

Development of a high resolution planetary boundary layer height analysis system using aircraft, radiosonde, and NYS mesonet profiler data and the analysis impact on atmospheric transport and dispersion

Jeongran Yun, Sarah Lu, Qilong Min, Wei-Ting Hung, Jeff McQueen, Perry Shafran, Jeff Whiting, Geoff DiMego, Manuel Pondeva, Runhua Yang, Yanqiu Zhu and Ariel Stein

Reliable and accurate estimates of planetary boundary layer (PBL) heights are important due to its role in many applications such as weather forecasting, dispersion and air quality modeling. A PBL verification system has been established at the NOAA National Centers for Environmental Prediction (NCEP), but the PBL is not assimilated for operational purpose yet. The goal of this study is to develop a high resolution PBL height analysis system, which can be used operationally in the future when the New York State mesonet profiler observation data are available in 2017. There will be 17 profiler sites in New York State. Data will be collected in every 5 minutes. PBL heights derived from observations using temperature, winds, and moisture will be assimilated into the NCEP's Real-Time Mesoscale Analysis, which uses the 2DVar option of the Grid-Point Statistical Interpolation (GSI) analysis system. Estimates of the PBL heights are derived from radiosonde observations at airports, measured twice a day. To expand temporal variation, we use observation profiles from the Aircraft Communications Addressing and Reporting System (ACARS). PBL heights are derived with a critical Richardson number approach. We aim to perform a PBL height analysis and evaluate its impact on trajectory and dispersion calculations of pollutant sources for air pollution episodes at high model resolution. The NOAA Air Resources Laboratory (ARL) HYSPLIT dispersion-model will be used to estimate the PBL analysis impact on atmospheric transport and dispersion.