SUMMARIES

Development of high-resolution ensemble prediction system for the region of Sochi-2014 Winter Olympics / Alferov D.Yu., Astakhova E.D., Rivin G.S., Rozinkina I.A. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 5–20.

A mesoscale ensemble prediction system COSMO-Ru2-EPS was developed within the framework of the COSMO priority project CORSO and WWRP WMO FROST-2014 international project aimed at improving forecast methods and technologies for mountainous regions and providing meteorological support for the Sochi Olympic Games. The system is based on the COSMO model with a horizontal resolution of 2,2 km. It is implemented for the Sochi region and uses forecasts of the Italian system COSMO-S14-EPS with a resolution of 7 km as initial and boundary conditions. The COSMO-Ru2-EPS system and its technology are described in detail accompanied by a list and examples of EPS products available in operational mode at the FROST-2014 site during the Olympics. The forecast efficiency is analyzed in case studies and using standard probabilistic scores for two winter months of 2013. COSMO-Ru2-EPS showed the ability to add value to coarser 7 km ensemble forecasts and proved to be useful during the Olympics.

Keywords: ensemble prediction system, COSMO model, mesoscale forecast, high-resolution models.

Tab. 2. Fig. 6. Ref. 17.

Ensemble prediction systems for sochi region based on cosmo model: development of methods and provision of probabilistic forecasts for XXII Winter Olympics / Astakhova E.D., Montani A., Alferov D.Yu. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 21–36.

The ensemble prediction systems based on the COSMO model with a horizontal resolution of 7 and 2.2 km were developed and implemented in order to provide probabilistic forecasts for XXII Winter Olympic Games in Sochi. The activity was within the framework of the COSMO consortia priority project CORSO and the WWRP/WMO international project FROST-2014. The COSMO-S14-EPS system with a resolution of 7 км was a "clone" of the Italian system COSMO-LEPS implemented for the Sochi region with a reduced ensemble size. The COSMO-Ru2-EPS system with a resolution of 2.2 km, allowing to resolve deep convection directly, provided a dynamical downscaling of COSMO-S14-EPS forecasts. During the Olympics, the ensemble forecasts were operationally issued, disseminated to forecasters and presented at the FROST-2014 site. The description of the ensemble systems as well as of the technology used to prepare ensemble forecasts is given and the results are analyzed.

Keywords: ensemble prediction system, COSMO model, mesoscale forecast.

Tabl. 3. Fig. 3. Ref. 17.

First verification results for COSMO-Ru mesoscale numerical weather forecasts issued for the Sochi-2014 Olympics / Bundel A.Yu., Kirsanov A.A., Muraviev A.V., Rivin G.S., Rozinkina I.A., Blinov D.V. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 37–54.

The first results of the comparative COSMO-Ru1 and COSMO-Ru2 verification are considered for the period of Sochi-2014 Olympics. Some results of test periods 2011−2013 are given, in particular, the experience of using the EDI (Extremal Dependency Index, the quality index for extreme weather events) for the basic variables.

Keywords: verification, COSMO-Ru model, Sochi-2014 Olympics, EDI (Extremal Dependency Index).

Tab. 1. Fig. 6. Ref. 9.

Diana visualization system for meteorological information / Zaripov R.B. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 55–73.

The adaptation of DIANA visualization system developed in the Norwegian Meteorological Institute (NMI) to use it in is carried out in Hydrometcenter of Russia in order to get a tool while using it in researches and operative tasks. DIANA can visualize practically all types of meteorological information – analysis and forecast data on regular grid, satellite and radar images, synoptic observations and radio sounding. The scheduled production of graphics, including movies is possible. The experts working with DIANA can not only draw fronts and weather phenomena on the prepared maps, but they can also correct meteorological fields. DIANA is fully integrated in the NMI software environment which is very different from software of the Hydrometcenter of Russia. That is why the technology of DIANA implementation at the Hydrometcenter of Russia differed considerably from the NMI technology.

Keywords: DIANA visualization system, the Hydrometcenter of Russia, the Norwegian Meteorological Institute (NMI).

Fig. 4. Ref. 26.

Fresh snow depth calculation via results of atmospheric modeling (exemplified by the use of the COSMO-Ru model / Kazakova E.V., Chumakov M.M., Rozinkina I.A. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 74–84.

The description of the developed system of postprocessing calculations of fresh snow depth based on the mesoscale model COSMO-Ru forecasts (sum of precipitation and air temperature) with the use of the fresh snow depth calculation algorithm implemented at the Hydrometcenter of Russia is presented. The preliminary analysis of cases of snowfalls observed during the Winter Olympic Games Sochi-2014 showed the efficiency of its use for meteorological support provision of sectors of the national economy.

Keywords: fresh snow, weather forecast, meteorological support of Winter Olympic Games Sochi-2014.

Tab. 1. Fig. 3. Ref. 6.

