Estimations of Regional Model Simulations of Atmospheric Boundary Layer Vertical Structure

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Accurate depiction of meteorology, especially in the planetary boundary layer (PBL), is important for air pollution modeling. The PBL parameterization schemes play a critical role in simulating the boundary layer meteorology. Comparison of the mesoscale model WRF forecasts and remote measurements of temperature and wind speed in the planetary boundary layer in Moscow region is made. Long term measurements of wind profiles, carried out by acoustic sounding, and temperature, measured by microwave profilers MTP-5, provide information for statistical analysis of model errors. Forecasts were made using different parameterizations of PBL. Observation data were obtained by co-working of Obukhov Institute of Atmospheric Physics (IAPh RAS), Moscow State University (MSU) and Hydrometcentre of Russia. The statistical estimations of forecasts deviations in description of temperature and wind profiles are calculated. Main limitations of parameterizations of ABL are noted. The developed method of comparison with remote measurements provide opportunity to estimate influence of different model options on the forecast.

Numerical Simulation of Mesoscale Meteorology and Air Quality Near Urban Territory

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The results of application of developed meteorological and photochemical mesoscale models for numerical prediction of aerodynamics, physical and chemical processes above a city are presented. The main features of the meteorological model are possibility of explicit representation of some specific for urban territory ('heat island') atmospheric phenomena and taking into account interaction between boundary layer and surface with specific roughness and heat transfer for urban obstacles. The photochemical model has horizontal resolution up to 500 meters and allows predicting in detail influence of turbulent structure of an atmospheric boundary layer on transport and dispersion of primary and secondary pollutants in an urban air. The considered mesoscale models are numerically realized with supercomputers. These models are used to analyze influence of meteorological conditions and features of underlying surface on generation and development of atmospheric circulations and pollution transport above idealized and real urbanized territories and formation of secondary pollutants near cities. Research is supported by RFBR, grant N 07-05-01126.

Application of Fuzzy Sets to Forecast Air Quality Index AQI in the Southern Poland

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The aim of this paper is to present the forecast air quality AQ created under the Air Quality Forecasting System in the Silesian region in the southern Poland that based on the method of data mining in particular, using fuzzy sets. Forecasting AQ assumptions are as follows: air sanitary situation characterized level concentrations of air pollutants depends on meteorological conditions and emissions; there is a similarity between the meteorological conditions determining the emission of pollutants, spatially varied local conditions; local conditions such as type of land use, emission factors and weather conditions determine the size of emissions, but the nature of the active layer and weather conditions determine the conditions for the spread of pollutants; the future is similar to the past. The basis of AQ forecast is the Numerical Weather Prediction for the near daily, and historical meteorological data base (IMWM) and the concentrations of pollutants (Automatic of Air Quality Monitoring System in Silesian voivodeship). Using parallel the knowledge base of historical COSMO-LM model and the historical real curses of meteorological conditions we take a group similar forecasts to the current forecast. On this basis, we creates fuzzy meteorological situation forecast for the near 24h. Using these data will consider the past in terms of finding meteorological conditions which the most appropriate for fuzzy meteorological forecast. The result is a set of weather situations that may occur in the forecast horizon. Each selected as the meteorological situation corresponds to the proper course of the pollutants concentrations from the past. The last stage of forecasting is to build one of the air pollutants concentrations with many a similar sanitary situation. The forecast of SO2, NO2, PM10, PM2.5, O3 and AQI is created for the zones and agglomerations. In Poland not yet developed as the original and typical of the country's sanitation AQI. The choice of AQI was dictated the possibility of measuring AQ and climatic conditions. AQI are based on the principles of the USA EPA and the study\'s own. Air quality forecast model based on fuzzy sets, can be implemented for other areas, using the principle of similarity.