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A Method for Specifying Atmospheric Gravity Wave Fields for Long-range Infrasound Propagation Calculations

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Two important challenges in infrasound propagation physics are; 1) explain frequently observed infrasound signals in the classical near-field shadow zones, 2) accurately predict observed waveform amplitude and signal duration. For these problems the role that small-scale internal atmospheric gravity wave fluctuations play has recently been realized [e.g., Millet et al., 2007; Kulichkov et al., 2010; Chunchuzov et al., 2011; Green et al., 2011]. This paper provides a methodology for representing small-scale internal gravity wave fluctuations which is suitable for infrasound propagation calculations. Adapted from the numerical weather prediction and climate modeling communities, the resulting stochastic gravity wave noise field model is three dimensional, time dependent, and self-consistent with the atmospheric background state. To illustrate the methodology the resultant gravity wave fields are applied to ray-trace simulations of observed infrasound travel times for a dense seismic network in the Western United States which recorded infrasound signals from a large surface explosion.