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Pressure Field Estimation on Flow over a Sidewall Aneurysm
PAULO YU, VIBHAV DURGESH, University of Idaho — One of the challenges associated with the experimental fluid dynamic study of flow in an aneurysm is the inability to accurately estimate pressure distribution inside the aneurysm sac. The objective of this study is to estimate the pressure field in the sac using velocity data from Particle Image Velocimetry (PIV) measurements. An in-house experimental setup was developed and an idealized sidewall aneurysm was used for this investigation. A computer-controlled pump system was used to precisely control inflow conditions such as Reynolds number (Re) and Womersley number, which ranged from 50-250 and 2-5, respectively. PIV measurements were conducted on a vertical plane inside the aneurysm sac. Proper Orthogonal Decomposition (POD) was used for low-order reconstruction to reduce the noise in the velocity field. The pressure field was estimated numerically using pressure Poisson equation with Neumann boundary conditions. The estimated pressure field in the pipe was compared with a simulated multi-modal solution for a pulsatile flow showing good agreement. The results of the study showed the evolution of the pressure field inside the aneurysm sac and its dependence on change in Reynolds and Womersley numbers.

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