Flood estimation for the Sukhona River based on the joint use of ECOMAG and COSMO-Ru models / Churiulin E.V., Krylenko I.N., Frolova N.L., Belyaev B.M., Rozinkina I.A. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 6-24.

A new runoff forecast methods is presented for modern climate conditions. It is based on the joint use of the ECOMAG runoff formation model and the output products of COSMO-Ru nonhydrostatic atmospheric model to calculate spring floods on the Sukhona river near Velikiy Ustyug. Satisfactory calculated characteristics of spring floods were obtained for the period of 2013–2018 including the runoff-ice-jam flood in May 2016 near Velikiy Ustyug.

Keywords: runoff formation model, nonhydrostatic atmospheric model, precipitation, calculation of flood characteristics

Tab. 2. Fig. 7. Ref. 21.

Orographic turbulence: generation mechanisms and forecasting / Shakina N.P. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 25-47.

Main results are reviewed in orographic turbulence studies, including mechanisms of its generation, field experiments and attempts to predict the phenomenon, as basing of numerical models outputs. It is concluded that post-processing of numerical forecasting fields (mainly those of height, wind and temperature, with sufficient vertical resolution) from the models operatively used in Hydrometeorological center of Russia can produce a useful first approximation to operative forecasts of orographic turbulence for aviation.

Keywords: mountain waves, Kelvin-Helmholtz instability, critical level, orographic turbulence, downslope windstorms, lee-wave rotors, wave drag, aviation forecasts

Tab. 1. Ref. 74.

Some methods of convective activity analysis in the Northwest Pacific / Fil' A.Y., Krokhin V.V., Bokhan V.D., Veriatin V.Y. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 48-59.

The results of the analysis of the development of atmospheric convection in the northwestern Pacific are presented. Based on the Falkovich equations, a method has been developed for calculating the parameter $\varkappa$ characterizing multi-scale convective activity in the region. The fields of the parameter "upper level of convection" were constructed to estimate the spatial distribution of zones of convective layers of different thickness and the probable position of the northern boundary of the tropical atmosphere in the region. A "$\varkappa$-analysis" is proposed for the purpose of optimal digital, textual and graphical representation of the fields of the parameter $\varkappa$. The hydrometeorological data of the global forecast model GFS was used for the study.

Keywords: atmospheric convection, convective activity, Falkovich indicator, parameter $\varkappa$, GFS model

Fig. 3. Ref. 12.

On the theoretical possibility of Rossby wave stabilization / Klemin V.V. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 60-66.

The conclusions presented in the article refer to the quasigeostrophic approximation for describing atmospheric processes. A part of the Northern Hemisphere is considered as the domain of definition of the solution.

The result obtained can be considered as a theoretical substantiation to a hypothetical possibility of influencing large-scale atmospheric wave processes (the stationing of Rossby waves), provided that the control actions are commensurate with the spatial scale of the synoptic processes.

Keywords: atmospheric processes, hypothetical influence, Rossby waves stabilization, Northern Hemisphere

Ref. 6.

Monitoring and prediction of climate variability in the Volga Region / Perevedentsev Y.P., Vilfand R.M., Shantalinskii K.M., Guryanov V.V., Nikolaev A.A., Ismagilov N.V. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 67-94.

The history of meteorological observations and climate research in the Volga region is briefly considered. The long-period climatic fluctuations are identified. It is shown that Northern Hemisphere temperature changes in 1850–2016 are uneven that is defined by the 60–70-year oscillation. The contribution of global processes to the temperature variability for the Kazan region is 37 % in winter and 23 % in summer. The focus is on the analysis of climatic changes on the territory of the Volga Federal District (VFD) from the ground up to a height of 64 km over the past decades (1979-2016) using data of ERA-Interim reanalysis and 117 VFD weather stations (1955-2009). The temperature trends in the troposphere and stratosphere are assessed, the vertical correlations between the layers are revealed. The climate change scenarios until the end of the 21st century are considered on the basis of CMIP5 climate model ensemble simulations.

Keywords: climate variability, air temperature, linear trend, temperature anomaly, atmospheric circulation

Tab. 3. Fig. 15. Ref. 16.

Forecasting of Heat Waves on Subseasonal Timescales / Kruglova E.N., Kulikova I.A., Tishchenko V.A., Khan V.M. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 95-108.

