Abstract Submitted
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A regime map for secondary flow structures under physiological and multi-harmonic inflow through a bent tube model for curved arteries[1] SHANNON M. CALLAHAN, KIRIN CALDWELL, KARTIK V. BULUSU, MICHAEL W. PLESNIAK, The George Washington University — Secondary flow structures are known to affect wall shear stress, which is closely related to atherogenesis and drug particle deposition. A regime map provides a framework to examine phase-wise variations in secondary flow structures under physiological and multi-harmonic inflow waveforms under conditions of a fixed Womersley number (4.2) and curvature ratio (1/7). Experimental PIV data were acquired at the 90-degree location in a 180-degree curved test section of a bent tube model for curved arteries using a blood analog working fluid. Coherent structure detection was performed using a continuous wavelet transform algorithm (PIVlet 1.2) and further analysis was carried out by grouping similar secondary flow structures at a fixed secondary Reynolds numbers. Phase-locked, planar vorticity fields over one period of inflow waveform revealed size, structure and strength similarities in secondary flow morphologies during the acceleration and deceleration phases. The utility of the new regime map lies in the a priori identification of pulsatile secondary flow structures, eliminating the need for exhaustive experimentation or computing, requiring only flow rate measurements that are easily acquired under clinical conditions.

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