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In Vivo PIV Measurement in the Embryonic Chicken Heart

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Blood flow is an important factor influencing the embryonic heart development. The flow induces shear stress that act on the vascular endothelium and modulate gene expression. Previous work has qualitatively shown that modification of the flow through the heart can significantly alter the heart development. To enlighten the relationship between fluid shear stress and gene expression, the blood flow of a chicken embryo is manipulated. Combining the fluorescent visualization of gene expression with a quantitative measurement of the instantaneous flow field using PIV, a direct relation between shear stress and gene response can be found. In vivo PIV measurements are performed at different phase angles of the cardiac cycle. Fluorescent lipid micro-spheres serve as tracer particles. The velocity distribution within the ventricle and the atrium is resolved. Current work is focused on improving the spatial resolution and accuracy in the near-wall region along with accurate registration of the wall boundary.

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