DOI: https://doi.org/10.37162/2618-9631-2023-1-6-20

Improved dynamic statistical method for forecasting monthly surface air temperature / Vilfand R.M., Kruglova E.N., Kulikova I.A., Khan V.M. // Hydrometeorological research and forecasts, 2023, no. 1 (387), pp. 6-20.

The possibility of improving the dynamic statistical method for forecasting monthly air temperature using modern hydrodynamic models and statistical methods in operational practice of the Hydrometeorological Research Center of Russia is substantiated. The technology for monthly forecasting of surface air temperature anomalies based on the combination of the improved scheme of medium-range forecasts of weather elements for 15 days and the SL-AV model output forecast data for 16–30 days is presented. Forecast skill scores obtained in real time for 326 stations located on the territory of Russia are given. Advantages of the proposed approach are shown, especially in the case of significant air temperature anomalies. The results are supposed to be used in the technology of long-range forecasting at the Hydrometeorological Research Center of Russia.

Keywords: surface air temperature, monthly forecasts, statistical correction, verification

Tab. 2. Fig. 10. Ref. 11.

DOI: https://doi.org/10.37162/2618-9631-2023-1-21-66

Verification of deterministic and probabilistic radar precipitation nowcasting in warm and cold seasons in the European part of Russia / Muravev A.V., Kiktev D.B., Smirnov A.V., Pavljukov Ju.B., Serebrjannik N.I. // Hydrometeorological Research and Forecasting, 2023, no. 1 (387), pp. 21-66.

Comparative quality analysis of ensemble radar precipitation nowcasting based on test results for the warm (May–September 2020) and cold (November 2021–March 2022) seasons are presented. Composite precipitation intensity fields obtained from radar observations were used as control data for verification. In both periods, a slight but systematic advantage of forecasts of the mean ensemble field was revealed, which indicates the expediency of using ensembles of even a small volume. For all the skill scores used (except for the frequency bias), forecasts in the cold season turn out to be better than forecasts in the warm season, however, the sample sizes for verification in the cold season may be significantly lower than the corresponding sample sizes in the warm season. The problems of comparative quality analysis are discussed, which are caused, in particular, by the loss of spatial connectivity of the composite field during the cold season.

Keywords: ensemble nowcasting of meteorological fields, radar precipitation estimates, composite precipitation field, point and spatial field forecast verification

Tab. 19. Fig. 25. Ref. 17.

DOI: https://doi.org/10.37162/2618-9631-2023-1-67-86

Forecasting sea surface temperature and 2 m air temperature with a coupled ocean-atmosphere system for the White Sea region in summer / Butakov N.Y., Rubinstein K.G. // Hydrometeorological Research and Forecasting, 2023, no. 1 (387), pp. 67-86.

The results of forecasting the fields of hydrometeorological parameters with a coupled ocean-atmosphere system for the White Sea region for the period of June 2–September 1, 2015 are presented. The coupled system included the atmospheric (WRF-ARW), oceanic (ROMS) and wave (SWAN) models. Sea surface temperature (SST) and 2 m air temperature forecast skill scores are obtained. A systematic overestimation of the computed SST values relative to the OISST analysis data is 0.4 °C. The 2 m air temperature forecasts were generally more successful when using the coupled system than when using the WRF-ARW, and the improvement was observed mainly in the land areas immediately adjacent to the White Sea. Time intervals in which the influence of the sea on the 2 m air temperature forecasts was maximum and minimum are given.

Keywords: coupled ocean-atmosphere system, ocean-atmosphere interaction, White Sea, WRF-ARW, ROMS, SWAN

Tab. 8. Fig. 11. Ref. 22.

DOI: https://doi.org/10.37162/2618-9631-2023-1-87-101

Modeling of the wind waves in the Laptev, East Siberian and Chukchi seas / Myslenkov S.A. // Hydrometeorological Research and Forecasting, 2023, no. 1 (387), pp. 87-101.

The paper presents an analysis of wind wave parameters in the Laptev, East Siberian and Chukchi seas based on the results of numerical experiments with the WAVEWATCH III wave model for a period from 1979 to 2021. Wave modeling was carried out using an unstructured computational grid with a high resolution (up to 800 m) in the coastal zone. The NCEP/CFSR/CFSv2 reanalysis was used as wind forcing. The maps of the long-term mean values of the wave height, wave length and period were obtained. For the several points in the central part of each sea, the mean annual values of wave heights are calculated and the analysis of interannual variability is carried out. The maximum significant wave height was 5–6 m in the Laptev Sea, 6–7 m in the East Siberian Sea, and 7–7.5 m in the Chukchi Sea. The analysis of interannual variability showed that there is a positive trend in wave height for all seas under consideration. The largest increase in the annual mean wave height is observed in the East Siberian Sea (from 0.4 to 1.4 m in the ice-free period).

Keywords: Laptev Sea, Chukchi Sea, East Siberian Sea, wave modeling, Arctic wind waves, WAVEWATCH III

Fig. 9. Ref. 22.

DOI: https://doi.org/10.37162/2618-9631-2023-1-102-119

Analysis of the causes of flooding on the Partizanskaya River (Primorsky Krai) in September 2022 / Lisina I.A., Vasilevskaya L.N., Vasilevsky D.N., Kramareva L.S., Shamilova Yu.A. // Hydrometeorological Research and Forecasting, 2023, no. 1 (387), pp. 102-119.

The article presents the analysis of conditions for the occurrence and development of flooding caused by the influence of typhoon Hinnamnor in September 2022 on the Partizanskaya River, which is not typical of this basin and therefore led to major economic damage.

