Methane in middle and high northern latitudes. Research 2018–2023. Kiselev A.A. Proceedings of the GGO. 2023. V. 608. P. 7–52.

A review of publications devoted to studies of the methanosphere of the middle and high latitudes of the northern hemisphere in 2018–2023 is presented, in particular, the growth rate of atmospheric methane concentration, its natural sources (flows from wetlands, from the coastal zone of the Arctic seas, permafrost, gas hydrates). Works are also considered, in which, through modeling, various aspects of the formation of the methanosphere, assessment of the response of the climate system to an increase in the content of methane in the atmosphere, etc. are studied. Particular attention is paid to the processes occurring in the 60–90°N belt.

Keywords: methane, natural sources of methane, methane concentration, middle and high northern latitudes

Fig. 2. Ref. 132.

Actinometric information in climate reference books. Stadnik V. V., Zadvornykh V. A., Trofimova O. V. Proceedings of the GGO. 2023. V. 608. P. 53–73.

The article contains concise information about the features of presentation of actinometric information in climate reference books. In the context of an extremely rare actinometric network in Russia, indirect methods for calculating the real amounts of total radiation are considered.

Particular attention is paid to estimating the possible amounts of radiation at an average state of atmospheric transparency and the complete absence of cloudiness, since the error in the indirect calculation of the total radiation depends on their reliability. When assessing the possible amounts of total radiation using data for 60 years of actinometric observations, changes in atmospheric transparency associated with the influence of volcanic eruptions, as well as a reduction in anthropogenic emissions due to a decline in industrial production, were taken into account.

The updated values of the possible sums of radiation and the empirical coefficients included in the calculation formulas for use on the territory of Russia are presented.

Keywords: actinometric network, indirect calculation methods, possible sums of radiation, empirical coefficients.

Tab. 7. Fig. 4. Ref. 22.

Simulation of illumination in conditions of continuous clouds of various forms. Gorbarenko E.V., Rublev A.N. Proceedings of the GGO. 2023. V. 607. P. 74–90.

On the basis of long-term observations carried out at the Moscow State University, the levels of natural illumination depending on the point and form of clouds are analyzed, empirical dependences of natural illumination are obtained with a continuous cover of clouds of various tiers and forms. Based on model calculations by the Monte Carlo method, theoretical estimates of the change in the illumination of the earth's surface for continuous clouds of various optical thicknesses were made. Comparisons were made between mathematical and empirical models of illumination under conditions of continuous cloudiness. An estimate of the level of illumination was made by the value of the transmittance of the light flux by various forms of clouds relative to a clear sky. The methods are compared with observations. It is shown that there are no advantages in using this or that method, since in all cases there remains an uncertainty associated with the impossibility of accurately determining the cloudiness parameters from ground-based, visual observations.

Keywords: natural illumination, cloudiness, long-term observations, mathematical models, empirical dependences.

Tab. 6. Fig. 5. Ref. 15.

Depth of soil freezing in climate change in river basins of the Republic of Bashkortostan. Baryshev V.I., Kalyuzhnyj I.L. Proceedings of the GGO. 2023. V. 608. P. 91–108.

Long-term observations (from 1937 to 2020) at the meteorological network of Roshydromet for soil freezing made it possible to present series of observations in the form of two sections: the first, from 1937 to 1980÷1982 (with a stable climate) and the second, from 1981 to 2020, with its change. Rows are characterized by great synchronicity of changes in the territory under consideration. The average freezing depths in the first section were 79 cm, varying from 44 to 115 cm. During the period of climatic changes, the freezing depth decreased by an average of 22 cm (from 6 to 43 cm), which is 28% of the original value. It was established that the change in freezing depths in the Tanalyk river basin by 15 cm (by 22% of the original) caused an increase in winter runoff by 0.457 m^3/s (which is 2 times more than in the first period). The decrease in spring runoff for the second period was 0.460 m^3/year.

Keywords: long-term observations depth of soil freezing, climate change, winter runoff, Republic of Bashkortostan.

Tab. 7. Fig. 4. Ref. 9.

