Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Truncated Navier-Stokes Equations with the Automatic Filtering Criterion TAWAN TANTIKUL, JULIAN DOMARADZKI, University of Southern California — Truncated Navier-Stokes (TNS) methodology is a LES technique in which Navier Stokes equations are solved in the DNS mode on a coarse LES mesh. Because no explicit SGS model is used, such simulations would quickly depart from DNS results obtained on a full DNS mesh, with departures observed first in the small scales. In TNS this process is controlled by periodically filtering out the small scales of the numerical solution and replacing them by new, estimated scales. In previous work the filtering time interval was normally fixed through trial and error. We report details of a modified TNS procedure where the filtering interval is determined automatically during the course of the simulations. The procedure employs the criterion that prevents the energy buildup in the small scales beyond limits allowed by the inertial and dissipation range dynamics. The procedure is tested in a sequence of TNS simulations for turbulent channel flow and several Reynolds numbers for which detailed DNS data are available for comparison, up to $Re_\tau = 2000$.

Julian Domaradzki
University of Southern California

Date submitted: 01 Aug 2008 Electronic form version 1.4