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Explicitly filtered LES on unstructured grids[1] SANJEEB BOSE, PARVIZ MOIN, FRANK HAM, Center for Turbulence Research, Stanford University — Prior investigations using explicitly filtered LES have demonstrated that grid-independent solutions can be obtained by decoupling the filtering operator from the underlying grid. Dynamic, mixed SGS models were then derived from the explicitly filtered LES governing equations and showed good accuracy in coarse simulations of high Reynolds number wall-bounded flows. The explicitly filtered framework and SGS models are now implemented in a second order, unstructured, finite volume solver. Filtering on unstructured grids is decoupled from the mesh by utilizing differential filters. LES, using the proposed dynamic mixed models, of a Re=50000 rectangular duct flow (aspect ratio = 3.33) is performed. The grid is anisotropically refined in the near-wall region in the vicinity of the duct midplane away from the side walls. The regions of grid refinement are selected by processing the mean statistics of $\overline{u'}_i\overline{u'}_i$, which measures the smoothness of the LES solution with respect to the filter width. The overall resolution of the LES remains coarse ($\Delta x_f^+ \approx 150$, maximum $\Delta z_f^+ \approx 60$). Streamwise mean velocity profiles are predicted within a few percent of the experimental measurements of Kolade and Eaton (2010). Preliminary simulations of a three dimensional stalled diffuser will also be presented.

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