Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Analysis of boundary conditions and diffusion schemes for SPH methods ZHENYU HE, LOUIS ROSSI, University of Delaware — In this paper, we systematically explore the accuracy and stability of different methods for satisfying boundary conditions and capturing viscous diffusion in smoothed particle hydrodynamics (SPH). Smoothed particle hydrodynamics (SPH) is a Lagrangian method for compressible and incompressible flows. The state of fluid system is represented by a set of moving basis functions which interpolate the material properties. The mesh-free formulation of the method and its inherent stability make it popular for problems that have complex geometry or large deformations. Our research focuses mathematically on an accurate and efficient treatment for physical boundary conditions. Also, we analyze several smoothing kernels and diffusion schemes. We compare different techniques for non-slip, non-penetration conditions such as fixed fluid particles, ghost particles and boundary particle forces. We verify our results by comparing computations to exact solutions for 2D planar and circular, steady and unsteady Couette flows.

Louis Rossi
University of Delaware

Date submitted: 08 Aug 2011 Electronic form version 1.4