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Accuracy of standard image processing and PIV analysis applied to x-ray velocimetry ELIZABETH VOIGT, RODERICK LA FOY, KAMEL FEZZAA, WAH-KEAT LEE, PAVLOS VLACHOS, Virginia Tech — Particle image velocimetry (PIV) using x-ray illumination is a recently developed technique providing a new capability to study low-Reynolds number opaque flows such as blood flow in microvessels. Preliminary work in x-ray PIV by several groups has used image processing and PIV techniques originally developed for optical PIV images, although significant differences exist between standard PIV images and x-ray PIV images. This work quantitatively assesses the validity of standard image processing and PIV techniques for x-ray images. Data were acquired for steady Poiseuille flow using hollow glass microspheres as tracers. Images were pre-processed using techniques including mean subtraction, Fourier filter, phase retrieval, and inversion filter, and velocity fields were computed using standard cross-correlation and robust phase correlation. A metric of image quality was found that reliably predicts the best of the pre-processed image sets. Quantitative comparison of velocity profiles with the Poiseuille solution indicated that robust phase correlation outperforms standard cross correlation for x-ray images.

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