Abstract Submitted
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Effect of centrifugal forces on formation of secondary flow structures in a 180-degree curved artery model under pulsatile inflow conditions[1] SHANNON CALLAHAN, ROSHAN SAJJAD, KARTIK V. BULUSU, MICHAEL W. PLESNIAK, The George Washington University — An experimental investigation of secondary flow structures within a 180-degree bent tube model of a curved artery was performed using phase-averaged, two-component, two-dimensional, particle image velocimetry (2C-2D PIV) under pulsatile inflow conditions. Pulsatile waveforms ranging from simple sinusoidal to physiological inflows were supplied. We developed a novel continuous wavelet transform algorithm (PIVlet 1.2) and applied it to vorticity fields for coherent secondary flow structure detection. Regime maps of secondary flow structures revealed new, deceleration-phase-dependent flow morphologies. The temporal instances where streamwise centrifugal forces dominated were associated with large-scale coherent structures, such as deformed Dean-, Lyne- and Wall-type (D-L-W) vortical structures. Magnitudes of streamwise and cross-stream centrifugal forces tend to balance during deceleration phases. Deceleration events were also associated with spatial reorganization and asymmetry in large-scale D-L-W secondary flow structures. Hence, the interaction between streamwise and cross-stream centrifugal forces that affects secondary flow morphologies is explained using a "residual force" parameter i.e., the difference in magnitudes of these forces.

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