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Infrasound Events Detection Using Plostina Seismo-Acoustic Array

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Plostina seismo-acoustic array has been recently deployed in the Vrancea epicentral area by the National Institute for Earth Physics (NIEP). This array is distributed within a 2.5 km aperture and consists of 6 seismic sites (PLOR1, PLOR2, PLOR3, PLOR4, PLOR5 and PLOR6) and 7 infrasound elements (IPL2, IPL3, IPL4, IPH4, IPH5, IPH6 and IPH7), collocated in the sites 2 to 7. In addition, sites 2, 3 and 4 are equipped with electrometers and three-component fluxgate sensors. All collected data are continuously recorded and real-time transmitted to the Romanian National Data Centre, in Bucharest, where they are processed and archived. The array was designed mainly for the seismic monitoring of the local and regional events, as well as for the acoustic measurement, i.e. detection of the infrasound events (explosions, mine and quarry blasts, earthquakes, aircraft etc.).
Data recorded with the Plostina seismo-acoustic array are analyzed using two programs: one of them, kindly provided by NORSAR, is applied to the seismo-acoustic data for the event detection and characterization, using frequency-wave number analysis, while the other, based on the Progressive Multi-Channel Correlation (PMCC) algorithm, is used for the infrasound data processing.
The results obtained by applying the two types of detectors, for the seismo-acoustic data recorded from the infrasound events observed with the Plostina array are presented. The explosions generate infrasound waves which are recorded at the acoustic elements. The sound waves also result in ground-motion which is recorded at the seismic array and, using array processing methods of the data (beamforming, f-k analysis) many marginal signals can be detected. Therefore, for each explosion, seismic phases (P and S) can be associated, and later, a signal travelling with the air sound speed and coming from the approximately the same direction is observed on the seismogram.
On the other hand, applying the PMCC algorithm, in the first part of the signal, coherent wave trains with values of trace velocity greater than 3 km/s can be associated with the passage of seismic waves across the infrasonic array. Another group of signals, corresponding to infrasonic waves can be detected as generated over a large effective source area surrounding the epicenter. The PMCC algorithm allows a precise description of the global wave train with complex variations of azimuth and velocity, based on the ability to obtain high-resolution continuous detection and propagation parameter measurements.