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-Blast Data for Sayarim Calibration Explosions Facilitate New Method of Source Identification and TNT Yield Estimation

Large on-surface explosions were conducted by the Geophysical Institute of Israel at Sayarim: 82 tons of strong HE explosives in August 2009, and 10&100 tons of ANFO explosives in January 2011 (initiated and supported by the CTBTO). The main goal was to provide strong controlled sources in different wind conditions, for calibration of IMS infrasound stations. High-pressure gauges were deployed at 100-600 m to record air-blast properties and provide reliable yield estimation. The rarely reported Secondary Shock (SS) phenomenon was clearly observed at the gauges, and numerous seismic and acoustic sensors. Empirical relationships for peak pressure, impulse, and SS time delay were developed and analyzed. The parameters, scaled by the cubic root of estimated TNT equivalent charges, were found uniform for all explosions, except of SS delays, clearly separated for 2009 and 2011 shots, thus demonstrating clearly dependence on the type of explosives with different detonation velocity. Additionally air-blast records from non-Sayarim shots, were used to extend the charge and distance range for the SS delay relationship, and showed consistency with Sayarim data. Obtained results evidence that measured SS delays can provide important information about an explosion source character, and can be used as a new simple cost-effective yield estimator.

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