Abstract Submitted
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Evaluation of two-component PIV uncertainty for flow in porous media[1] VISHAL PATIL, JAMES LIBURDY, Oregon State University — The measurement of flow in porous media is challenging due to accessibility and large range of flow passage scales. The use of PIV requires matching of refractive indices of fluid and solid phases. Slight mismatches are shown to cause significant tracking errors. In gaining PIV data at discrete planar locations along the optical axis, variations occur in the imaging magnification, and if not taken into consideration may lead to increased error. This paper addresses three forms of error in PIV measurements as they pertain to porous media flow: tracking error, bias error due to displacement gradients and perspective error. As applied to a porous bed of spherical beads, the local magnification is evaluated based on measured variations of detected bead diameter along the optical axis. The variation of magnification through the bed is then used to evaluate perspective error. The error due to displacement gradients was evaluated from correlation peak width. The bias error was also evaluated by reducing the interrogation window size and estimating the RMS difference between the two velocity estimates. The bias error evaluated using these two methods compared well. Results are shown for a flow at a pore Reynolds number of 4. Perspective errors are shown to be most significant, with total errors up to 6%.

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Vishal Patil
Oregon State University

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