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Modeling of near-surface generated turbulence in large-eddy simulation of microscale atmospheric flows REY DELEON, University of Idaho, Boise State University, INANC SENOCAK, Boise State University — Large-eddy simulation (LES) is often used in microscale atmospheric boundary layer (ABL) flows. As a wall-resolved LES is not relevant in actual ABL flows due to surface roughness and very high Reynolds numbers, LES with wall-modeling has been widely adopted. But special attention must be given to the near-surface treatment in LES of ABL flows as several of the more commonly applied methods, e.g. hybrid RANS/LES or models, can provide unrealistic accelerations leading to the log-layer mismatch problem. Numerous studies have focused on the smooth-wall turbulent channel flow to address the log-law mismatch problem. However, several of these studies have yet to be extended to LES of ABL flows where terrain surface is aerodynamically rough and arbitrarily complex. We investigate different near-surface treatments to ABL flow in our GPU-accelerated LES framework with an immersed boundary method for complex terrain. We consider the constrained LES approach of Chen et al. (2012), and the mean wall shear stress boundary condition proposal of Lee et al. (2013) that have shown promising results. Additionally, we investigate a hybrid RANS/LES approach. Our goal is to identify a suitable near-surface treatment and extend it to LES of complex terrain winds using the immersed boundary method.

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