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Decoupling and DOB explosion experiments in Israel

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We studied empirical features of seismic energy generation for different explosion seismic sources, and partitioning of this energy between regional phases, in specific geological conditions and tectonic settings of the Middle East. The goal of the research was to provide data for improvement of nuclear test monitoring within the framework of the CTBT. Experimental explosions with near-spherical charges at different depths were conducted at Oron phosphate quarry in Northern Negev. A special complicated technology was applied for creation of large cavities (up to 3.5 m size) at different depths for accommodation of explosives, using boreholes with 6.5" diameter only. A number of decoupled and fully coupled explosions in the cavities with charges 1240 kg ANFO were conducted on July 17, 2006. Extensive observations in near-source zone and remote area demonstrated peculiar signal features and energy generation related to these specific decoupled seismic sources. On January 2, 2007, after long preparations and many efforts the unique Depth-of-Burial (DOB) experiment with original design and configuration was successfully conducted. The explosion series of three charges of 4200 kg ANFO each one were detonated at different depths: 26 m, 45 m and 59 m. The design and configuration of the explosions were different and preferable compared to previous similar experiments: near-spherical charges, small separation (only 180-220 m), placement of all seismic sources in the same consolidated sediments (marls). The charges were fully stemmed, the explosions were fully contained. Numerous good recordings of signals from all shots were obtained at portable near-source accelerometers and close-in 3C seismic stations, permanent local Israel SP and BB stations, and IMS stations EIL and MMAI (240 km). A clear correlation between charge deepening and magnitude/peak-amplitude reducing was observed. Obtained data will contribute to the ability of parameter estimation of nuclear explosions. Oron experiments demonstrated feasibility of the utilized technology of seismic source design for creation of near-spherical charges of different size (up to 7-10 tons) and at different depths (up to 70-80 m) and conducting broad-scale, low-cost experimental series: decoupling,

DOB, variable charge weight. The research was sponsored by the AFRL of the US Department of Defense.