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Extracting Near-Field Structures Related to Noise Production in High Speed Jet[1] PINQING KAN, JACQUES LEWALLE, Syracuse University, SYRACUSE UNIVERSITY TEAM — Jet noise research started with Lighthill's seminal work on aerodynamic sound in 1952. The current consensus is that jet noise has two main kinds of sources, the large turbulent structures and the fine-scale turbulence. Coherent structures and the noise they produce are the focus of this paper because they offer better odds for control and they are associated with the most energetic part of the acoustic spectrum. We develop an algorithm using cross-correlation, continuous wavelet and pattern recognition techniques to search for near-field (NF) structures associated with far-field (FF) acoustic noise at aft angles. An experimental data is analyzed which measured a cold circular jet of Mach 0.6 (Low et al. 2013). The events identified are short wave packets in the time-frequency domain, distorted by ambient perturbations. The statistics of the event properties, including intermittency, frequency and magnitude are consistent with observations from other researchers. We investigate the localization and time sequencing of the events and use ensemble average to bring out the distinct structures associated to noise production. The filtered signals including / excluding the events are compared and the results are further tested using synthetic and randomized signals.

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