Mean wall shear stress boundary condition for large eddy simulation with coarse mesh near the wall[1] JUNGIL LEE, MINJEONG CHO, HAECHEON CHOI, Seoul National University — Mean wall shear stress is proposed for the wall boundary condition for large eddy simulation without resolving near-wall region. The motivation of using this wall boundary condition instead of no-slip boundary condition is that with very coarse resolution near the wall providing an accurate mean wall shear stress is most important in the momentum transport near the wall. As test problems, we consider two canonical wall-bounded flows at high Reynolds number: turbulent channel and boundary layer flows. First, the mean wall shear stress is obtained from the momentum balance for channel flow or from an empirical correlation of skin friction for boundary layer flow. The present boundary condition provides excellent predictions of the mean flow statistics, even if the first off-wall grid locates far away from the wall, $y^+ = O(10^1 \sim 10^3)$, where y is the wall-normal distance from the wall. Next, a dynamic approach based on the log-law is developed to obtain mean wall shear stress during computation and is applied to both flows, showing also excellent results.

Haecheon Choi
Seoul National University

Date submitted: 04 Aug 2012   Electronic form version 1.4