Abstract Submitted
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High-resolution numerical simulation of Left Ventricular Hemodynamics Guided by in-vivo Cardiac Magnetic Resonance Data[1] TRUNG LE, FOTIS SOTIROPOULOS, University of Minnesota, LUCIA MIRABELLA, BRANDON CHAFFINS, ARVIND SANTHANAKRISHNAN, Georgia Institute of Technology, JOHN OSHINSKI, Georgia Institute of Technology & Emory, AJIT YOGANATHAN, Georgia Institute of Technology, UNIVERSITY OF MINNESOTA COLLABORATION, GEORGIA INSTITUTE OF TECHNOLOGY COLLABORATION — We study the fluid dynamics within a patient-specific left ventricle (LV) during diastole using both numerical simulations and in-vivo data. The kinematics of the LV is reconstructed from high-resolution Magnetic Resonance Imaging (MRI) data acquired on a healthy volunteer, using image segmentation and a surface registration process. The flow velocity is acquired using phase-contrast MRI at the mitral orifice and at an additional parallel plane inside the ventricle. Numerical simulations are carried out using the CURVIB method (Ge et al., JCP, 2007) with the MRI reconstructed LV wall motion imposed as boundary condition. The numerical simulations show the highly dynamic environment of the flow field. The mitral vortex ring is formed during early diastolic filling and breaks down into small scale structures. The simulated hemodynamics are compared with phase-contrast MRI measurements and previous simulations in which the LV wall motion was obtained from a lumped parameter model (Le and Sotiropoulos, Eur. J. Mechanics B - Fluids, 2012)

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Trung Le
University of Minnesota

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