



Improvements of the Regional Seismic network of Northwestern Italy in the framework of ALCoTra program activities

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Arpa Piemonte (Regional Agency for Environmental Protection), in partnership with University of Genoa, manages the regional seismic network, which is part of the Regional Seismic network of Northwestern Italy (RSNI). The network operates since the 80s and, over the years, it has developed in technological features, analysis procedures and geographical coverage. In particular in recent years the network has been further enhanced through the integration of Swiss and French stations installed in the cross-border area.

The environmental context enables the installation of sensors in sites with good conditions as regards ambient noise and limited local amplification effects (as proved by PSD analysis, signal quality monitoring via PQLX, H/V analysis). The instrumental equipment consists of Broadband and Very Broadband sensors (Nanometrics Trillium 40" and 240") and different technological solutions for signals real-time transmission (cable, satellite, GPRS), according to the different local environment, with redundant connections and with experimental innovative systems.

Digital transmission and acquisition systems operate through standard protocols (Nanometrics, SeedLink), with redundancy in data centers (Genoa, Turin, Rome). Both real-time automatic and manual operational procedures are in use for signals analysis (events detection, picking, focal parameters and ground shaking determination).

In the framework of cross-border cooperation program ALCoTra (<http://www.interreg-alcotra.org>), approved by the European Commission, several projects have been developed to improve the performances of seismic monitoring systems used by partners (Arpa Piemonte, Aosta Valley Region, CNRS, Joseph Fourier University). The cross-border context points out first of all the importance of signals sharing (from 14 to 23 stations in narrow French-Italian border area, with an increase of over 50%) and of coordination during new stations planning and installation in the area.

In the ongoing ALCoTra project "CASSAT" (Coordination and Analysis of Alpine Trans-border Seismic Surveillance), we evaluate the improvement of monitoring systems performances in terms of localizations precision and number of detections. Furthermore, we update the procedures for the production of ground shaking maps, with installation of accelerometers and integration of new available data for site effects assessment (VS30 map, FA-VS30 correlations by numerical simulations of seismic response), determined for the specific regional context from geophysical surveys data and geological analysis.

As a consequence of the increase of available data due to new stations installation and recently recorded events, a new local magnitude scaling law is calibrated for the area.

We also develop a parametric methodology to improve network real-time localization procedures in Northwestern Italy. The area, surrounded by Western Alps and Northern Apennines, presents a complex system of lithospheric structures, characterized by strong heterogeneities of various physical parameters (Ivrea Body, subducting European lithosphere, Ligurian Sea Moho, Po Valley deposits). We work with a localization algorithm (Hypoinverse-2000) suitable for such a heterogeneous context, adopting multi-1d crustal velocities models, linked to epicentral coordinates. In this analysis, first we build velocities models integrating several available geophysical and geo-structural data; then we test jointly both models and algorithm parameters with specifically developed automatic iterative procedures, through batch scripting, database, GIS and statistical analysis tools.