The possibilities of predicting extreme weather events on intraseasonal (to 45 days) time intervals based on the hydrodynamic modeling are considered. Background information is based on the forecasts of daily mean surface air temperature obtained with the ECMWF model in the framework of the S2S (Subseasonal to Sesonal Prediction Project) project, as well as on the ERA Interim reanalysis. The case studies (for different initial dates and regions) of significant temperature anomalies are investigated using the modified warm spell duration index (WSDI) recommended by WMO. The atmospheric circulation patterns affecting the heat wave formation are also considered. Based on the obtained skill scores of forecasts using EDI (Extremal Dependence Index) and its standard deviation *s*, a conclusion is made on the presence of the useful signal on intraseasonal timescales. The results can be useful in the practice of long-range meteorological forecasting of surface air temperature.

Keywords: long-range forecasts, heat waves, atmospheric circulation patterns, verification

Tab. 3. Fig. 2. Ref. 19.

Comparison of the parametric and non-parametric approaches to probabilistic interpretation of ensemble seasonal predictions / Kryjov V.N. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 109-118.

A skill of probabilistic predictions estimated based on the parametric and non-parametric approaches to the probabilistic interpretation of ensemble model forecasts is analyzed. It is shown that the Gaussian approximation of the probability distribution of the forecast ensemble improves its probabilistic interpretation and leads to the essential statistically significant improvement of the skill of probabilistic forecasts.

Keywords: model ensemble forecast, probabilistic interpretation of forecast ensemble, rank probability skill score

Tab. 2. Ref. 21.

Trends in the occurrence of thaws in the Arkhangelsk region / Grishchenko I.V.// Hydrometeorological Research and Forecasting, 2018, no. 4 (370), pp. 119-126.

The frequency of occurrence of thaws within the calendar winter is analyzed for the territory of the Arkhangelsk region. It is revealed that they are most often observed in December and are less often observed in January. The calculation of the linear trend coefficients for the number of thaw days for the period of 1977–2017 and over the past 20 years shows that there is a trend towards an increase in the number of days with thaws in December and February, and it has increased over the past 20 years. In January there is a tendency toward the reduction of the number of days with thaw. The atmospheric circulation pattern for these periods is considered. The dependence of the occurrence of thaws on a particular atmospheric circulation pattern is studied. The influence of thaws on the regional economy and economic activity of population is demonstrated.

Keywords: causes of its occurrence, trends in the number of days with thaws, atmospheric circulation, damage

Tab. 1. Fig. 3. Ref. 4.

Precipitation regime features in the Moscow region in 2008-2017 / Brusova N.E., Kuznetsova I.N., Nahaev M.I. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 127-142.

The signals of the anthropogenic impact on precipitation under conditions of the megacity growth and suburb urbanization are revealed from precipitation measurements at 11 stations of the Moscow region in 2008–2017. The sensitivity to the urban impact is not found for precipitation averaged over the long period but is manifested for monthly mean precipitation. A response to the anthropogenic impact is most noticeable in the distribution of summer precipitation associated with convective processes. The amount of precipitation in Moscow in the recent decade has decreased as compared with the normal in winter and has increased in summer. There was 7–10 % more precipitation at the VDNKh and Nemchinovka urban stations than in the center of Moscow (Balchug) and in its northwestern outskirts (Tushino). Precipitation of more than 10 mm/12hour at the city stations is registered more often than in the suburbs and at the background stations. The zone of precipitation decrease was detected around the megapolis, where the amount of precipitation was smaller than at the background and city stations from April to November during the analyzed period.

Keywords: precipitation, urban impact on precipitation, zone of precipitation decrease around the megacity

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

Analysis of consensus forecast for summer 2018 / Khan V.M., Tishchenko V.A., Vilfand R.M., Kulikova I.A., Kruglova E.N., Birman B.A., Berezhnaya T.V. // Hydrometeorological Research and Forecasting, 2019, no. 1 (371), pp. 143-155.

The results of the development of consensus forecast (CF) for the anomalies of air temperature and precipitation in Northern Eurasia for the summer of 2018 during the 14th session of the North Eurasian Climate Outlook Forum, are presented. Estimates of the state of atmospheric modes of climatic variability in the prognostic period, inertial factors of the surface characteristics, variability of air temperature and precipitation over the study area, and forecasts based on hydrodynamic models from leading prognostic centers for the summer of 2018 are discussed. Based on a comparison of observational and forecast data, qualitative and quantitative estimates of CP verification are given for the whole territory of the NEACC and separately for large regions.

Keywords: consensus forecast, NEACOF, NEACC, skill scores, predictability, circulation indices

Tab. 1. Fig. 3. Ref. 16.