Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

An EDQNM-based analysis on the effect of numerical errors in LES NOMA PARK, University of Minnesota, KRISHNAN MAHESH, University of Minnesota — LES is known to be influenced by errors due to numerical discretization. Conventional linear analysis using modified wavenumbers does not account for the nonlinearity of turbulent flows. Static error analysis based on the power spectral density of the error terms (Ghosal, J. Comput. Phys. **125**, 1996) neglects the dynamic evolution of the solution. This paper presents a dynamic error analysis procedure based on EDQNM theory, and applies it to the LES of isotropic turbulence. The effects of finite-differencing error, aliasing error and the dynamic Smagorinsky model are incorporated into the one- dimensional equation for turbulent kinetic energy. Both collocated and staggered discretizations are considered. The proposed model equation shows good agreement with actual three- dimensional LES results. It is shown that the impact of numerical error on LES solution is overestimated by the conventional analysis and that the existence of numerical error does not overshadow the role of SGS model.

Krishnan Mahesh
University of Minnesota

Date submitted: 18 Jul 2005 Electronic form version 1.4