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**One-dimensional Simulations Enable Study of Cerebrospinal Fluid Flow in Complex Perivascular Space Geometries**[1] MAHSA MIRZAEE, JEFFREY TITHOF, University of Minnesota — Removal of brain's protein wastes such as amyloid-$\beta$ is facilitated by cerebrospinal fluid (CSF) transport in perivascular spaces (PVSs), which are annular channels surrounding blood vessels. Buildup of amyloid-$\beta$ in the brain is connected to neurological disorders such as Alzheimer's disease. Here, we derive and solve the one-dimensional (1D) Navier-Stokes equation to study CSF flow in PVSs. 1D modeling let us simulate complex geometries that are not computationally feasible in higher- dimensional simulations. We model PVSs as an annulus filled with CSF and impermeable walls. Two cases are considered: 1) a straight annulus with a finite length, 2) an annulus bifurcating into two smaller but identical branches. In both cases, the outer radius of the annulus is fixed while inner radius changes periodically in time to model arterial pulsations, which are hypothesized to drive CSF through PVSs. We utilize both a sinusoidal function and a realistic waveform obtained from in vivo experiments. This approach will enable new insights into peristalsis in complicated geometries, expanding our knowledge of the brain's waste removal system and paving the way for new understanding of the mechanisms leading to neurological diseases.

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