

Abstract Submitted
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Direct Numerical Simulations of Stably Stratified Turbulent Boundary Layers at High Re JUNWOO LIM, Pittsburgh Supercomputing Center, Carnegie Mellon University, BYUNG-GU KIM, CHANGHOON LEE, Yonsei University, Seoul, Korea — We performed direct numerical simulations (DNS) of stably stratified turbulent boundary layers, in the range of $Re_\tau = 180 \sim 800$ and $Ri = 0 \sim 400$. To extend our investigation on the dynamics of near-wall turbulent structures under strong stratification to higher Reynolds numbers, we developed a highly scalable parallel program. Compared to the previous version, extensive improvements on the computation efficiency and the communication scalability were made so that tera-scale supercomputers could be fully exploited. Our simulations show the evidences of modification in the near-wall structures due to the stratification, as well as the typical suppression of turbulence far away from the wall as previously reported by other researchers. Interestingly, for some cases, DNS resulted in complete suppression of the near-wall disturbances while large-eddy simulations (LES) for the same cases did not. More detailed discussion on this issue and a few other computational issues associated with the increase of the Richardson number will be addressed in the presentation.

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