Model for snow cover characteristics calculation based on standard net meteorological observations / Kazakova E.V., Chumakov M.M., Rozinkina I.A. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 85–102.

The description of the proposed Multilayer Snow Cover Model (Многослойная Модель Снежного Покрова – ММСП) based on standard meteorological observations is presented. Results of snow water equivalent calculation according to the model and their comparison with snow surveys data for stations situated at the European part of Russia are discussed. It is shown that the model reproduces snow cover characteristics realistically and could be used in automated technology for snow water equivalent (SWE) initial fields forming for atmospheric models and daily SWE calculations in the future.

Keywords: snow cover modeling, snow water equivalent, weather forecast.

Tabl. 2. Fig. 2. Ref. 23.

Algorithm for calculating turbulent length scale in the atmospheric boundary layer module of the COSMO-Ru model in the presence of stratocumulus clouds / Perov V.L. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 103–114.

In the paper [2] an algorithm for the calculation of the non-local turbulent length scale l is proposed. This algorithm is based on the method of displacement of air particles vertically under the influence of thermal stratification in the atmospheric boundary layer (ABL). The results obtained in [2] using the numerical weather prediction model COSMO-Ru showed that the use of the non-local l gives better results than the results with the local l when compared with observational data. In this paper, we propose a generalization of the algorithm from [2] for the cases when stratocumulus clouds are present in the ABL. The presence of clouds strongly alters the buoyancy term in the equation of turbulent kinetic energy by virtue of taking into account phase transitions of moisture. As a result, turbulence, buoyancy flux and turbulent length scale significantly increase in comparison with the case of cloudless. The results show the advantage of the proposed algorithm when compared with observations from the experiment ASTEX.

Keywords: numerical weather prediction model COSMO, atmospheric boundary layer, turbulent length scale, stratocumulus clouds.

Fig. 5. Ref. 9.

Forecast of air pollutants concentration using thecoupled chemical model COSMO-Ru7-ART / Surkova G.V., Kirsanov A.A., Kislov A.V., Revokatova A.P, Rivin G.S. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 115–138.

This article represents the results obtained while using the coupled chemical transport model COSMO-Ru7-ART. In the first part we described our methods. In particular the model COSMO-ART itself and its version adopted at Hydrometeorological Center of Russia − COSMO-Ru7-ART Besides, we give a description of numerical experiments. Results of the model verification are represented. The implemented at the HMC of Russia techniques for fires pollutant distribution forecast and for calculation of actual emissions of air pollutants in the megapolis (based on monitoring data) are shown. The second part is dedicated to the description of the results of numerical experiment performed using two different methods of emission calculation. In conclusion areas for further development of the COSMO-Ru7-ART at the Hydrometeorological Center of Russia suggested.

Keywords: air pollution, chemical-transport modeling, emissions, fires pollution forecast, COSMO-Ru7-ART.

Fig. 4. Ref. 45.

The impact of snow albedo parametrization in the global atmosphere model on medium- and longe-range numerical forecasts / Tolstykh M.A. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 139–149.

The variations in snow albedo due to aerosol deposition and water loading of snow can change considerably the surface radiation flux. This, in turn, affects surface temperature substantially. In this work, the impact of snow albedo modification on the results of numerical medium- and long-range weather forecasts computed with the global atmosphere model SL-AV is studied. It is shown that the snow albedo modification significantly reduces the error in near-surface temperature long-range forecasts.

Keywords: numerical weather prediction, atmospheric general circulation models, parameterizations of subgrid-scale processes, snow albedo.

Fig. 4. Ref. 14.

High resolution model COSMO-Ru1SFO: influence of the external parameters on the model output / Shatunova M.V., Rivin G.S. // Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 150–167.

The paper examines the impact of external parameters on the simulation results of the high resolution model COSMO-Ru1SFO with the grid step 1,1 km for the region with complicated orography. The influence of the model integration domain size and the model orography on temperature and precipitation forecast is explored.

Keywords: High spatial resolution, external parameters, orography, model domain, temperature forecast, precipitation forecast.

Tab. 2. Fig. 8. Ref. 8.

Improvement of the method for forecasting the index Wi characterizing winter weather conditions / Sadokov V.P., Kuznetsova N.N., Kozeltseva V.F.// Proceedings of Hydrometcentre of Russia. – 2014. – Vol. 352. – P. 168–176.

New methods of the forecast of the temperature-humidity index *Wi* are presented. The first one is based on the use of the fields H500 as a predictor. The second is founded on new air temperature and precipitation long-term prediction methods. The estimation of a series of forecasts for H500 for 1979–2006 is shown. The estimation of a series of forecasts based on new methods of forecast of air temperature and precipitation for 2007–2010 is given

Keywords: forecast, predictor, selection of similar processes, temperature-humidity index *Wi.*

Tab. 4. Ref. 6.