Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

A comparison of dynamic procedures for subgrid stresses in low- and high-speed channels[1] SUNGMIN RYU, GIANLUCA IACCARINO, Stanford University — We present a novel dynamic procedure to determine the space- and time-dependent model coefficient of a subgrid scale (SGS) eddy-viscosity model. As a preceding step, an exact relationship between SGS Reynolds stresses and four different types of SGS closures is derived from the incompressible Navier-Stokes equation applying Reynolds decomposition and its filtered relation. To validate the proposed dynamic procedure, large eddy simulations (LES) of freely decaying isotropic turbulence and incompressible turbulent channel flow at $Re_\tau = 395$ are performed with the Vreman model with the model coefficient dynamically determined by the SGS Reynolds stress based procedure. Moreover, LES with the dynamic Smagorinsky model and the Vreman model with the constant coefficient are also carried out to assess the performance of our dynamic model. Finally, LES with our dynamic model in compressible turbulent channel flows is evaluated to demonstrate that the relation of identity derived from the incompressible flow governing equations is also valid in compressible flows.

[1]This work is funded under NASA Cooperative Agreement NNX11AI41A (Technical Monitor Dr. Stephen Woodruff)

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Date submitted: 01 Aug 2013 Electronic form version 1.4