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Non-linear parabolized stability equation (NPSE) models for predicting large-scale mixing noise of turbulent round jets[1] ARNAB SAMANTA, Caltech, KRISTJAN GUDMUNDSSON, University of Twente, TIM COLONIUS, Caltech — We study sound generation from lower-frequency, large-scale wavepacket structures of turbulent round jets using PSE models. The computations use a set of subsonic and supersonic mean flows for which databases from PIV measurements and LES simulations, respectively, are available. Linear PSE models have previously shown good agreements with the amplitude and phase of microphone array data measured just outside the jet shear layer. Non-linear effects are likely to be important for the lower-order modes, near and beyond the closing of the jet potential core, where the wave amplitudes reach their maximum values. Unlike the LPSE evolution, which is independent of the initial amplitudes, an accurate estimate of the near-nozzle disturbance spectrum is necessary as the initial condition for NPSE, which is obtained from precomputed LPSE modal amplitudes, but can also be obtained from experimental data or high-fidelity simulations. Studies show the non-linear evolution to be sensitive not only to the initial modal amplitudes but also to their phases, the number of modes retained in the solution, and also any spurious noise that might be present in the mean flow measurements.

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