Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Implicit LES of turbulent flows with a high order discontinuous Galerkin method SIMONE GREMMO, Polytechnic faculty, University of Mons, Belgium, CORENTIN CARTON DE WIART, BASTIEN GORISSEN, KOEN HILLEWAERT, Cenaero, Belgium, GREGOIRE WINCKELMANS, Universite catholique de Louvain (UCL) - iMMC, GREGORY COUSSEMENT, LAURENT BRICTEUX, Polytechnic faculty, University of Mons, Belgium — This study is concerned with the ability of a flow solver using a discontinuous Galerkin method (DGM) to perform large eddy simulation (LES) of turbulent flows. Several approaches are considered: the Smagorinsky model, a multiscale model, and implicit LES (ILES). First DGM is used to simulate 1D Burgers turbulence. This helps to analyze the spectral behavior of different subgrid scale (SGS) models. Energy spectra are obtained and compared to those obtained using a spectral code. It is shown that a moderate order (p=3,4) ILES-DGM approach provides sufficient dissipation concentrated only at the smallest resolved scales of the flow, preserving the larger scales. Second, results on homogeneous isotropic turbulence at very high Reynolds number also allow to highlight the scale selectivity of the approach. ILES-DGM provide energy spectra and energy decay results consistent with theory. At last the method is also validated on turbulent channel flow at $Re_\tau = 395$, 590. The results show a good agreement with the DNS of Moser et al. As a conclusion, for the present cases using a SGS model with DGM does not improve and can even degrade the results compared to ILES-DGM. Indeed, ILES-DGM already dissipates the small scales without influencing the larger turbulent structures.

Laurent Bricteux
Polytechnic faculty, University of Mons, Belgium

Date submitted: 01 Aug 2012 Electronic form version 1.4