POSTER PRESENTATION

P-02. Julia Palamarchuk: Evolution of the forecast error at various parameterization schemes in the MM5 model

J. Palamarchuk, S. Ivanov

Odessa State Environmental University, Ukraine
(j_pal @ ukr.net)

An ideal forecasting system should produce not only an estimate of the flow state, but also an estimate of the associated uncertainty. One of major sources of forecast errors is the model fitness including parameterization of sub-grid processes. Various parameterization schemes for the planetary boundary layer (PBL), cumulus convection, microphysics and radiation processes are used in this study in order to estimate the systematic error of the MM5v3.7 model. Integrations with different schemes were carried out under the same initial and boundary conditions. Model results were compared against ERA40 reanalysis for the geopotential, temperature and humidity fields over the extended range of the winter season of 2002. A simulation domain covers the North Atlantic and European continent regions. The results are presented in terms of the temporal evolution, spatial distribution and vertical profiles of the systematic model error as well as spectra of the model and reanalysis variables.

Results show that the most optimal parameterization scheme set, in general, is the following: the Reisner mixed phase for microphysics; the Kain-Fritsch scheme for cumulus; the MRF scheme for PBL and CCM2 scheme for radiation. The spatial distribution of the systematic model error for geopotential and temperature shows a barotropic structure. The model overestimates geopotential and temperature over the North Atlantic throughout the whole troposphere and underestimates these variables over the European continent. In difference, the relative humidity systematic model error changes a sign in the vertical. Within the low troposphere, the model overestimates humidity, while in the middle and upper troposphere humidity is underestimated, i.e., the model redistributes water vapour downwards. This provokes overestimation of convective precipitation, especially over warm regions and, in particular, in the East Mediterranean. For large scale precipitation, the systematic model error is mainly related to intensive synoptical patterns and manifests in the form of the phase error. This means that the magnitude of precipitation form is reproduced well enough but is placed in wrong position. Spectra show that the model rather realistically reproduce the atmospheric variability over the ocean, but sufficiently enforces low-frequency variability like blocking (10 days and extended) and redistribute intensity of synoptical activity (3-7 days) from longer to shorter periods.

Feedbacks from finer to larger scales usually lead to better behavior in the simulated state. However, this is mainly true for the atmospheric properties characterized by smooth patterns with large scale structure functions, such as geopotential and temperature. Contrary, the humidity model error in the nesting mode is sensitive to the choice of a parameterisation scheme.