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Screech Generation in a Rectangular Jet[1] GAO JUN WU, SANJIVA LELE, JINAH JEUN, Stanford Univ — Screech emission from a rectangular jet with an aspect ratio of 4:1 is studied, using large-eddy simulations based on Cascade Technologies' solver, CharLES. LES results agree very well with experimental data from Florida State University (Dr. Ranjan Kumar, private communication) including mean flow, near and far field sound. LES data show the jet is flapping in the minor-axis plane. Screech tones are emitted from an effective sound source approximately between the 4th and the 5th shock cells. The fundamental tone propagates strongly upstream and less so downstream, and the first harmonic travels almost perpendicular to the jet. SPOD analysis reveals clear signature of upstream- and downstream- travelling wave packets. The upstream wave packet contains both an internal mode and upstream beamed sound. Varying NPR changes the strength of the wave packets, and its relation to the screech amplitude and frequency is examined. While evidence supports external sound waves being the key link in screech closure, the role of the internal mode is also examined by quantifying its amplitude and phase at the nozzle exit. Lastly, a comparative study on the effect of initial shear layer turbulence on screech is conducted by numerically tripping the boundary layer with geometric perturbations.

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