Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

High-Order Ghost-Point Method for Non-Conforming Boundaries[1] PRAKASH SHRESTHA, PETER BRADY, VITALIY GYRYA, DANIEL LIVESCU, Los Alamos National Laboratory
— We investigate numerical properties of constrained moving least squares method for numerical implementation of solid boundary conditions (CMLS, an immersed boundary method) by Qu, Shi and Batra (2018) coupled with central finite differences for interior derivatives. This study represents an extension of the original method, which uses first order interpolation / extrapolation for the ghost and image points, as well as dissipative interior discretization. The objectives of the investigation are to determine the suitability of the method for direct numerical simulations of turbulent flows in complex geometries and to find an optimal set of built-in parameters in terms of achieving high order of accuracy and stability of the method for a wide range of canonical test problems. The test problems include a 1-D linear scalar wave equation, for which rigorous stability and conservation properties can be discussed, and 2-D nonlinear tests using Burgers' equation and the compressible Euler equations with manufactured solutions. Preliminary data indicate that the method can achieve good stability and accuracy properties.

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Date submitted: 01 Aug 2019 Electronic form version 1.4