It was found that, against the background of orographic features of the southeastern Primorsky Krai, intense precipitation was registered due to the development of deep convection in the system of the former typhoon, which along with increased wetting of the catchment surface in the previous summer months, caused the 2022 strongest flood on the Partizanskaya River.

Keywords: Primorsky Krai, Partizanskaya River, typhoon impact, heavy shower, outstanding flood, NDVI

Tab. 2. Fig. 7. Ref. 19.

DOI: https://doi.org/10.37162/2618-9631-2023-1-120-130

Method for forecasting the sunflower yield in the subjects of the European part of Russia and entire Russia with a lead time of 3–3.5 months / Strashnaya A.I., Tishchenko V.A. // Hydrometeorological research and forecasts, 2023, no. 1 (387), pp. 120-130.

A method is developed for forecasting the yield of sunflower seeds for the subjects of the European part of Russia and entire Russia based on ground observations of Roshydromet hydrometeorological stations. The sunflower yield was used according to Rosstat data in weight after processing. When developing the forecast method for the subjects of the Russian Federation, the predicted sunflower yield was considered as the sum of two forecasts: the forecast of the yield trend described by degree 1 and 2 polynomials and the forecast of yield anomalies (yield deviations from the trend) depending on meteorological and agrometeorological factors and most affecting the yield. The criterion for selecting parameters for the predictive regression prediction model for different subjects was a degree of influence of this parameter on the yield. The predictive regression model for calculating yields in entire Russia was developed on the basis of the principal component analysis using yields for federal districts expressed in yield deviations from the average long-term yield for specific districts.

The method for forecasting the sunflower yield was adopted as the main one at Hydrometeorological Research Center of Russia and for the subjects on the territory of the Bashkir, Volga, Crimean, Central Chernozem, Tatarstan, and North Caucasian administrations for hydrometeorology and environmental monitoring (the Volgograd, Rostov, Krasnodar, Stavropol regions, the Kabardino-Balkarian Republic).

Ключевые слова: sunflower, yield, forecast method, operational tests, accuracy

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

DOI: https://doi.org/10.37162/2618-9631-2023-1-131-147

Regional features of changes in the normals of the main climatic parameters in Russia / Korshunova N.N., Shvets N.V. // Hydrometeorological Research and Forecasting, 2023, no. 1 (387), pp. 131-147.

The regional features of changes in the normals of the main climatic parameters (air temperature, precipitation, water vapor tension, sea level pressure) on the territory of Russia are studied for three 30-year periods: 1961–1990, 1981–2010, and 1991–2020. Climate normals are calculated in accordance with the WMO requirements. In addition to the difference in the normals for stations, the values averaged over the territory of quasihomogeneous climatic regions are calculated. Seasonal changes in the regime of the main climatic parameters in certain regions of Russia over the past decades are revealed. In the last thirty years, a slowdown in warming in all seasons has been revealed on the territory of Russia. Summer precipitation normals for 1991–2020 decreased in most of the country, however, a significant increase in precipitation was found in the southern regions of Yakutia, the Amur region, and Primorye. For the regime of sea level pressure, the greatest changes are revealed in winter. The differences in climatic normals obtained in the present study can be considered as one of the indicators of climate change that are differently manifested in different regions of Russia. The information can be useful for developing preventive adaptation measures under changing climate.

Keywords: climate, climate normal, air temperature, precipitation, air pressure, partial water vapor pressure, regional features

Tab. 2. Fig. 9. Ref. 13.

DOI: https://doi.org/10.37162/2618-9631-2023-1-148-160

Dynamics of meteorological factors affecting desertification of the Kura-Aras Lowland during 1991–2020 / Gadzhiev A.Kh., Guseinov Dzh.S., Ismailova N.N. // Hydrometeorological Research and Forecasting, 2023, no. 1 (387), pp. 148-160.

The influence of meteorological factors on the changes in landscapes and the climatic regime of the Kura-Aras Lowland over a 30-year period (1991–2020) is investigated. An interest in the region is caused by the major environmental problem: an increase in the area of saline lands of the Kura-Aras Lowland and the expansion of the area of its desertification. The dynamics of temperature, precipitation, wind, as well as the influence of the Caspian Sea level during 1991–2020 is compared with the parameters for 1961–1990. It is shown that over the recent 30 years, the average annual temperature in the lowland has increased by 0.8 °C as compared to the period of 1961–1990.

Keywords: Kura-Aras Lowland, climate change, desertification, precipitation, temperature anomaly, correlation, interpolation, trend

Tab. 1. Fig. 6. Ref. 15.

DOI: https://doi.org/10.37162/2618-9631-2023-1-161-171

Features of atmospheric circulation in the summer of 2022 / Khan V.M., Vilfand R.M., Tishchenko V.A., Sumerova K.A., Emelina S.V., Kaverina E.S., Kruglova E.N., Kulikova I.A., Nabokova E.V., Subbotin A.V. // Hydrometeorological research and forecasts, 2023, no. 1 (387), pp. 161-171.

The main features of the atmospheric circulation in the summer of 2022 based on the Northern Hemisphere climate system monitoring are discussed. Estimates of the temperature and precipitation regime in Northern Eurasia based on observational data are given. The regions in which the anomalies of geopotential height, surface air pressure, and sea surface temperature are most/least successfully simulated by WMO multi-model forecasts and SL-AV model forecasts are identified. Good skill scores of consensus air temperature and precipitation forecasts for the summer of 2022 issued during NEACOF-22 is noted. For the entire territory of Northern Eurasia, the accuracy of forecasts was 80% for surface air temperature and 64% for precipitation.

Keywords: large-scale atmospheric circulation, sea surface temperature, multi-model forecast, consensus forecast, air temperature, precipitation, skill scores

Tab. 1. Fig. 4.