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Acoustic wavepackets and sound radiation by jets UNNIKRISHNAN SASIDHARAN NAIR, DATTA GAITONDE, Ohio State Univ - Columbus — The three-dimensional spatio-temporal evolution of the acoustic mode in a supersonic jet is analyzed using Doak's Momentum Potential Theory on an LES database. The acoustic mode exhibits a well-defined wavepacket nature in the core and convects at sonic speed. Its spatial coherence is significantly higher than the hydrodynamic component, resulting in an efficient sound radiation mechanism dominated by the axisymmetric and the first helical modes. Enthalpy transport by the acoustic mode yields insight into the sound energy flux emitted by the jet. Intrusion and ejection of coherent vortices into the core and ambient outer fluid respectively are found to be major intermittent sources of acoustic radiation. The scalar potential which defines the acoustic mode is found to satisfy the homogenous wave propagation equation in the nearfield which makes it a suitable variable to predict farfield radiation. The propagated acoustic field closely resembles the corresponding nearfield LES result. The acoustic mode thus provides a physically consistent wavepacket model to predict sound radiation from jets. Ongoing efforts on subsonic jets will discern the influence, if any, of the Mach number on the model.

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