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for Characterizing Meteors from Infrasound Signals

Within the last few years recent theoretical models have enabled better estimates of meteor-generated infrasounds, thus enabling enhanced descriptions of past events such as the Carancas and Chelyabinsk meteor falls. These models are often derived by employing weakly-nonlinear Whitham's approximations to Burgers equation. Even though it is known how to incorporate the effect of strongly-nonlinear waves that emanate from meteor sources, the use of such theory has been restricted to cases in which the underlying atmosphere is deterministic and in cases in which dispersion is ignored. In the pursuit of the most suitable model for application of CTBT validation, it has been deemed necessary to include random small-scale perturbations (gravity waves, turbulence) within the available atmospheric specifications. Moreover, addition of dispersion phenomena in nonlinear models becomes important when considering long-range infrasound propagation problems and has not been thoroughly studied. In this work, we introduce and comparatively analyze results developed from nonlinear models that include dispersion and atmospheric randomness and discuss how such an analysis can benefit future characterization of meteor sources. Theoretical trends are compared to numerical results obtained by solving a generalized Burgers equation with a Fourier-Galerkin spectral numerical scheme.

Primary author: HAYNES, Christophe (Humboldt University of Berlin)

Presenter: HAYNES, Christophe (Humboldt University of Berlin)

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