Impact of Doppler weather radar data assimilation on the quality of precipitation forecasting in Belarus

Palina Zaiko (1,2), Siarhei Barodka (1,3), Aliaksandr Krasouski (1,3,4)

(1) Faculty of Physics, Belarusian State University, Minsk, Belarus, (2) Republican Center for Hydrometeorology, Control of Radioactive Contamination and Environmental Monitoring, Minsk, Belarus (polly_lo@tut.by), (3) National Ozone Monitoring Research and Education Center (NOMREC), Belarusian State University, Minsk, Belarus, (4) Faculty of Geography, Belarusian State University, Minsk, Belarus

Precipitation forecast remains one of the biggest problems in numerical weather prediction. Modern remote sensing systems allow tracking of rapidly developing convective processes and provide additional data for numerical weather models practically in real time. Assimilation of Doppler weather radar data also allows to specify the position and intensity of convective processes in atmospheric numerical models.

The primary objective of this study is to evaluate the impact of Doppler weather radar data assimilation in the WRF-ARW mesoscale model for the territory of Belarus. Specifically, we focus on the short-range numerical forecasting of mesoscale convective systems passage over the territory of Belarus in 2016-2017 with assimilated radar data.

Proceeding with weather radar observations available for our cases, we first perform the necessary processing of the raw radar data to eliminate noise, reflections and other kinds of clutter. We then use the WRF-DA (3D-Var) system to assimilate the processed radar observations in the WRF model. Assimilating both radar reflectivity and radial velocity data in the model we aim to better represent not only the distribution of clouds and their moisture content, but also the detailed dynamical aspects of convective circulation. Finally, we analyze WRF modelling output obtained with assimilated radar data and compare it with available meteorological observations and with other model runs (including control runs with no data assimilation or with assimilation of conventional weather stations data only), paying special attention to the accuracy of precipitation forecast 12 and 24 hours in advance.