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The importance of the shock-cell structure in the A1 and A2 jet screeching modes[1] PETRONIO NOGUEIRA, Department of Mechanical and Aerospace Engineering, Monash University, Clayton, Australia, MATTEO MANCINELLI, VINCENT JAUNET, DAMIEN EYSSERIC, PETER JORDAN, Département Fluides Thermique et Combustion, Institut Pprime, CNRS, Université de Poitiers, ENSMA, Poitiers, France, DANIEL EDGINGTON-MITCHELL, Department of Mechanical and Aerospace Engineering, Monash University, Clayton, Australia — This work focuses on exploring jet screech closure mechanisms of the axisymmetric modes in shock-containing jets. The analysis is based on different types of waves supported by the jet medium (Mancinelli et al. 2019), and the interaction between the Kelvin-Helmholtz mode and the shock-cell structure (Tam & Tanna 1982, Shen & Tam 2002). Analysis of the convective terms in the Navier-Stokes equations expanded around a streamwise-oscillatory mean flow shows that new forcing terms arise in particular wavenumbers by the interaction between instability waves and shocks, creating new energy transfer paths for the generation of upstream-travelling waves that can close resonance. Predictions using locally parallel spatial stability analysis and the wavenumber spectrum of the shock-cell structure, educed from experiments, suggest that the A1 mode resonance is closed by the peak wavenumber of the shock-cell spectrum interacting with the Kelvin-Helmholtz mode, and the A2 mode is closed by a secondary peak, which arises from the spatial variation of the shock-cell wavenumber. Results are in good agreement with experiments in the region of dominance of each mode, and an analysis of the dominance of each mode is performed.

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