Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Near-wall Behavior of a Scale Self-Recognition Mixed SGS Model
MIZUKI KIHARA, YUKI MINAMOTO, Tokyo Institute of Technology, YOSHITSUGU NAKA, Meiji University, NAOYA FUKUSHIMA, Tokyo University of Science, MASAYASU SHIMURA, MAMORU TANAHASHI, Tokyo Institute of Technology — A Scale Self-Recognition Mixed SGS Model was developed in terms of GS-SGS energy transfer in homogenius isotropic turbulence by Fukushima et al. (2015). In the present research, the near-wall characteristics of the Smagorinsky coefficient, C_S are investigated in terms of GS-SGS energy transfer by analyzing DNS data of turbulent channel flows at $Re_\tau = 400$, 800 and 1270. C_S is dependent on grid anisotropy, and this cause dependences of C_S on Re_τ. It is revealed that C_S obtained directly from the DNS data is independent of Re_τ and dependent on only dimensionless wall distance, y^+ and filter-width to Kolmogorov scale ratio corrected by f, $f \cdot \Delta/\eta$, when the grid anisotropy is isolated from C_S by using the correction function f proposed by Scotti et al. (1993). The contributions of Leonard, cross and Reynolds terms to total energy transfer are also independent of Re_τ and dependent on only y^+ and $f \cdot \Delta/\eta$ in the near-wall region. These results suggest that C_S can be determined dynamically from $f \cdot \Delta/\eta$ in the wall turbulence if η is sufficiently predicted from the grid scale quantities.

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Date submitted: 29 Jul 2016 Electronic form version 1.4