Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Improving the near-wall behavior of multiscale models for LES[1]
MATTHIEU DUPONCHEEL, UCL, Louvain School of Engineering (EPL), LAURENT BRICTEUX, GREGOIRE WINCKELMANS — The multiscale models (in fact the "multiscale approaches" applied to the Smagorinsky model) have gained a growing interest in the LES community because of the appealing properties resulting from the involved high-pass filtering (HPF). One could hope that this filtering is sufficient for wall-resolved LES; hence no need for further near-wall damping (explicit or using a dynamic procedure). Unfortunately, the dissipation profile of such models does not tend to zero at the wall, even though the dissipation is indeed reduced compared to the corresponding unfiltered model. This leads to relatively poor results and, quite importantly, to severe and unpractical time-step restrictions because of stability issues. This unsatisfactory behavior is basically due to the fact the HPF velocity field has the same near-wall scaling as the unfiltered field. Hence, the SGS viscosity scalings previously developed to provide the proper y^3 near-wall dissipation behavior when computed using the unfiltered field, also provide the proper behavior when computed using the HPF field. In this study, several new and classical scalings, used in the multiscale approach, are investigated in turbulent channel flow LES at $Re_\tau = 395$ using a fourth order finite difference solver.

[1]M. Duponcheel is supported by the FNRS of Belgium.

Gregoire Winckelmans
UCL, Louvain School of Engineering (EPL)

Date submitted: 04 Aug 2008 Electronic form version 1.4