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Acoustic source analysis of supersonic jets from complex nozzles¹ JOSEPH W. NICHOLS, JORDAN KREITZMAN, Aerospace Engineering and Mechanics, University of Minnesota — We compute acoustic source terms corresponding to Goldsteins generalized acoustic analogy from an unstructured high-fidelity large eddy simulation of a supersonic jet issuing from a rectangular nozzle with chevrons. The simulation data are validated against experimental measurements of mean and turbulence flow statistics as well as far-field noise. We evaluate fourth-order correlations from the simulation data to assess assumptions of quasi-normality and statistical axisymmetry that underpin reduced-order acoustic source models originally developed for round jets. A spatial analysis of these correlations in relation to the complex geometry of the nozzle reveals locations where the validity of these assumptions begins to break down. Using two point two-time correlations of the simulation data, we also directly evaluate and compare the accuracy of four different acoustic source models, including the Gaussian, moving-frame, fixed-frame, and modified distance models.

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