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Theory and observation of the two primary stratospheric phases in ground to ground infrasound propagation

Roger Waxler (1), Läslo Evers (2), Philip Blom (1), and Jelle Assink (1)

(1) NCPA, University of Mississippi, University, MS, 38677 USA (rwax@olemiss.edu), (2) Royal Netherlands Meteorological Institute (KNMI) Seismology Division PO Box 201, 3730 AE De Bilt, The Netherlands

Ground to ground infrasound propagation along paths which travel downwind relative to the stratospheric jet are considered here. Theory predicts that there are two types of stratospheric returns: fast arrivals with trace velocities close to the effective sound speed at the stratopause, and slower arrivals with trace velocities close to the sound speed on the ground. Definite predictions are made for the ratios of the amplitudes of these phases, and for the relationship between their waveforms. A particularly striking example of returns from the stratosphere is found in the signals received in the Netherlands from the vapor cloud explosion at the oil depot near Buncefield, UK in 2005. At the time and latitude of the explosion, the stratospheric jet was particularly strong, reaching wind speeds of up to 180 m/s. In this presentation, theory will be presented and compared to the observations of the signal from the Buncefield explosion.