Abstract Submitted
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A Sweeping based Kinematic Simulation for the Stably Stratified Surface Layer ADITYA GHATE, SANJIVA LELE, Stanford Univ — A Kinematic Simulation (KS) for a statistically stationary and stably stratified surface layer is proposed. The Fourier coefficients are obtained by numerically solving the linearized NS equations with Boussinesq approximation in spectral space, under the assumption of "rapid" deformation (RDT) due to combined shear and stratification. The linearization of RDT, which is unrealistic for the surface layer, is rectified using Mann's (JFM, 1994) idea of wavenumber dependent eddy lifetime. The input parameters required by the KS are estimated using either Monin-Obukhov theory, or an appropriate Second Moment Closure. In order to overcome the frozen turbulence hypothesis made in the Mann model, we incorporate inter-scale "sweeping" of eddies following the ideas of Fung, et. al. (JFM, 1992), along with temporal decorrelation associated with the natural eddy time scale. The solenoidal velocity field generated by the KS allows inclusion of a wide range of scales with correct space-time correlations, making it ideal to investigate particle dispersion in a stably stratified environment, and can also serve as inflow for the study of Wind Farm-PBL interactions. The effect of varying Obukhov length will be discussed by analyzing the frozen Eulerian spectra and Lagrangian particle dispersion.

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