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Properties of the Optimal LES Kernel for wall-bounded turbulence[1] AMITABH BHATTACHARYA, Univ Illinois, Urbana Champaign, ROBERT MOSER, The Univ Texas at Austin — Das (2004) succesfully performed an Optimal LES (OLES) of turbulent channel flow ($Re_\tau = 590$), based on correlations obtained from DNS. A very coarse Fourier representation was used in all directions (including the wall normal direction), along with the filtered boundary formulation of Das & Moser (2001). The Optimal subgrid model is purely dissipative, suggesting that simplier dissipative models such as Smagorinsky might be useful, and so a simulation employing the Dynamic Smagorinsky model was also performed, yielding poor results. We investigate the reason Dynamic Smagorinsky behaves poorly compared to the OLES model, with the goal of devising simple models that do not require DNS data, and that perform as well as OLES. We study the critical properties of the OLES model (e.g. dissipation spectra, kinetic energy spectra & anisotropy of the OLES kernel), in comparison with the properties of the Dynamic Smagorinsky model. The desirable properties of subgrid models for LES of wall bounded flows are thus determined.

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