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Physics-based Enrichment of Planetary Boundary Layer LES ADITYA GHATE, SANJIVA LELE, Stanford University — A new multiscale simulation methodology is introduced to facilitate efficient simulations of very high Reynolds number wall bounded flows such as the PBL. The two-simulation, one-way coupled, scale splitting methodology combining a) Non-linear wave space model using the Gabor Transform and spectral eddy-viscosity, b) Representation of the subfilter fields via a set of random modes, and c) Large Eddy Simulation using a robust subgrid scale model, is introduced. The viability of the methodology is investigated using 3 increasingly sophisticated idealizations for the PBL. In the first idealization, the surface layer is approximated using a uniform shear and a positive (stable) temperature gradient which makes the problem homogeneous. The second idealization models the PBL as a constant pressure gradient driven half channel thus introducing inhomogeneity in the vertical direction. The high latitude Stable PBL used in GABLS1 intercomparison study (Beare et. al. BLM 2006) serves as the third idealization for the PBL and it further introduces Coriolis and Stratification effects. These idealizations help validate the two-simulation methodology, where comparisons are made in terms of statistics such as space-time correlations, k-omega spectra and profiles of second order correlations.

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