Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

A finite volume method for fluctuating hydrodynamics of simple fluids[1] KIRAN NARAYANAN, RAVI SAMTANEY, BRIAN MORAN, King Abdullah University of Science and Technology — Fluctuating hydrodynamics accounts for stochastic effects that arise at mesoscopic and macroscopic scales. We present a finite volume method for numerical solutions of the fluctuating compressible Navier Stokes equations. Case studies for simple fluids are demonstrated via the use of two different equations of state (EOS) : a perfect gas EOS, and a Lennard-Jones EOS for liquid argon developed by Johnson *et al.* (Mol. Phys. 1993). We extend the fourth order conservative finite volume scheme originally developed by McCorquodale and Colella (Comm. in App. Math. & Comput. Sci. 2011), to evaluate the deterministic and stochastic fluxes. The expressions for the cell-centered discretizations of the stochastic shear stress and stochastic heat flux are adopted from Espanol, P (Physica A. 1998), where the discretizations were shown to satisfy the fluctuation-dissipation theorem. A third order Runge-Kutta scheme with weights proposed by Delong et. al. (Phy. Rev. E. 2013) is used for the numerical time integration. Accuracy of the proposed scheme will be demonstrated. Comparisons of the numerical solution against theory for a perfect gas as well as liquid argon will be presented. Regularizations of the stochastic fluxes in the limit of zero mesh sizes will be discussed.

[1]Supported by KAUST Baseline Research Funds.

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Date submitted: 27 Jul 2015 Electronic form version 1.4