Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Numerical Dissipation and Subgrid Scale Modeling for Separated Flows at Moderate Reynolds Numbers[1] FRANCOIS CADIEUX, JULIAN ANDRZEJ DOMARADZKI, University of Southern California — Flows in rotating machinery, for unmanned and micro aerial vehicles, wind turbines, and propellers consist of different flow regimes. First, a laminar boundary layer is followed by a laminar separation bubble with a shear layer on top of it that experiences transition to turbulence. The separated turbulent flow then reattaches and evolves downstream from a nonequilibrium turbulent boundary layer to an equilibrium one. In previous work, the capability of LES to reduce the resolution requirements down to 1% of DNS resolution for such flows was demonstrated (Cadieux et al, JFE 136-6). However, under-resolved DNS agreed better with the benchmark DNS than simulations with explicit SGS modeling because numerical dissipation and filtering alone acted as a surrogate SGS dissipation. In the present work numerical viscosity is quantified using a new method proposed recently by Schranner et al. and its effects are analyzed and compared to turbulent eddy viscosities of explicit SGS models. The effect of different SGS models on a simulation of the same flow using a non-dissipative code is also explored.

[1]Supported by NSF

Julian Domaradzki
University of Southern California

Date submitted: 22 Jul 2014 Electronic form version 1.4