

Source Characterization for Chemical Explosions in Air

Explosive events in the atmosphere create significant pressure waves in the air. Those pressure waves propagate as shock waves near the source and quickly transitioned into acoustic waves in the far-field. Since low-frequency acoustic waves, so called infrasound, propagate long distances without significant loss of energy, acoustic signals induced by explosions are used to determine explosion energies of the events in terms of an explosion yield. In order to estimate the explosion energy accurately, the relationship between acoustic energy and explosion yield must be understood. However, explosion energies are often measured by non-linear shock waves in the near-field, and it is not clear how much acoustic energy accounts for the explosion energy. In addition, acoustic signals typically have lower-frequency contents than shock waves in the near-field, and hence frequency-dependent explosion energy should be understood to accurately infer explosion yields based on acoustic observations. In this study, we investigate the relationship between acoustic energy and explosion yield based on ground-truth explosion data. A standard acoustic source waveform will be determined by acoustic observations, and frequency-dependent energy will be explored for yield estimation. We will demonstrate that this frequency-dependent acoustic source characterization can improve the accuracy and confidence of explosion yield estimation.

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