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Jet noise models using one-way Euler equations AARON TOWNE, TIM COLONIUS, California Institute of Technology — Experimental and numerical investigations have correlated large-scale coherent structures in turbulent jets with acoustic radiation to downstream angles, where sound is most intense. These structures take the form of wavepackets and can be modeled as linear instability modes of the turbulent mean flow. The parabolized stability equations have been successfully used to estimate the near-field evolution of these wavepackets, but are unable to properly capture the acoustic field. We have recently developed an efficient method for calculating linear instability modes that properly capture both the near-field wavepacket and the associated acoustic field. The linearized Euler equations are modified such that all upstream propagating acoustic modes are removed from the operator. The resulting equations, called one-way Euler equations, can be stably and efficiently solved in the frequency domain as a spatial initial value problem. In this work, we use the one-way Euler equations to model sound generation and propagation in subsonic and supersonic jets. The mean flows are obtained from high resolution large-eddy-simulation (LES) data, and the one-way Euler solutions are validated against direct solution of the linearized Euler equations and compared to the LES data.

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