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Computations of turbulent channel flow using the nested-LES approach RAYHANEH AKHAVAN, YIFENG TANG, The University of Michigan, Ann Arbor — Nested-LES is an approach to computing high Reynolds wall-bounded turbulent flows based on coarse-resolution LES in the full-domain, coupled with nested, well-resolved LES in a minimal flow unit. The two domains are coupled by renormalizing the instantaneous LES velocity fields, at each time-step during the course of the simulation, to match the profiles of kinetic energies of the components of the mean velocity and velocity fluctuations in both domains to those of the minimal flow unit in the near-wall region, and to those of the full-domain in the outer region. The method reduces the required number of grid points from $O(Re_\tau^2)$ of conventional LES to $O(\log Re_\tau)$ and $O(Re_\tau)$ in flows with two and one locally or globally homogeneous directions, respectively. In this talk, we review the results obtained with nested-LES in turbulent channel flow at $1000 \leq Re_\tau \leq 10000$. It is shown that nested-LES predicts not only the first-order statistics, but also all higher-order moments, spectra, and structural features of the flow in agreement with DNS and experimental results. The details of the optimal construction of the grid to achieve these results and the principles behind nested-LES will be discussed.

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