Southern Hemisphere jet streams and factors determining their dynamics / Ivanova A.R. // Hydrometeorological research and forecasts. 2025, no. 2 (400), pp. 6-22.

A review of papers related to jet streams in the Southern Hemisphere is presented. The structural features of jet streams and an analysis of their variability during different periods of the 20th and early 21st centuries are discussed. The results of climate modeling of jet streams within the CMIP and PAMIP projects are described. Potential causes for changes in the position and intensity of jet streams on both long and short timescales are identified.

Keywords: jet streams, Southern Hemisphere, reanalysis, Southern Annular Mode, climate change, stratospheric ozone, volcanic eruptions

Ref. 51.

DOI: https://doi.org/10.37162/2618-9631-2026-2-6-22

Cloud liquid water path over the global ocean derived from MTVZA-GYa satellite-based microwave radiometer / Maslyashova A.O., Uspensky A.B. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 23-37.

The purpose of the present study is to describe a new algorithm based on a neural network approach (Convolutional Neural Network with encoder-decoder architecture, CNN) for cloud liquid water path (LWP) estimation over the global ocean from MTVZA-GYa satellite-based microwave radiometer observations. The input data for the network are the antenna temperatures measured in 10 MTVZA-GYa channels. The CNN was trained on a sample of 2 723 000 spatiotemporally collocated pairs of antenna temperatures and reference cloud LWP values from the ERA5 reanalysis. The data were selected for individual days across different seasons of 2024–2025 over the Pacific and Atlantic oceans, excluding polar areas.

Verification of the retrieved LWP was performed against the spatiotemporally nearest “reference” LWP values from the ERA5 reanalysis and with LWP estimates from the AMSR2 microwave radiometer onboard the Japanese GCOM-W1 satellite. The root-mean-square deviation values calculated for various areas of the Atlantic and Pacific oceans within the latitude zone of ±60° for June 30, 2025 range from 0.05 to 0.075 kg/m² depending on the region and observation time. A visual comparison of the LWP fields retrieved from the MTVZA-GYa and AMSR2 data showed a good agreement in the patterns of high and low values for both kinds of estimates. The verification confirmed the operational capability of the proposed method for analyzing MTVZA-GYa data and demonstrated a satisfactory quality of the retrieved cloud LWP fields.

Keywords: MTVZA-GYa microwave radiometer, cloud liquid water path, Convolutional Neural Network, ERA5 reanalysis, verification

Fig. 6. Ref. 26.

DOI: https://doi.org/10.37162/2618-9631-2026-2-23-37

Atmospheric circulation during summer heatwaves over the Svalbard archipelago / Ilyushchenkova I.A. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 38-50.

Data on daily maximum air temperatures for the period from 1932 to 2025 in Barentsburg (Svalbard archipelago) are analyzed. Twenty episodes of extreme air temperature rises (heatwaves) were identified. It was found that there has been an increase in the duration and intensity of heatwaves after the 1990s. The most intense and longest heatwave was observed from July 31 to August 27, 2024.

The connection between the temperature rise and atmospheric circulation patterns near the surface and in the mid-troposphere, as well as the presence of atmospheric blocking based on an averaged anomaly of potential vorticity were investigated. The analysis showed that in all cases of the temperature rise over the Barents and Kara seas, a large anticyclonic area disrupting the western atmospheric circulation was formed.

Keywords: Svalbard archipelago, atmosphere, Western Arctic, climate change in the Arctic, meteorological characteristics, climate warming, synoptic conditions

Tab. 1. Fig. 3. Ref. 21.

DOI: https://doi.org/10.37162/2618-9631-2026-2-38-50

Climate anomalies of the summer season of 2024 over Northern Eurasia: monitoring, forecasts, impacts / Sumerova K.A., Khan V.M., Tishchenko V.A., Vilfand R.M. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 51-68.

The main results of a comprehensive analysis of the large-scale atmospheric circulation in the upper, middle, and lower troposphere of the Northern Hemisphere for the summer of 2024 are presented. Spatial features of long-term trends in the distribution of air temperature and precipitation are examined. Particular attention is paid to heat waves in Russia in the summer of 2024 and to the associated economic losses. The skill scores of the consensus forecast for the territory of Northern Eurasia for the summer of 2024 are assessed in terms of reproducing the temperature and precipitation regime. An analysis of the multi-model forecast of the World Meteorological Organization and the NEACC consensus forecast of average seasonal anomalies of air temperature and precipitation showed an advantage of the consensus forecast based on three Russian models (SLAV, MGO, and INM) with equal weighting factors.

Keywords: air temperature, precipitation, forecast skill, large-scale atmospheric circulation, NEACC, circulation indices, Arctic ice, extreme weather, economic losses

Tab. 4. Fig. 6. Ref. 19.

