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On the Application of Compressed Sensing to Non-Time-Resolved PIV Measurements[1] ERIC DEEM, TIMOTHY DAVIS, LOUIS CATTAFESTA, FARRUKH ALVI, Florida State University — Temporally resolved, full-field flow measurements are still impractical for most flows of interest. Fortunately, the spectral content of many flows can be described in a low dimensional space. This sparsity has inspired the recent adaptation of compressed sensing into the fluid mechanics community as a method for reconstructing spectral content of sub-Nyquist sampled data (arXiv:1401.7047). We apply this method to the analysis of several example fluid flow data sets, varying in spectral content. These data sets include the measured flow about a high-lift airfoil, an impinging jet, and a zero-net mass-flux (ZNMF) actuator. The Proper Orthogonal Decomposition (POD) is applied to the random PIV snapshots and we apply Orthogonal Matching Pursuit (OMP) to approximate the discrete Fourier transform of the POD coefficients. Additionally, reconstruction parameters are varied for to examine criteria regarding the probability of a successful reconstruction versus the degree of spectral sparsity. The advantages and restrictions of this method are discussed.

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Eric Deem
Florida State University

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