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Spectral reconstruction of incompressible flows and application to incomplete flow measurements SIAVASH AMELI, SHAWN SHADDEN, UC Berkeley — A wide range of fluid flow applications are incompressible. Noise in flow measurements is the main source that violates the divergence-free condition for such flows. A variety of approaches have been proposed to filter noise and reconstruct data. Proper Orthogonal Decomposition, Dynamic Mode Decomposition, radial basis functions and smoothing kernels and spectral filtering by Fourier representation are a few examples. Yet, for many applications the necessity of an incompressible projection is important. Previously, we have presented the spectral representation of vector fields that addresses incompressibility by means of orthogonal family of solenoidal fields. The spectral representation of the fluid flow is obtained by the projection of the flow to the eigenmodes that are generated for a specific geometry and satisfy a flow boundary condition. In this talk, we discuss the optimality of the set of eigenfunctions in modal reduction and representation of incompressible flows. Also, we will present modal reconstruction of ill-defined problems and demonstrate results on incomplete measurements of noisy flows.

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