
# On the presence and feedback role of upstream-propagating waves in supersonic screeching jets

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In screeching non-ideally expanded jets, the origin of the oscillation modes of the jet is still unclear. In this paper, it is assumed that the feedback loop responsible for screech noise is closed by acoustic waves belonging to the family of the upstream-propagating wave modes of the equivalent ideally expanded jets. The dispersion relations of these modes are obtained from an analysis using a vortex sheet model of the jets. In order to demonstrate this hypothesis, results from several large-eddy simulations of screeching jets are examined. In particular, frequency-wavenumber decompositions of density fluctuations and pressure fluctuations are carried out and the results are compared, in the frequency-wavenumber space, with the analytical dispersion relations of the neutral acoustic wave modes of the equivalent ideally expanded jets. High-amplitude patterns following the dispersion relations are observed in the spectra obtained inside the jet, for the first time to the best of our knowledge in screeching jets. The screech tones are also observed on the spectra. They are located very near the lower limits of the dispersion relations of the neutral acoustic wave modes, indicating the presence in the jet of upstream-propagating waves whose both group and phase velocities are close to the ambient speed of sound.