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# Nonlinear Propagation Modeling of Infrasound

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The significance of nonlinear propagation effects on infrasound is studied using the Nonlinear Progressive Wave Equation (NPE) [B. E. McDonald and W. A. Kupperman, J. Acoust. Soc. Am., 81, 1406–1417 (1987)]. The NPE model accounts for nonlinear effects associated with a weak shock front, including shock-driven energy loss and self refraction. Numerical implementation is accomplished using a pseudo-spectral approach, which provides excellent computational efficiency while still maintaining acceptably small numerical errors. The nonlinear effects are isolated by generating NPE predictions with the nonlinear terms turned on and off. With the nonlinear terms off, the NPE reduces to a standard linear PE formulation. Waveform predictions through a realistic atmosphere are compared to ground truth observations to evaluate the NPE model performance and assess the influence of the nonlinear effects along the propagation path.