Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Coupling the BGK Equation and Molecular Dynamics in a Multiscale Plasma Simulation JACOB PRICE, University of Washington, GIL SHOHET, Stanford University — The Bhatnagar-Gross-Krook (BGK) approximation is an effective kinetic model of the Boltzmann equation for hot plasma given accurate relaxation parameters. These parameters are difficult to know a priori. Molecular dynamics, on the other hand, offers a fully detailed model for ionic motion. The heterogeneous multiscale method (HMM) provides a computational and analytical link between disparate physical models. In this talk, we present a proof of concept of HMM as a modeling method for hot plasma. The unknown relaxation parameters can be inferred from data collected in short, small molecular simulations, and subsequently used in the kinetic model. Simulations using the hybrid kinetic-molecular dynamic model are both more accurate than the kinetic model alone, and orders of magnitude more efficient than the molecular dynamics model alone. We will present the theory and results, comment on the advantages and limitations of the method, discuss potential applications, and propose future avenues inquiry into multiscale plasma methods.

Jacob Price
University of Washington

Date submitted: 14 Jul 2016 Electronic form version 1.4