Improving the Detectability of the Catalan Seismic Network for Local Seismic Activity Monitoring

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The seismic survey of the territory of Catalonia is mainly performed by the regional seismic network operated by the Cartographic and Geologic Institute of Catalonia (ICGC).

After successive deployments and upgrades, the current network consists of 16 permanent stations equipped with 3 component broadband seismometers (STS2, STS2.5, CMG3ESP and CMG3T), 24 bits digitizers (Nanometrics Trident) and VSAT telemetry. Data are continuously sent in real-time via Hispasat 1D satellite to the ICGC data-center in Barcelona. Additionally, data from other 10 stations of neighboring areas (Spain, France and Andorra) are continuously received since 2011 via Internet or VSAT, contributing both to detect and to locate events affecting the region.

More than 300 local events with $Ml \geq 0.7$ have been yearly detected and located in the region. Nevertheless, small magnitude earthquakes, especially those located in the south and south-west of Catalonia may still go undetected by the automatic detection system (DAS), based on Earthworm (USGS). Thus, in order to improve the detection and characterization of these missed events, one or two new stations should be installed.

Before making the decision about where to install these new stations, the performance of each existing station is evaluated taking into account the fraction of detected events using the station records, compared to the total number of events in the catalogue, occurred during the station operation time from January 1, 2011 to December 31, 2014. These evaluations allow us to build an Event Detection Probability Map (EDPM), a required tool to simulate EDPMs resulting from different network topology scenarios depending on where these new stations are sited, and becoming essential for the decision-making process to increase and optimize the event detection probability of the seismic network.