Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Scaling properties of subgrid-scale energy dissipation rate in Large Eddy Simulation[1] SERGEI CHUMAKOV, Los Alamos National Laboratory — In Large Eddy Simulation (LES), the dissipation rates of subgrid-scale (SGS) kinetic energy and SGS scalar variance are arguably the two most elusive quantities to model. In the literature it is customary to model them using assumed power-law correlations between the SGS energy and its dissipation, and between SGS scalar variance and its dissipation. We use DNS of forced homogeneous isotropic turbulence with 512^3 and 1024^3 grid points with Reynolds number based on Taylor microscale up to 400 to examine a priori the scaling properties of the SGS kinetic energy, SGS variance of a passive scalar and their dissipation rates. It is found that the two pairs of quantities are strongly correlated and a power-law scaling assumption holds reasonably well for both pairs. However, the scaling exponent for the power-law approximation of correlation between SGS energy and its dissipation was found to change considerably with the LES filter size, while it was assumed to be varying weakly in previous studies. The scaling between SGS scalar variance and its dissipation, on the other hand, was found to be extremely close to the power-law scaling with an exponent that does not vary with the LES filter size.

[1]This work was funded by the US Department of Energy (W-7405-ENG)

Sergei Chumakov
Los Alamos National Laboratory

Date submitted: 02 Aug 2007 Electronic form version 1.4