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Analysis and Propagation Modeling of Dynamic Sources of Opportunity

Sources of opportunity play a key role in expanding our understanding of source physics and validating propagation models. For dynamic sources, such as rockets, the modeling is complicated by the body's motion through the propagation medium. Supersonic sources pose the additional challenge of introducing nonlinear propagation effects. Previous research efforts in this area have successfully modeled arrival time, azimuth and waveform observations using eigenrays (Blom et al., "Analysis and Modeling of Infrasound from a Four-Stage Rocket Launch," Jour. Acous. Soc. of Am., 139, 3134-3138, 2016) and full-wave modal analysis (Waxler et al., "The Stratospheric Arrival Pair in Infrasound Propagation," Jour. Acous. Soc. of Am., 137, 1846-1856, 2015). In this study, observations from recent heavy-lift rocket launches are analyzed to further quantify our model capabilities. Booster separation from the main rocket body may introduce distinct, separated sources, and it is included in the analysis as ground truth will support. Prediction limitations for arrival time, azimuth, and dominate waveform features are compared to observations. Event-to-event comparisons are also made to identify features that can be attributed to source type.

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