

## Seismo-acoustic Measurements of Bolides

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Fireballs produce shock waves which are detectable at the ground using seismic or infrasonic instruments. Near field acoustical signals from fireballs (ranges < 200 km), when detected by dense ground networks, may be used to estimate the orientation of the trajectory of the fireball (Pujol, 2006) as well as fragmentation locations (Kalenda et al., 2013; Edwards et al., 2004). Distinguishing ballistic arrivals (from the cylindrical shock of the fireball) from fragmentation generated signals (quasi-spherical sources) remains a challenge. Fireball airwaves have been previously successfully used to measure trajectories, but inversion of these signals usually assumes a single atmospheric model without examination of wind field uncertainties. This study will explore the sensitivity of seismo-acoustic fireball solutions by implementing a wind variability model, reflecting the uncertainty in atmospheric measurements. The expected atmospheric variations in arrival times will be compared to theoretical estimates of expected arrival time variances due to the finite velocity of fireballs as a means to gauge the prospect of measuring fireball speeds (and hence orbits) from seismo-acoustic signals alone. We explore wind variance sensitivity on trajectory solutions as well as approaches for distinguishing ballistic vs. fragmentation signals using the Stubenberg meteorite fall as a case study.