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Synchronized LES for acoustic near-field analysis of a supersonic jet[1] UNNIKRISHNAN S, DATTA GAITONDE, The Ohio State University, THE OHIO STATE UNIVERSITY TEAM — We develop a novel method using simultaneous, synchronized Large Eddy Simulations (LES) to examine the manner in which the plume of a supersonic jet generates the near acoustic field. Starting from a statistically stationary state, at each time-step, the first LES (Baseline) is used to obtain native perturbations, which are then localized in space, scaled to small values and injected into the second LES (Twin). At any subsequent time, the difference between the two simulations can be processed to discern how disturbances from any particular zone in the jet are modulated and filtered by the non-linear core to form the combined hydrodynamic and acoustic near field and the fully acoustic farfield. Unlike inverse techniques that use correlations between jet turbulence and far-field signals to infer causality, the current forward analysis effectively tags and tracks native perturbations as they are processed by the jet. Results are presented for a Mach 1.3 cold jet. Statistical analysis of the baseline and perturbation boost provides insight into different mechanisms of disturbance propagation, amplification, directivity, generation of intermittent wave-packet like events and the direct and indirect effect of different parts of the jet on the acoustic field.

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