Geophysical Research Abstracts
Vol. 18, EGU2016-9902-1, 2016
EGU General Assembly 2016

The precipitation forecast sensitivity to data assimilation on a very high resolution domain

Iuliia Palamarchuk, Sergiy Ivanov, and Igor Ruban
Odessa State Environmental University, Ukraine (svvivo@te.net.ua)

Last developments in computing technologies allow the implementation of a very high resolution in numerical weather prediction models. Due to that fact, simulation and quantitative analysis of mesoscale processes with a horizontal scale of few kilometers become available. This is crucially important in studies of precipitation including their life-cycle. However, new opportunities generate prerequisites to revising existing knowledge, both in meteorology and numerics. The latter associates, in particular, with formulation of the initial conditions involving the data assimilation. Depending on applied techniques, observational data types and spatial resolution the precipitation prediction appears quite sensitive.

The impact of the data assimilation on resulting fields is presented using the Harmonie-38h1.2 model with the AROME physical package. The numerical experiments were performed for the Finland domain with the horizontal grid of 2.5 km and 65 vertical levels for the August 2010 period covering the BaltRad experiment. The initial conditions formulation included downscaling from the MARS archive and involving observations through 3DVAR data assimilation. The treatment of both conventional and radar observations in numerical experiments was used. The earlier included the SYNOP, SHIP, PILOT, TEMP, AIREP and DRIBU types. The background error covariances required for the variational assimilation have already been computed from the ensemble perturbed analysis with the purely statistical balance by the HIRLAM community.

Deviations among the model runs started from the MARS, conventional and radar data assimilation were complex. In the focus therefore is to know how the model system reacts on involvement of observations. The contribution from observed variables included in the control vector, such as humidity and temperature, was expected to be largest. Nevertheless, revealing of such impact is not so straightforward task. Major changes occur within the lower 3-km layer of the atmosphere for all predicted variables. However, those changes were not directly associated with observation locations, as it often shows single observation experiments. Moreover, the model response to observations with lead time produces weak mesoscale spots of opposite signs. Special attention is paid to precipitation, cloud and rain water, vertical velocity fields. A complex chain of interactions among radiation, temperature, humidity, stratification and other atmospheric characteristics results in changes of local updraft and downdraft flows and following cloud formation processes and precipitation release. One can assume that those features would arise due to both, atmospheric physics and numeric effects. The latter becomes more evident in simulations on very high resolution domains.