9.1 Recent advances in three-dimensional turbulent mixing parameterization in the WRF model.

Jimenez, Pedro A., *National Center for Atmospheric research (NCAR)*, Alberto Martilli, *CIEMAT, Spain*, and Branko Kosovic, *NCAR*

All the planetary boundary layer parameterizations implemented in WRF are one dimensional (1D). These parameterizations are based on the assumption of horizontal homogeneity. As the grid cell size decreases, the assumption of homogeneity is violated. This poses fundamental problems for mesoscale modeling over heterogeneous regions wherein fine grid spacing is necessary to resolve the heterogeneities. We have therefore implemented a three-dimensional (3D) PBL parameterization in the Weather Research and Forecasting (WRF) model. The implementation of the 3D PBL scheme follows the model of Mellor and Yamada. To evaluate the 3D PBL performance we have conducted an idealized numerical experiment. We have prescribed a horizontal heterogeneity in the sensible heat flux and initialized the model with homogeneous meridional wind. Under this set up, the solution should be homogeneous in the meridional direction. We carried out two mesoscale simulations at 200 m of grid spacing with 1) the 1D MYNN PBL parameterization and with 2) our 3D-PBL parameterization. We complement these simulations with microscale simulations performed with WRF-LES. We will show that accounting for the horizontal turbulent fluxes in our 3D PBL is necessary to ensure the homogeneous solution in the meridional direction.