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Seismo-acoustic analysis for series of ammunition demolition explosions at Sayarim, Israel

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We analyzed detection and location capabilities of a seismo-acoustic network using records of explosion series conducted recently at Sayarim Military Range (SMR), Israel, for demolition of outdated ammunitions. The signals from the explosions have been recorded at local distances by the Israel Seismic Network (ISN), two single infrasound sensors co-located with ISN seismic stations and two infrasound arrays deployed by Israel NDC: 5-element IMA (at Mt. Meron), co-located with IMS seismic array MMAI, and 4-element test temporary array in Northern Negev. All shots (each one with nominal explosives weight $\sim$10-15 tons, detonated simultaneously) were located at the same small area $\sim$0.5x0.5 km, in some cases placed in several grooves, separated by 0.3-0.5 km. Some shots were divided in time by only 20-40 sec, facilitating analysis of the source variability under about constant atmospheric conditions.

The following preliminary results have been obtained: 1) the accuracy of seismo-acoustic source location, provided by 5 seismic stations and 2 acoustic receivers using celerity model and wind profile for the day, was within $\pm$1 km of the SMR explosion site; 2) the analysis of acoustic phases recorded at ISN seismic stations at different azimuths showed a clear correlation of the phase peak amplitude with the wind direction; 3) infrasound signals from the explosions were clearly detected at IMA array at 340 km, whereas seismic signals were attenuated below the background noise after 100-150 km; 4) the frequency band occupied by the signal is estimated within 0.2-5 Hz, and the f-k analysis, applied to the infrasound array recordings, provided azimuth of 184º and apparent velocity of 344 m/s, compared to the true azimuth 190º and celerity 277 m/s (the azimuth bias could be explained by the prevailing strong south-western winds $\sim$80 knots observed at a time of the explosion at assumed propagation heights); 5) spectral analysis of infrasound signals provided determination of the dominant period used for rough estimating of the source yield based on an empirical relationship.

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