Assessment of performance of an automatic procedure for a review of recent seismicity in Western Alps compiling an homogeneous and reliable catalog

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The Alpine chain marks the border between different nations, so it’s important in this area the cooperation, the data sharing and the coordination among institutions operating in contiguous regions and nations that are involved in the observation and the management of natural hazards such as earthquakes affecting large portions of the territory.

As part of the Interreg Alcotra cross-border program, one of the objectives of the RISVAL project concerns the improvement of the seismic hazard assessment and in general of the knowledge of seismicity in the Western Alps. In this area, Italian, French and Swiss stations operate in various national and regional networks, connected to each other, sharing data also with European services (e.g. EIDA). Streaming raw data are the basic type of data shared, since each institution produces its own analyses and computed data, resulting for instance in different seismic catalogs, with of course different characteristics, also in spatio-temporal boundaries.

Furthermore the monitoring and analysis systems have been interested over the years by technological developments, so that the available data grow exponentially and the catalogs derived from the surveillance activities in near-real time show several internal inhomogeneities in the various time intervals, also considering the different sensitivity and subjectivity of the operators who alternate in carrying out the manual review.

Therefore emerges the need to process increasingly large amounts of data available, that could be re-analyzed and updated in a homogeneous way according to new developments. To face this effort we wanted to test the performance of a complete automatic procedure (Scafidi et. al, 2019) to re-compile a portion (2012-2019) of the seismic catalog derived by RSNI network (Regional Seismic network of Northwestern Italy) operating routines, including travel-time and strong-motion parameters dataset.

The procedure, driven by customizable set of parameters suitable for network geometry and seismicity features, relies on a multistep algorithm, that in this work we tested skipping the initial steps concerning the event detection tool on continuous raw data. So we perform it on 21391 already available detected waveform traces for 1549 events: 1) automatic P- and S-phase picker, 2)
hypocenter locator (using NonLinLoc package and 3D velocities model), 3) magnitude and strong-motion parameter calculator.

We firstly evaluate the results for the re-compiled catalog both in terms of distributions of errors and other quality parameters and in terms of time-residuals distributions on the basis of azimuth variation for each station, distinguishing shorter and longer epicentral distances, in order to evaluate anomalies in propagation velocities pattern.

Then we compare the new catalog results with manual catalogs available in the area, to point out differences in sources and stations calculated parameters: primarily the original RSNI, confirming the reliability of the method, then the Italian national CPTI by INGV, and, with a closer view in the cross-border Alps area, the French ones (RéNaSS, Sismoazur, SISmalp).