Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Subgrid scale contributions to Lagrangian time correlations in isotropic turbulence GUO-WEI HE, YUE YANG, JIAN ZHANG, LNM, Institute of Mechanics, Chinese Academy of Sciences, Beijing, 100080, China, LIAN-PING WANG, Dept. of Mech. Eng. University of Delaware, Newark, DE 19716, USA —
Lagrangian time correlations or simply LTCs are the correlations of the Lagrangian velocities of one or two particles at two different times. Recently, there have been increasing applications of large-eddy simulation (LES) to turbulent dispersion, mixing processes and particle-laden flows. The applications raise such a fundamental question: can the LES with a subgrid scale (SGS) model predict LTCs correctly? The current existing SGS models are mainly developed in terms of the energy budget equations. As a result, they are able to correctly predict energy spectra. However, they may not ensure the accurate prediction on time correlations. Our previous researches investigate the effects of subgrid scales on the Eulerian time correlations. In present research, we will study the effects of subgrid scales on the LTCs in isotropic turbulence. A direct numerical simulation (DNS) and the LES with a spectral eddy viscosity model are performed for isotropic turbulence. It is observed that the LES overpredicts the LTCs than the DNS. We conclude from the straining hypothesis that an accurate prediction of LES on the enstrophy spectra is most critical to its prediction of the LTCs.

Duan Z. Zhang
Los Alamos National Laboratory

Date submitted: 06 Aug 2006 Electronic form version 1.4