ID: Type: **Oral**

atmospheric updating to construct high precision models of propagation effects for source localization and event characterization

The dynamic and poorly sampled nature of the atmosphere has posed an ongoing challenge in infrasound propagation modeling applications due to the associated uncertainty in the acoustic propagation medium. Propagation-based, stochastic models defining seasonal trends in path geometry and travel times as well as transmission loss have been constructed using archived atmospheric specifications combined with ray tracing and normal mode simulation capabilities, respectively, and produced promising improvements in relevant applications. Improving the precision of these models requires refinement of the suite of atmospheric states considered in the stochastic formulation, which can be accomplished via atmospheric updating analysis. Such analysis aims to identify perturbations to an initial estimate of the atmospheric state that improves agreement between observed and predicted propagation characteristics. Several approaches to atmospheric updating for infrasonic propagation modeling will be discussed and evaluated in cases with and without ground truth source locations and origin times using a combination of synthetic and real-world data sets.

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Track Classification: Modelling & Network Performance