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Lagrangian Coherent Structures in Blood Flow[1]

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Knowledge of fluid transport is particularly compelling in understanding the function of cardiovascular processes. Transport of chemicals, cells, and compounds in the vascular system is influenced by local flow structures in large vessels. Local flow features can also induce cell-signaling pathways and biologic response critical to maintaining health or disease progression. Complex vessel geometry, the pulsatile pumping of blood, and low Reynolds number turbulence leads to complex flow features in large vessels. However, we are gaining the ability to study transport in large vessels with unprecedented detail, which is in part allowing us to broaden the "shear-centric" view of hemodynamics. In this talk we will describe the application of computational fluid mechanics and the computation of Lagrangian coherent structures (LCS) to study transport in various cardiovascular applications. We will discuss some of the challenges of this work and some results of computing LCS in several regions of the vascular system. In collaboration with Charles Taylor, Stanford University.

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