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**High-fidelity large eddy simulation of blood flow through a mechanical heart valve** MIN ZHOU, FOLUSO LADEINDE, DANNY BLUESTEIN, SUNY Stony Brook — Bileaflet heart valves are currently the most commonly implanted type of mechanical heart valve (MHV). However, the current designs are far from being optimal and, due to non-physiological flow characteristics, significant complications often arise after implantation. We carry out a high-fidelity large eddy simulation (LES) of blood flow through a bileaflet MHV for a better understanding of the dynamics of flow in both 2-D and 3-D models. For this purpose, we employ a sixth-order Padé approximant compact scheme that is coupled with an eleventh-order filtering procedure for removing high wave number noise. To our knowledge, this is one of the most complicated applications of high-order CFD methods, from the standpoint of geometry, and the first attempt at simulating blood flow in 3-D mechanical heart valves using such methods, with and without the overset grid methodology. The results clearly show the need for a full 3-D model for MHV. The formation of vortices and shear layers is discussed, as are their physiological implications.

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