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Comparison of Strongly Coupled Diffuse and Sharp Interface Fluid-Structure Interaction Approaches for Particle-Laden Flows FAZLOLAH MOHAGHEGH[1], H.S. UDAYKUMAR[2], University of Iowa — The aim of this study is to find a proper method for the simulation of blood as a particulate flow. Since the blood cell density is almost the same as plasma, the high added mass effect necessitates implementation of a strongly coupled FSI method in the numerical simulation. Therefore, three different FSI approaches are compared, two Smoothed Profile Methods (SPM) with one and two projection steps as diffuse interface approaches and the Sharp Interface Method (SIM). Stable FSI computations can be achieved by using sub-iterations within each time step, i.e. by updating the fluid and structure and their boundary conditions at each time step multiple times to reach a desired tolerance as the convergence criteria. Various cases were used to benchmark the methods, including particles motion in a channel and particles sedimentation. The results show that the number of sub-iterations plays a key role in the efficiency. While use of SPM with two projection steps has the most expensive sub-iteration process, it has the best efficiency as it requires the lowest number of sub-iterations within each time step. Moreover, the method is more stable than SIM and the SPM with one projection. SIM is faster than SPM with one projection and it has better stability.

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