Magneto-Hemodynamic Flow in a Two-Sided Lid-Driven Cavity

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Abstract: An incompressible, non-Newtonian, magnetohydrodynamic solver, called nonNewtonianMHD-Foam, is implemented in OpenFOAM. The effects of the magnetic field on the blood flow in a two-sided lid-driven square cavity with anti-parallel wall motion is studied using the nonNewtonianMHDFoam.
The study of blood flow in the human body is integral in the branch of Biofluid Mechanics. Understanding the influences of forces due to blood flow and its effect on the blood vessel wall is crucial in the study of the cardiovascular system and the related diseases. Since blood is an electrically conducting fluid, it interacts with the magnetic field. Such type of interaction is prevalent in cardiac MRI.
An incompressible, laminar, MHD blood flow is investigated at four different Stuart number (N = 0, 1, 10, 50) as Newtonian and non-Newtonian fluid. The viscosity of the blood is assumed to follow the power-law model. The results from the simulations are compared with literature for validation.

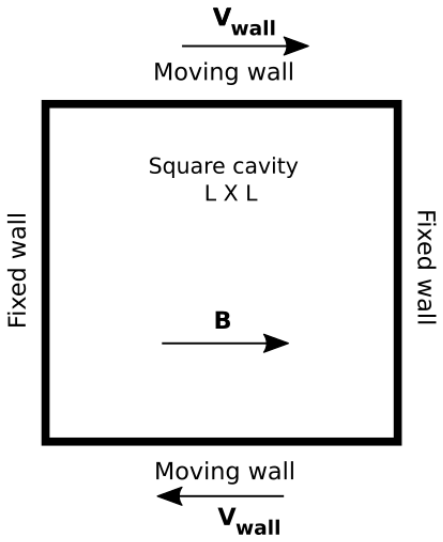

Fig. 1: Case setup