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Image-based flow modeling in a two-chamber model of the left heart[1] VIJAY VEDULA, JUNG-HEE SEO, KOUROSH SHOELE, RICHARD GEORGE, LAURENT YOUNES, RAJAT MITTAL, Johns Hopkins University — Computational modeling of cardiac flows has been an active topic of discussion over the past decade. Modeling approaches have been consistently improved by inclusion of additional complexities and these continue to provide new insights into the dynamics of blood flow in health and disease. The vast majority of cardiac models have been single-chamber models, which have typically focused on the left or right ventricles, and in these models, the atria are modeled in highly simplistic ways. However, the left atrium acts as a mixing chamber and works with the left ventricle in a highly coordinated fashion to move the blood from the pulmonary veins to the aorta. The flow dynamics associated with this two-chamber interaction is not well understood. In addition, the flow in the left atrium has by itself significant clinical implications and our understanding of this is far less than that of the left ventricle. In the current study, we use 4D CT to create a physiological heart model that is functionally normal and use an experimentally validated sharp-interface immersed boundary flow solver to explore the atrio-ventricular interaction and develop insights into some of the questions addressed above.

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