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Influence of the MM5 PBL scheme on high-resolution CHIMERE simulations

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The accurate determination, evolution and structure of the planetary boundary layer (PBL) in meteorological models has important implications for predicting and understanding the dynamics of ozone and particulate matter, since it determines the effective volume in which pollutants are dispersed and because PBLH (Planetary Boundary Layer Height) is usually used in turbulent mixing parameterization. The MM5 model outputs using two PBL parameterizations (local Gayno-Seaman (GS) and non local Medium Range Forecast (MRF)) coupled with different LSM (Land Surface Model) are compared with atmospheric measurements carried out in the frame of two intensive campaigns of the QUITSAT project (http://www.quitsat.it/). In particular, aerosol data from in situ, balloon and lidar measurements collected in the Milan urban area during summer 2007 and winter 2008 are used.The MM5 results clearly show that both PBL schemes lead to an understimation of PBLH, smaller for GS-PBLH than MRF-PBLH during winter. MRF compares better with observations under very unstable conditions. During summer, both PBL schemes lead to an overstimation of PBLH during sunny hours, with MRF predicting higher PBLH than GS. GS compares better with observations under stable conditions. The impact of different PBL schemes on the simulation of pollutant levels is evaluated with CHIMERE model (http://www.lmd.polytechnique.fr/chimere/) feeded with MM5 outputs. MRF-CHIMERE produces better results in comparison with ozone observations. GS-CHIMERE predicts far too high ozone concentration at night, pointing out potential limitations of CHIMERE turbolent mixing parameterization.