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Fluid-structure interaction in the left ventricle of the human heart coupled with mitral valve VALENTINA MESCHINI, Gran Sasso Science Institute, MARCO DONATO DE TULLIO, Politecnico di Bari, GIORGIO QUERZOLI, Universit di Cagliari, ROBERTO VERZICCO, Universit di Roma Tor Vergata and University of Twente — In this paper Direct Numerical Simulations (DNS), implemented using a fully fluid-structure interaction model for the left ventricle, the mitral valve and the flowing blood, and laboratory experiments are performed in order to cross validate the results. Moreover a parameter affecting the flow dynamics is the presence of a mitral valve. We model two cases, one with a natural mitral valve and another with a prosthetic mechanical one. Our aim is to understand their different effects on the flow inside the left ventricle in order to better investigate the process of valve replacement. We simulate two situations, one of a healthy left ventricle and another of a failing one. While in the first case the flow reaches the apex of the left ventricle and washout the stagnant fluid with both mechanical and natural valve, in the second case the disturbance generated by the mechanical leaflets destabilizes the mitral jet, thus further decreasing its capability to penetrate the ventricular region and originating heart attack or cardiac pathologies in general.

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