Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

3D Large-Scale DNS of Weakly-Compressible Homogeneous Isotropic Turbulence With Lagrangian Tracer Particles[1] R. FISHER, D. LAMB, Univ. of Chicago ASC FLASH Center, L. KADANOFF, Univ. of Chicago, F. CATTANEO, Univ. of Chicago ASC FLASH Center, P. CONSTANTIN, Univ. of Chicago, T. PLEWA, Univ. of Chicago ASC FLASH Center — When simulating turbulence with complex or embedded geometries, or which transitions from incompressible to weakly-compressible, it is desirable to have a robust numerical method which is equally capable of handling these regimes without significant loss of accuracy. The FLASH 2006 turbulence simulation is a driven, weakly-compressible, homogeneous, isotropic simulation which explores this concept in detail. It was performed at 1856^3 resolution with 16.7 million Lagrangian tracer particles at a (1D) RMS velocity of 0.17. The simulation was performed by special invitation on the LLNL BG/L machine shortly before it was permanently placed inside their secure network earlier this year. Approximately one week of CPU time on 65,536 processors were used. We will present results including both Eulerian and Lagrangian properties of the simulation, and compare these to previous experiments and theories. We will also discuss a systematic error in the determination of the higher-order structure functions due to finite statistics and address this issue for our dataset.

[1]This research was conducted under the auspices of the ASC / Alliance Center for Astrophysical Thermonuclear Flashes at the University of Chicago under U. S. Department of Energy contract B341495.

Robert Fisher
University of Chicago ASC FLASH Center

Date submitted: 06 Aug 2006 Electronic form version 1.4