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Quantitative image processing of high-speed Schlieren of a hot supersonic jet[1] TOBIAS ECKER, DONALD R. BROOKS, K. TODD LOWE, WING F. NG, Virginia Tech — Understanding the physics of noise generation from hot supersonic jets is indispensable in the effort of jet noise reduction. This study describes the analysis of time-resolved Schlieren images obtained in a hot supersonic jet with Mach wave radiation ("crackle"). Proper orthogonal decomposition (POD) is commonly used with large quantitative experimental and numerical datasets. Recent research has shown application of POD post-processing with flow visualization techniques in order to extract valuable information on the large-scale turbulent structures in the flow. POD of the intensity distributions of the Schlieren images were performed to reveal organized structures in the outer shear layer, while mode evolution may be reconstructed in the images taken at over 86,400 frames per second. Albeit the screeching modes are more than twice as energetic than the next order of modes for NPR = 3, TTR = 2.5, a number of modes of similar energy density were found to exhibit convective cyclical structures.

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Tobias Ecker
Virginia Tech

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