A Review of the Instrumental Seismic Monitoring in Greece: earthquake monitoring network capabilities

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The instrumental era of earthquake monitoring in Greece started back in the period 1899-1906 with the deployment of the first five seismic stations by the National Observatory of Athens, Institute of Geodynamics (NOA-IG). Over the years, several upgrades and expansions were implemented improving the earthquake monitoring capabilities. Today, a unified national seismic network operates, combining almost all permanent modern seismic stations in the country and serving the research community by providing waveform and parametric data in near real time. The examination of the detection capabilities through the evolution of the National Seismic Network in Greece demonstrates the effect of the changes and their impact in the available earthquake catalogues. In the present study we use the available parametric bulletin database of the International Data Centre (ISC), which contains all reported phases and amplitude measurements by all officially reporting agencies. Specifically, we use the available locations and magnitudes provided by the National Institutes, and the ISC revised locations and magnitudes where necessary, for the earthquakes that have been recorded by the seismic stations within the country's physical borders. In order to explore the evolution of the network capabilities and its true operation we apply two different methods: (i) based on the method of Kvaerna and Ringdal (2013), we split the area of interest in a 0.2x0.2 degrees regular grid and we determine the 50% probability detection threshold for each station-grid cell pair for different periods, and (ii) we employ the probability-based magnitude of completeness method of Schorlemmer and Woessner (2008) and provide detection probabilities of all magnitudes and completeness magnitudes on a 0.1x0.1 degrees grid for every three months starting 1970 and for three different depths layers (15km, 60km and 100km). For the latter method, we also provide completeness estimates for the entire territory of Greece for easy catalog filtering, taking into account the spatial detection heterogeneity.