Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

**A Fully Grid-Line-Based Immersed Boundary Method**[1] GUANT-ING SU, Beihang University & University of California, Berkeley, TIANYU PAN, Beihang University, QIUSHI LI, Beihang University & Xihua University — By introducing proper variable reconstruction scheme in the vicinity of immersed boundaries, a group of immersed boundary methods (IBMs), including ghost-cell method and hybrid Cartesian method, showed promising performance when simulating unsteady, incompressible flow around complex boundaries using non-body-conformal orthogonal grids. In this work, we propose a fully grid-line-based IBM with a novel velocity reconstruction scheme which is capable of stably imposing desired linear velocity distribution along single or multiple gridline directions. Pressure boundary condition is inherently implemented with desired velocity distribution imposed. Present method greatly simplifies boundary-related operations by eliminating existing need to search for projections along off-gridline direction (e.g. normal to boundary). And with utilization of standard discretization stencils enabled on boundary-adjacent grid nodes, implicit time advancement of viscous term is straightforward. Flow simulation results are in good agreement with reference data and show that the proposed method retains second-order accuracy of the fractional-step Navier-Stokes solver incorporated.

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Date submitted: 31 Jul 2019        Electronic form version 1.4