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Comparison of nonlinear infrasound propagation models with observations

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An algorithm has been written to numerically solve the nonlinear transport equation for infrasonic propagation in the atmosphere as previously derived by Robinson (Ph.D. Thesis, Univ. of Texas, 1991) and Gaineville (Ph.D. Thesis, École Centrale de Lyon, 2008). This algorithm is used to analyze data obtained from recent Tungurahua volcanic eruptions in Ecuador and from Trident Missile rocket motor fuel elimination events in Utah and the recent 100 ton Sayrim (2011) experiment. Tropospheric, stratospheric, and thermospheric arrivals are studied. The algorithm is used to estimate the amplitude of the source, dominant frequency of the received signal, and the attenuation in the thermosphere. Tropospheric arrivals show little nonlinear distortion. Stratospheric arrivals show nonlinear distortion for sufficiently high amplitude signals. Thermospheric arrivals are stongly distorted. Analysis of thermospheric arrivals indicates that the Sutherland-Bass model seems to overestimate the attenuation in the thermosphere. It also shows that the dominant frequency of the signal received decreases as the return heights of the signal increases in the thermosphere. An overview of the results and copmparisons with data will be presented.