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Analysis of velocity fluctuations downstream of a bileaflet mechanical heart valve MARCIO FORLEO, LAKSHMI DASI, Colorado State University — Bileaflet mechanical heart valves are widely used to replace diseased aortic heart valves. The stresses induced by the rich and unsteady non-physiological flow structures have been the focus to evaluate red blood cells damage and platelet activation, develop flow control strategies, or improve valve designs. In this study, we analyzed the flow fields obtained downstream of a bileaflet mechanical heart valve using time-resolved particle image velocimetry under pulsatile and steady flow conditions. Our study demonstrates the rich dynamics downstream of the valve and weighs the relevance of unsteady effects vs inertia effects on the different flow structures. Power spectrum analyses of the turbulent fluctuations highlight the highly anisotropic influence and the limited applicability of classical self-similar turbulence theory in describing the small-scale structures in the immediate vicinity of the valve.

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