Abstract Submitted
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An immersed boundary method for the interaction of turbulence with particles of arbitrary shape SHIZHAO WANG, MARCOS VANELLA, ELIAS BALARAS, The George Washington University — In this work we present a computational scheme applicable to turbulence/particle interactions, targeting applications involving millions of particles of arbitrary shape. Immersed boundary methods have been frequently applied in simulating such problems, but are usually confined to spherical particles. Extension to rigid/deformable particles of arbitrary shape introduces significant challenges in achieving parallel efficiency. The proposed method is based on the moving least squares immersed boundary approach (Vanella & Balaras, J. Comput. Physics, 228(18), 6617-6628, 2009) on uniform and adaptive block-structured grids. We will present a novel parallelization strategy based on a master/slave model: the processor on which a body/structure resides is designated the master processor, while all the processors that contain at least one block overlapping with the body are designated the slaves. As the particle moves through the fluid, its blocks association and therefore the participating processors change. Effective ways of replicating the mesh metadata on all processors will be discussed. Results for homogeneous turbulence interacting with spherical and ellipsoidal particles and comparisons with experimental results will be given.

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