

Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

The hidden role of wall shear stress in fluid mechanics of coronary artery atherosclerosis¹ AMIRHOSSEIN ARZANI, MOSTAFA MAHMOUDI, Northern Arizona University — Wall shear stress (WSS) is arguably the most important parameter in the biomechanics of atherosclerosis. Traditionally, WSS is used to quantify the frictional force on the endothelial cells and study mechanotransduction. However, WSS also provides valuable information about near-wall transport. Biologically, near-wall transport of certain biochemicals and cells influence atherosclerosis progression. The recent concept of Lagrangian WSS structures (WSS manifolds) provides a connection between WSS vectors and near-wall transport. In this talk, we demonstrate the connection between WSS and near-wall localization of several atherogenic and atheroprotective biochemicals and cells in coronary artery atherosclerosis. Finally, an automated computational framework developed in FEniCS is presented to study the two-way coupling between WSS and plaque growth in coronary arteries. A phenomenological WSS driven growth model is developed to simulate plaque growth, which in turn influences the blood flow and WSS patterns.

¹Funding from the American Heart Association (19AIREA34430058) is acknowledged.

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Date submitted: 23 Jul 2019

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