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Error propagation in PIV-based Poisson pressure calculations ZHAO PAN, JARED WHITEHEAD, Brigham Young University, SCOTT THOMSON, Brigham Young University Idaho, TADD TRUSCOTT, Utah State University — After more than 20 years of development, PIV has become a standard non-invasive velocity field measurement technique, and promises to make PIV-based pressure calculations possible. However, the errors inherent in PIV velocity fields propagate through integration and contaminate the calculated pressure field. We propose an analysis that shows how the uncertainties in the velocity field propagate to the pressure field through the Poisson equation. First we model the dynamics of error propagation using boundary value problems (BVPs). Next, L_2-norm and/or L_∞-norm are utilized as the measure of error in the velocity and pressure field. Finally, using analysis techniques including the maximum principle, the Poincare inequality pressure field can be bounded by the error level of the data by considering the well-posedness of the BVPs. Specifically, we exam if and how the error in the pressure field depend continually on the BVP data. Factors such as flow field geometry, boundary conditions, and velocity field noise levels will be discussed analytically.

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