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Large Eddy Simulation of the Neutrally Stratified Atmospheric Boundary Layer TIE WEI, JAMES BRASSEUR, Penn State University — A long standing problem in large eddy simulation of the neutrally stratified atmospheric boundary layer (ABL) is the excessive shear ($\phi_m = \frac{\kappa z}{u_*}\frac{\partial U}{\partial z}$) found in the semi-resolved region close to the surface. Due to the high Reynolds number of the flow Schumann-Grotzbach type 'wall stress models' are commonly used for the lower wall boundary conditions. The overshoot of ϕ_m has been attributed to the subfilter scale model and the lower wall boundary conditions. To improve the accuracy of the simulation, some researchers have focused on modification of the subfilter scale model, while using the classical wall stress model. To determine the relationship between the subfilter scale model, the lower wall boundary conditions and the overshoot of ϕ_m, we carried out simulations with several subfilter scale models and various modified lower wall boundary conditions. We examined the profiles of the mean resolved Reynolds stress and subfilter stress, and explored their relation to the structure of turbulent boundary layers. Our results show that small changes in the lower wall boundary conditions have a large influence on the simulation results. We aim to determine a pertinent combination of modifications to both the lower wall boundary conditions and the subfilter scale models to improve the accuracy in the near-wall region.

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