Abstract Submitted
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Velocimetry modalities for secondary flows in a curved artery test section[1] KARTIK V. BULUSU, George Washington University, CHRISTOPHER J. ELKINS, ANDREW J. BANKO, Stanford University, MICHAEL W. PLESNIAK, George Washington University, JOHN K. EATON, Stanford University — Secondary flow structures arise due to curvature-related centrifugal forces and pressure imbalances. These flow structures influence wall shear stress and alter blood particle residence times. Magnetic resonance velocimetry (MRV) and particle image velocimetry (PIV) techniques were implemented independently, under the same physiological inflow conditions (Womersley number = 4.2). A 180-degree curved artery test section with curvature ratio (1/7) was used as an idealized geometry for curved arteries. Newtonian blood analog fluids were used for both MRV and PIV experiments. The MRV-technique offers the advantage of three-dimensional velocity field acquisition without requiring optical access or flow markers. Phase-averaged, two-dimensional, PIV-data at certain cross-sectional planes and inflow phases were compared to phase-averaged MRV-data to facilitate the characterization of large-scale, Dean-type vortices. Coherent structures detection methods that included a novel wavelet decomposition-based approach to characterize these flow structures was applied to both PIV- and MRV-data. The overarching goal of this study is the detection of motific, three-dimensional shapes of secondary flow structures using MRV techniques with guidance obtained from high fidelity, 2D-PIV measurements.

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