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High-Speed Jet Noise Source Identification by Wavelet Filtering
JACQUES LEWALLE, ZACHARY BERGER, KERWIN LOW, MARK GLAUSER, Syracuse University — Pressure sensors in a Mach 0.6 jet provide near-field data at 2 sections (x/D = 3 and 6), and simultaneous far-field data at 5 angular locations from 15° to 90^{oo} degrees relative to the jet axis. Continuous wavelets allow some feature recognition at the various stations. In the absence of sustained oscillations, the Mexican hat wavelet is used on the Fourier mode 0 in the near-field. At each scale, some local extrema (presumed signature of a nearby vortex) are recognized, with delay, between the 2 stations, and a scale-dependent convection speed is calculated. Non-linear filtering isolates the recognized, "matched" features, at the 2 near-field stations, and a 'residue' presumed to include the result of vortex pairing or breakdown. The physical relevance of this decomposition is established by the cross-correlation of the filtered near-field data with far-field noise. A scale-dependent cross-correlation was calculated, showing distinct scales and convection propagation delays for the various pairs of traces, for which different causes will be discussed. At the time of writing, the distinctive characteristics are used for pattern recognition in the raw data.

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