A finite element-based method for pressure estimation from measured velocity fields[1] KYLE SINDING, MICHAEL KRANE, Penn State University — The finite element method (FEM) is implemented to improve pressure estimation from experimental velocity data. This approach allows the flexibility of pressure boundary condition options of a pressure Poisson solver, while limiting the number of spatial derivatives of the measured velocity field necessary to specify the source term. A Taylor vortex is used as an analytical solution for the method of manufactured solutions to verify the proposed FEM. In addition, an assessment of error propagation to the estimated pressure field from the noisy measured velocity field is performed. This assessment is performed by adding noise to the Taylor vortex analytical velocity field to mimic measurement error. Finally, pressure estimates from the FEM-based approach are compared to estimates made by other approaches, from the same velocity data. While each method produces similar results the proposed FEM solution is the most consistent and requires the lowest spatial resolution.

Michael Krane
Penn State University