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Coupled fluid-structure interaction and mass transport in aortic valves MOHAMMADREZA SOLTANY SADRABADI, Northern Arizona University, IMAN BORAZJANI, Texas A&M University, AMIRHOSSEIN ARZANI, Northern Arizona University — Near-leaflet biotransport processes play an important in calcific aortic valve disease initiation and bioprosthetic aortic valve thrombosis. The solution to these transport processes involves coupled blood flow, nonlinear structural mechanics, and convective mass transport problems. Herein, 2D simulations are carried out where a two-way coupled fluid-structure interaction (FSI) model of an aortic valve is coupled to continuum advection-diffusion transport equations. Two classes of problems representing aortic valve complications are studied. First, constant biochemical concentration is imposed at the aortic root. Next, constant biochemical flux is imposed at the moving leaflet. Subsequently, biochemical transport near the leaflet is studied. The results show a close connection between vortex structures and biochemical concentration patterns. Distinctions in concentration patterns on the aortic and ventricular side of the leaflet are shown and implications for calcification and thrombosis discussed.

Mohammadreza Soltany Sadrabadi
Northern Arizona University

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