The on-site method [2] aims to define alert levels at the monitored site. In particular, at each station the characteristic P-waves period ($\tau$c) and the peak displacement (Pd) are measured on the initial P-wave signal. They are compared with threshold values, previously established through an empirical regression analysis, to produce an alert level at each station that can be correlated with the expected local damage in a robust way. At the same time, by means of the software PRESTo and a newly developed prototype of a low-cost EEW sentinel, these data have been also used to run an EEW drill at a few school classes.
Finally, the preliminary results of the vulnerability study carried out at the school will be also shown. Indeed, after some preliminary in-situ surveys, structural and non-structural components, which are involved in the vulnerability analysis, have been identified. Hence, geometrical and mechanical model definition was performed and dynamic properties were carried out through a modal analysis. The evaluation of the seismic capacity has been performed through an incremental nonlinear static analysis approach, thus identifying seismic intensity levels leading to different Damage States in structural and non-structural components.

References

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