Abstract Submitted
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A computational scheme for simulation of dense suspensions of arbitrarily shaped rigid particles[1] MARCOS VANELLA, HUSSEIN EZ ELDIN, The George Washington University, PRATEETI MOHAPATRA, CHRISTOPHER DALEY, University of Chicago, ANSHU DUBAY, Lawrence Berkeley National Laboratory, ELIAS BALARAS, The George Washington University — Flows of dense particle suspensions are of great interest to engineering, science and medicine. Immerse boundary (IB) methods are commonly employed in simulations of such systems, but are usually confined to spherical particle suspensions. Extension to rigid particles of arbitrary shape introduces significant additional complexities on the IB tracking algorithms, as well as the rigid body dynamics. This increases the cost in the fluid-structure interaction (FSI) schemes employed. In this work we present a computational scheme targeted to the above problem, applicable to computations involving millions of particles on leadership high performance computing platforms. The fluid equations are discretized by standard, central, finite-differences on a staggered mesh and the equations of motion for each particle are employed on the Eulerian reference using Euler angles or quaternion variables. A Lagrangian forcing IB method is employed, using the Lagrangian particle framework of FLASH. Fluid and particle equations of motion are strongly coupled using a partitioned scheme. We present the details of the parallel implementation as well as scaling tests and results on the sedimentation of arbitrary shaped particles.

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Elias Balaras
The George Washington University

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