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Uncertainty Propagation In The Singular Value Decomposition Of Measured Data ERIC KRIVITZKY, BRENDEN EPPS, Thayer School of Engineering, Dartmouth College — Singular value decomposition (SVD) is a well-known mathematical tool that can be used to decompose an ensemble of velocity field data into spatiotemporal modes that may reveal coherent flow structures. Proper orthogonal decomposition (POD) is a special case of the SVD commonly used when the data are uncorrelated in time (such as in a turbulent flow) or for building surrogate models. Although the SVD and POD have been widely used in fluid mechanics, Epps and Techet (2010, ExpFluids 48:355367) were among the first to consider how experimental error affects the results of the SVD. This talk briefly reviews the work of that paper and provides mathematically-rigorous bounds on the errors in the computed singular values and spatiotemporal mode shapes. Using a constructed dataset with known, applied error as an example, the process to (i) determine the root mean square measurement error and (ii) determine error bars for the singular values and vectors is demonstrated. This process is then applied to measured data with unknown error.

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