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Monitoring man-made hazards using data recorded with the Romanian seismic and infrasonic arrays

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Seismic events observed with the Romanian Seismic Network, operated by the National Institute for Earth Physics, are produced by various sources: earthquakes, mining and quarry blasts, thunderstorms, atmospheric and underground explosions. To monitor man-made seismic sources, data recorded by the Romanian seismic and infrasonic arrays deployed at Plostina seismo-acoustic site (PLOR and IPLOR stations) and at Bucovina seismo-acoustic site (BURAR and BURARI stations) are jointly analyzed in order to build an efficient tool for discrimination between anthropogenic and natural events, i.e. between explosions and tectonic earthquakes. At the same time, our work supports the attempt to clean the Romanian seismic catalogue from non-tectonic events.
A specific methodology for the seismo-acoustic analysis has been developed. The main analysis steps consist of: (1) selection of natural and artificial reference events detected by seismo-acoustic arrays considered; (2) analysis of the infrasound detections using standard array processing methods – array data processing software "ep" – provided by NORSAR, in order to extract the signal features (backazimuth, apparent velocity, frequency content, amplitude, SNR); (3) analysis of the seismic detections using the same array data processing software, in order to extract the characteristics of their seismic signature (waveform shape, frequency content, amplitude, particle motion; (4) combination of the infrasonic detections with seismic ones in order to associate them with the reference events based on comparison of the backazimuth estimates and arrival time measurements with the theoretical/expected values and taking in account the effect of the atmospheric propagation conditions; (5) identification of the near-surface explosions produced in the local quarries using the analyzed seismo-acoustic signals and discrimination between these blasts and tectonic earthquakes.
In the future we aim to extract templates of the seismo-acoustic signals generated by the man-made explosions and compare them with the continuously recorded waveforms in order to develop an automatic event identification process.