Abstract Submitted
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Solid-Fluid flows using a variant of Immersed Boundary method in Gerris[1] PEI SHUI, University of Edinburgh, UK, STÉPHANE POPINET, National Institute of Water and Atmospheric research, New Zealand, PRASHANT VALLURI, University of Edinburgh, UK, STÉPHANE ZALESKI, Institut Jean Le Rond d'Alembert, UMR7190 CNRS and Université Pierre et Marie Curie (Paris 6), France, MARTIN CRAPPER, University of Edinburgh, UK — An efficient 3D Immersed Boundary solver to simulate fully coupled fluid-solid interaction with 6 degrees-of-freedom (6DOF) solid movement enabling all translational and rotational motions has been developed in the GERRIS code. Here the solids are fully immersed in a flowing fluid driven either by pressure or shear. Solid objects of any arbitrary geometry and number can be considered. Prevention of overlap between the solids and wall is enforced through a repulsive force (Glowinski et al., 2001) which is the sum of all short-range interactions. The method agrees well with Stokes' settling and is validated against experiments published in literature. The simulation also agrees well with the classical case of a neutrally buoyant solid in shear flow and the orbit tracked by it (Jeffrey, 1922). Strong hydrodynamic interaction is seen between multiple solids placed in shear flow. The interaction force is being calibrated as a function of relative distance between the solids and will be presented in the conference. Comparison with experiments of Fortes et al (1987) concerning drafting, kissing and tumbling of two spherical solids during fluidization will also be presented.

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