Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Differential filtering on unstructured grids with application to grid adaptation[1] SANJEEB BOSE, PARVIZ MOIN, Center for Turbulence Research, Stanford University, FRANK HAM, Cascade Technologies Inc — Extension of explicitly filtered LES methods and their corresponding SGS models require a filtering operator that is low-pass on arbitrary meshes and can be decoupled from the underlying grid topology. Previously, we have utilized the differential filters proposed by Germano (1986) to perform explicitly filtered LES on unstructured grids. This framework is now extended to extract an estimate of the mean SGS kinetic energy to determine regions where mesh refinement is required. This procedure is automated using a local, anisotropic mesh refinement tool, adapt. This approach has been applied to large eddy simulation of a three-dimensional diffuser at Re=50,000, experimentally characterized by Kolade (2010). Results from two different mesh resolutions will be presented; an initially coarse mesh and a mesh refined using the SGS kinetic energy estimates. The adapted mesh has increased resolution in the separated shear layers originating from the bottom and side expanding walls. The accuracy of the SGS model will also be assessed through comparison of the LES predictions with experimental measurements. Other recent applications to flow over a cylinder with heat transfer and to flow over a turbine blade will be presented.

[1]Work has been supported by the DoE CSGF (DE-FG02-97ER25308) and the DoE PSAAP Program

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Date submitted: 03 Aug 2012 Electronic form version 1.4