Abstract Submitted
for the TSF13 Meeting of
The American Physical Society

The Thermally Compatible GodunovSPH: Implementation and Tests SEUNG-HOON CHA, MATT WOOD, Department of Physics and Astronomy, Texas A&M University-Commerce, SHU-ICHIRO INUTSUKA, Department of Physics, Nagoya University — GodunovSPH (GSPH) is a consistent numerical method based on particle hydrodynamics, while the standard SPH shows an unphysical numerical surface tension when there is a density contrast due a numerical inconsistency. However, an entropy violation has been observed in some test results of GSPH. In order to fix the violation, the thermally compatible GodunovSPH (tcGSPH) has been implemented. tcGSPH can reproduce the entropy solution even in the expansion wave region. The thermal incompatibility of the continuity and energy equations has been identified as the cause of the entropy violation, and the numerical volume of a particle has been introduced to fix the incompatibility. The fluid density around a particle is estimated not only with the number density of particles, but also with the compression (or expansion) of the numerical volume of the particle, while standard SPH considers only the spatial configuration of the particles in the density estimation. With the consistency and the satisfaction of the entropy condition, the convergence of the tcGSPH is guaranteed. Several tests showing the performance of the tcGSPH will be presented. The comparisons with the standard SPH and/or the previous implementation of GSPH will be shown as well. Plans to implement tcGSPH in a new public-release accretion disk simulation code will be discussed.

Seung-Hoon Cha
Department of Physics and Astronomy,
Texas A&M University-Commerce

Date submitted: 13 Sep 2013 Electronic form version 1.4