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# ON THE DOMINATING INFLUENCE OF THE LARGE-SCALE MOTION IN A JET ON ITS PRESSURE NEAR FIELD AND THE ACOUSTIC FAR FIELD

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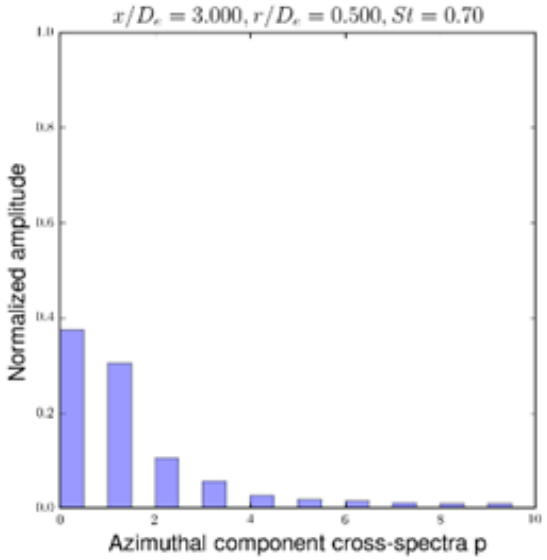
It is demonstrated with simulation data that the near field of a dual-stream jet is dominated by large-scale motions, which are related to instability waves in the inner and outer shear layers of the flow. The unsteady flow field is simulated with DES (detached eddy simulation, a hybrid RANS-LES method) using recent improvements to accelerate the RANS to LES transition. The unsteady flow field is stored on disk for later evaluation.




The data reduction is performed based on the pressure fluctuations in the flow, and it is shown that they are dominated by the influence of instability waves. The cross-spectral density of the pressure fluctuations between azimuthally separated probe positions is decomposed into azimuthal components and it is shown that only a few components are required to describe the unsteady flow field inside the jet. An example is given in the figure for the axial position at x/D=3 in the middle of the jet's shear layer, where the contribution for St=fD/U=0.7 dominates the one-third octave spectra. Higher Strouhal numbers are generated closer to the nozzle and lower Strouhal numbers further downstream in the jet.

The solenoidal near field around the jet is dominated even more by the low order components. This field is important for the interaction noise between a jet and the trailing edge of a wing. It is also shown that the axial coherence within the low-order components is much larger than of the higher order components, which explains the large source interference effects on the radiation of jet noise.

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