DOI: https://doi.org/10.37162/2618-9631-2026-2-51-68

Methods for correcting total precipitation retrieved from Himawari-9 geostationary satellite data over the territory of the Russian Far East / Kuchma M.O., Andreev A.I., Malkovsky S.I. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 69-87.

In this study, methods for the automatic correction of 12-hour precipitation derived from the Himawari-9 geostationary satellite are investigated. Satellite-based precipitation is obtained using a previously developed algorithm for estimating an instantaneous precipitation intensity. The correction is performed using accumulated precipitation measurements from ground-based meteorological stations preceding the analyzed period in a moving time window during the warm season from May to October. The study is conducted over the Russian Far East region using data from 136 Roshydromet meteorological stations. The best results were achieved with the method that selects a correction model based on the minimum root-mean-square error. The quality assessment was carried out using 10-day and monthly precipitation. Application of the correction algorithm reduces the root-mean-square error of total precipitation estimation on average by 30–50% and the bias by 1.5–3 times.

Keywords: precipitation, total precipitation, precipitation correction, Himawari, rain gauges

Tab. 2. Fig. 2. Ref. 30.

DOI: https://doi.org/10.37162/2618-9631-2026-2-69-87

Evaluating application of the satellite altimetry assimilation method in the one-degree NEMO model using the relationship between sea level and vertical displacements of water temperature and salinity profiles / Stepanov V.N., Resnyanskii Yu.D., Strukov B.S., Zelenko / A.A. / Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 88-105.

The results of a validation study of a satellite altimetry assimilation method, which is a part of the NEMOVAR assimilation system of the European Centre for Medium-Range Forecasts (ECMWF), are presented. The method utilizes a relationship between sea level and vertical displacements in water temperature and salinity profiles. The validated method is integrated into the ocean data assimilation system (ODAS) currently used at the Hydrometeorological Research Center of the Russian Federation using the one-degree NEMO numerical model. In addition to altimetry, the analyzed ODAS version assimilates Argo profiling float data on the vertical water temperature and salinity distributions using 3D-Var variational analysis, as well as sea surface temperature and sea ice concentration data using relaxation procedures. It is shown that the tested method provides a reduction in the error in reproducing the ocean surface level by the model from 6.8 to 5.4 cm, but does not improve the simulation of thermohaline fields due to the low model resolution.

Keywords: ocean data assimilation, NEMO model, Argo data, satellite altimetry

Fig. 4. Ref. 45.

DOI: https://doi.org/10.37162/2618-9631-2026-2-88-105

Spectral bandwidth of surface waves in the Black Sea / Zapevalov A.S. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 106-118.

The variability of the bandwidth of the frequency spectrum of sea surface elevations is analyzed. The analysis is based on direct wave measurements performed at a stationary oceanographic platform in the Black Sea. The spectral bandwidth ν_L was determined by the deviation of the frequency from its mean value and was calculated as a dimensionless combination of the first three spectral moments. It is shown that the lower limit of the range over which the spectral bandwidth varies is 0.4, and the upper limit is 1.0. The median of the distribution ν_L constructed from measurement data in all situations is equal to 0.6. The bandwidth ν_L depends on the significant wave height, the correlation coefficient between these parameters is -0.56.

Keywords: sea surface, waves, wave spectrum, spectral bandwidth, Black Sea
Fig. 3. Ref. 37.

DOI: https://doi.org/10.37162/2618-9631-2026-2-106-118

The World Meteorological Organization's activities to accelerate the digital transformation of operational hydrology / Simonov Yu.A., Dmitrieva T.M. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 119-127.

Recently, digital transformation has played an increasingly important role in hydrometeorological research and forecasting. The World Meteorological Organization (WMO) has significantly expanded the use of artificial intelligence and machine learning, as well as the Internet of Things, in developing its global infrastructure for observations, information exchange, data processing, and forecasting. In 2025, the Executive Council and the World Meteorological Congress endorsed the WMO Action Plan on Artificial Intelligence, established a joint advisory group on artificial intelligence, and adopted a new strategy for the WMO Integrated Data Processing and Prediction System with accelerated adoption of artificial intelligence, thereby giving strategic importance to the digital transformation of hydrometeorology.

Operational hydrology, encompassing the monitoring of water bodies, collection of hydrological information, its processing, production, and delivery of information, analytical and forecast products to end users, is no exception. The present paper provides an overview of the main areas of digital transformation of WMO projects and systems in operational hydrology.

Keywords: digital transformation, artificial intelligence, WMO, operational hydrology
Fig. 1. Ref. 19.

DOI: https://doi.org/10.37162/2618-9631-2026-2-119-127

Efficiency of using meteorological forecasts in river runoff forecasting methods / Borsch S.V., Vilfand R.M., Simonov Yu.A., Khristoforov A.V. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 128-142.

