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Title: The effects of minute-scale atmospheric variability on the acoustic signature of surface explosions
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Acoustic waves provide important information on the yield and emplacement conditions of explosions.
However, the atmosphere is dynamic on time scales ranging from seconds to decades, posing a unique problem for deterministically modeling the propagation of acoustic waves.
For example, recent work has shown that acoustic amplitudes can vary by a factor of three over 90 minutes, even when the source and receiver are identical.
Last fall, a series of 1 ton TNT equivalent, nearly co-located explosions were detonated 90 seconds apart to bound the time scales over which this amplitude and waveform variability occurs.
This experiment, called TurboWave, had two objectives: 1) Investigate acoustic variability over local (<20 km) ranges, likely related to turbulence and other small scale phenomena in the planetary boundary layer and 2) Determine the impacts of short period (~300 second) gravity waves on infrasound refracted from the stratospheric jet.
We report on the results from this initiative, first investigating source and topographically driven variability and then relating the remaining amplitude and waveform discrepancies to minute-scale variations in the planetary boundary layer and the middle stratosphere.