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Wall shear stress manifolds and near wall flow topology in aneurysms AMIRHOSSEIN ARZANI, University of California Berkeley, ALBERTO M. GAMBARUTO, University of Bristol, GUONING CHEN, University of Houston, SHAWN C. SHADDEN, University of California Berkeley — Transport of atherogenic and thrombogenic chemicals near the vessel wall highly influences atherosclerosis and thrombosis. The high Schmidt number of these species leads to a thin concentration boundary layer near the wall. The wall shear stress (WSS) vector field can be scaled to obtain the near wall velocity in this region, thus providing first order approximation to near wall transport. In this study, the complex blood flow in patient-specific abdominal aortic aneurysms was considered. Lagrangian tracking of surface-bound tracers representing near wall species was employed to identify Lagrangian coherent structures (LCS) for the WSS surface vector field. The WSS LCS matched the stable and unstable manifolds of saddle type fixed points of the time-average WSS vector field, due to the quasi-steady nature of these near wall transport processes. A WSS exposure time measure is introduced to quantify the concentration of near wall species. The effect of diffusion and normal flow on these structures is investigated. The WSS LCS highly influence the concentration of near wall species, and provide a template for near-wall transport.

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