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Testing the ability of different seismic detections approaches to monitor aftershocks following a moderate magnitude event.

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The detection and picking of seismic events is a permanent concern for seismic surveying, in particular when dealing with aftershocks of moderate magnitude events. Many efforts have been done to find the balance between computer efficiency and the robustness of the detection methods.

In this work, data recorded by a high density seismic network deployed following a 5.2 magnitude event located close to Albacete, SE Spain, is used to test the ability of classical and recently proposed detection methodologies. Two days after the main shock, occurred the 23th February, a network formed by 11 stations from ICTJA-CSIC and 2 stations from IGN were deployed over the region, with inter-station distances ranging between 5 and 10 km. The network remained in operation until April 6th, 2015 and allowed to manually identify up to 552 events with magnitudes from 0.2 to 3.5 located in an area of just 25 km2 inside the network limits.

The detection methods here studied applied are the classical STA/LTA, a power spectral method, a detector based in the Benford's law and a waveform similarity method. The STA/LTA method, based in the comparison of background noise and seismic signal amplitudes, is taken as a reference to evaluate the results arising from the other approaches. The power spectral density method is based in the inspection of the characteristic frequency pattern associated to seismic events. The Benford's Law detector analyses the distribution of the first-digit of displacement count in the histogram of a seismic waveform, considering that only the windows containing seismic wave arrivals will match the logarithmic law. Finally, the waveform similarity method is based in the analysis of the normalized waveform amplitude, detecting those events with waveform similar to a previously defined master event.

The aim of this contribution is to inspect the ability of the different approaches to accurately detect the aftershocks events for this kind of seismic crisis and to compare the highlights and pitfalls of each approach, to finally implement the best-suited methods as automatic processing routines.