Exploring the feasibility of an early warning system in a moderate seismicity context: case study of Pyrenees

Samuel Auclair (1), Xavier Goula (2), Jose-Antonio Jara (3), Yolanda Colom (2), Anne Lemoine (1), and Bastien Colas (1)

(1) Bureau de Recherches Géologiques et Minières (BRGM), (2) Institut Geològic de Catalunya (IGC), (3) GEOCAT

The massif of Pyrenees, who results from compressive movement between Iberic and Eurasian tectonic plates and who marks out the natural border between France and Spain, presents a moderate seismicity responsible of many destructive earthquakes over history, which maximum magnitude could probably reach 6.0-6.5. Thus Pyrenees constitute one of the Spanish and French areas where the seismic hazard is the most important, what have led to the progressive development of seismological forecasting networks around the massif. In this context, the *SISPyr* Interreg project (www.sispyr.eu) has as principal objective to allow the pooling of Pyrenean seismological data and to improve the massif coverage by the networks favouring the progressive transition to real-time data transfer technologies. In order to make profit of advantages offer by real-time seismology, the *SISPyr* project also aims at to assess the feasibility of a Pyrenean earthquake early warning system (EEW).

In a first time, the *SISPyr* seismic network had been examined in order to assess its adaptability to early warning purposes. In particular, redundancy issues, network coverage, data processing and time latency of the existing real-time system have been analysed. The main conclusion of the previous analysis is that the existing network and system could be the base of an EEW implementation for Pyrenees.

Then different rapid magnitude determination methodologies have been tested (so called τ_c, τ_p^{max} and P$_d$/P$_v$ methods) in order 1) to check their adaptability to the Pyrenean context and 2) to establish empirical relationships usable in Pyrenees. To that end, a waveform catalog had first been constituted, gathering more than 4.000 records from 195 Pyrenean seismic events. The analysis of these records has allowed us to bringing to light clear correlations between earthquakes' reference magnitudes and four waveforms indicators calculated from first seconds of the P wave on the vertical component. In order to extend the validity domain of these relationships to greater magnitudes (no Pyrenean data for Ml≥5.5 events), our data had then been successfully confronted to different published relationships established from foreign data.

Today, the main issue is to determine in which extend these "reference" relationships could be used for early warning purposes in Pyrenees, for earthquakes associated to high return periods. This analysis relies firstly on the test of a warning emission process, and secondly on a potential end-users survey in order to evaluate their wishes in terms of earthquake early warning.