A quantitative assessment of the efficiency of using meteorological forecasts in river runoff forecasting methods is proposed. Examples of such assessment are provided for long- and short-term forecasts of various water inflow characteristics for the Cheboksary Reservoir and river runoff of the Oka and Kama basins and the Black Sea coast of the Caucasus. These forecasts were generated using the ECOMAG, DWAT, and HBV hydrological models, an ensemble approach, and the COSMO-Ru operational system.

It is shown how the efficiency of using meteorological forecasts depends on the reliability and representativeness of available hydrometeorological information, the adequacy of the river runoff formation model, the degree of influence of weather conditions and the accuracy of their prediction on the resulting forecast during the lead time period.

A possibility of significantly reducing hydrological forecasting errors even when using low-accuracy meteorological forecasts is demonstrated.

Keywords: river runoff, forecast, lead time, error, meteorological elements, uncertainty, efficiency
Tab. 5. Ref. 24.

DOI: https://doi.org/10.37162/2618-9631-2026-2-128-142

Modern methods of water regime forecasting with different forecast lead times / Romanov A.V., Akmaev E.R., Semenova N.K. // Hydrometeorological research and forecasts. 2025, no. 2 (400), pp. 143-168.

An analisis comparing modern methods for forecasting water regimes with different lead times was performed, contrasting neural networks with advanced statistical methods. The comparison utilized data of routine hydrometeorological observations for five test watersheds located in different physiographic zones of river runoff formation according to the classification by B.D. Zaikov (type II (rivers with flooding during the warm season), Far Eastern type II, East European type I and two catchments of North Caucasian type III).

Despite limited hydrometeorological data, which constrained the effectiveness of neural network modeling, the standard forecast error criterion (the ratio of the root-mean-square error to the root-mean-square change over the forecast lead-time) based on deep learning (DL) turned out to be significantly better than the statistical methods used. For three test catchments DL models gave satisfactory skill scores differentiated by forecast lead times from one to ten days. For time-tested statistical methods such a result was obtained only for one test catchment (type II (rivers with flooding during the warm season)) with a forecast lead time of one day. The completed work, utilizing neural network technologies, demonstrates the validity of expanding the scope of scientific research related to physico-statistical mathematical modeling of streamflow generation.

The prospects for developing this approach are highlighted in the transition toward a fundamentally new automated neural network system for producing operational hydrological forecasts with varying lead times for all gauged watersheds in the Russian Federation that are of economic importance.

Keywords: short- and medium-term hydrological forecasts, neural networks, deep learning model, extrapolation of the water level hydrograph, statistical methods, water level

Табл. 10. Ил. 10. Библ. 28.

DOI: https://doi.org/10.37162/2618-9631-2026-2-143-168

Overview of the agrometeorological conditions during the 2024-2025 growing season / Tarasova L.L., Klang P.S., Pavlova A.V. // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 169-183.

The paper investigates main weather anomalies of the 2024/2025 winter and the 2025 summer. The agrometeorological conditions of the growing season in most regions were favorable, which allowed the harvest to be higher than planned (141.2×10^6 t of grain and pulse crops). The reasons for the formation of drought in southern Russia and its impact on final productivity are analyzed.

Keywords: drought, waterlogging of soil, light frosts

Tab. 2. Fig. 5. Ref. 6.

DOI: https://doi.org/10.37162/2618-9631-2026-2-169-183

Monitoring and consensus climate system assessments based on the results of the thirtieth session of the Northern Eurasia Climate Forum / Khan V.M., Vilfand R.M., Sumerova K.A., Tischenko V.A., Kulikova I.A., Emelina S.V., Kruglova E.N., Nabokova E.V., Leila Goodarzi Salarpour, Sofia Bilmes, Parvathy Subha // Hydrometeorological research and forecasts. 2026, no. 2 (400), pp. 184-199.

The paper presents projections of the state of the climate system that are based on an analysis of data from the Russian global models (SL-AV, MGO, INM RAS), models from international forecasting centers, and the results of the experimental Impact-Based Forecasting (IBF) methodology developed by the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) for the upcoming summer season of 2026. A detailed analysis of the stratospheric and tropospheric circulation in the Northern Hemisphere during the 2025/2026 winter is provided. Two episodes of sudden stratospheric warming, a negative phase of the Arctic Oscillation, and a record-low sea ice minimum, which contributed to an enhanced meridional circulation, are noted. The skill of the previous consensus forecast for the winter season is assessed. The reasons for its relatively low performance are discussed. Based on the consensus forecast for the summer of 2026, UN ESCAP IBF climate risks for the population, agriculture, and hydropower engineering are mapped.

Keywords: consensus forecast, Northern Eurasia, NEACOF-30, sudden stratospheric warming, Arctic Oscillation, sea ice, El Niño, forecast skill, Impact-Based Forecasting (IBF), UN ESCAP

Tab. 2. Fig. 10. Ref. 9.

DOI: https://doi.org/10.37162/2618-9631-2026-2-184-199