Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

An Immersed Boundary Method Coupled with a Level Set and Dynamic Overlapping Grids Approaches for Free Surface and Moving Bodies Problems RICCARDO BROGLIA[1], ANTONIO POSA, DANILO DURANTE, CNR-INM — An immersed-boundary (IB) approach was developed within an existing level-set/dynamic overlapping-grids finite-volume solver. An IB strategy is utilized together with curvilinear grids capabilities, keeping cells count under control, a main disadvantage for the classical IB methods using Cartesian grids. Moreover, the IB is identified by an additional level-set function, i.e., a distance function defined at each node of the computational grid, whose zero level represents the fluid/solid interface. One of the main advantages of the proposed approach is the coupling with a dynamic overlapping-grids methodology and a single-phase level-set approach. The former is especially convenient in presence of moving bodies: updating the position of the Lagrangian grid, which discretizes the surface of the body, relative to the Eulerian grid, is not required, since the Eulerian grid attached to a moving IB can follow the body during its motion. The latter is efficiently adopted to handle the presence of an air/water interface. Here the methodology is discussed in detail. Test cases feature stationary and moving bodies as well as complex geometries and free-surface flows. Results from present IB computations are compared with body-fitted solutions and data from literature.

[1]Membership Pending

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Date submitted: 01 Aug 2019 Electronic form version 1.4