On the effect of acoustic waves on the hydrometeor settling velocity. Ingel L. Kh. Proceedings of MGO. 2023. V. 608. P. 109–127.

Theoretically, some features of the motion of inertial particles in a liquid/gaseous medium are studied with rapid fluctuations in the velocity of the medium, for example, during the passage of an acoustic wave. Unlike a number of previous studies, the case of sufficiently massive particles/droplets (large Reynolds numbers) in the air is considered. Due to the nonlinear law of resistance, this resistance can increase significantly when the medium oscillates relative to inertial particles, so that the settling of hydrometeors can noticeably slow down.

Keywords: hydrometeors, inertial particles, settling velocity, medium oscillations, acoustic waves, nonlinear hydrodynamic resistance.

Fig. 2. Ref. 17.

Experimental investigation of fog viscosity. Shavlov A.V., Sokolov I.V., Dzhumandzhi V.A. Proceedings of the MGO. 2023. V. 608. P. 128–134.

The logarithmic decrement of the damping of oscillations of a pendulum in the form of a suspension with a thin plate and a ball in water fog under standard atmospheric conditions was measured. It was found that at high velocities of the pendulum, more than 10-1 mm/s, the viscosity of the fog is close to that of pure air. At speeds less than 10-1 mm/s, the fog begins to exhibit the properties of a non-Newtonian fluid. Its viscosity increases and can exceed the viscosity of pure air by tens of times. A numerical verification of the suitability of the electrostatic mechanism for explaining the non-Newtonian behavior of the fog has been performed.

Keywords: pendulum, logarithmic decrement of decay, fog, structural ordering, non-Newtonian viscosity, electric charge

Fig. 5. Ref. 24.

Estimation of the permissible area of non-shooting areas during anti-hail operations. Alita S.L., Appaeva Zh.Yu., Adzhieva A.A. Proceedings of MGO. 2023. V. 608. P. 135–145.

Article is devoted research of a question on degree of influence of the size of area of not shot on protected territory on efficiency of anti-hail works. The study was based on the materials presented in the annual reports of the Krasnodar, Stavropol and North Caucasus anti-hail services for the period from 2012 to 2022.

As a result, the distance between neighboring points of impact was optimized, allowing on the one hand to meet all requirements for seeding the most dangerous objects of exposure, and on the other hand to avoid an excessively dense arrangement of points of impact and as a consequence, an excessive increase in the cost of anti-hail protection.

Keywords: object of influence, non-shooting area, protected territory, impact point, sowing area.

Tab. 3. Fig. 3. Ref. 5.

Analysis of the scheme of impact points in the Crimean anti-hail service. Alita S. L., Borisova N. A. Proceedings of MGO. 2023. V. 608. P. 146–157.

This article is devoted to the analysis of the scheme of placement of points of impact on hail processes in the Crimean anti-hail service. For the analysis, the author's methodology, that was earlier used for the analysis of the scheme of placement of impact points in the Stavropol and Krasnodar anti-hail services, is also used here. For the analysis, the materials presented in the annual reports of the Crimean anti-hail service for the period from 2018 to 2021, were used. As a result, an assessment of the existing scheme of placement of impact points was given and recommendations for its optimization were developed.

Keywords: placement scheme, impact point, active impact, protected area, consumption of anti-hail missiles.

Tab. 2. Fig. 3. Ref. 9.

Activities I. V. Kurshatov at the Main Physical Observatory. To the 120th anniversary of his birth. Khairullin K. Sh., Obraztsova M.Z., Khoreva N.A. Proceedings of the GGO. 2023. V. 608. P. 158–.167.

The article provides information about the early period of the life and scientific research of the outstanding Soviet physicist, the «father of the atomic bomb» I. V. Kurchatov, associated with hydrometeorology.

Keywords: Kurshatov, Pavlovsk, Main Geophysical Observatory, Feodosia, seishi, tides, radioactivity of snow.

Fig. 4. Ref. 7.

Science as a vocation and profession (to the 110th anniversary of the birth of M.I. Yudin) Trubina M.A., Proceedings of the GGO. 2023. V. 608. P. 168–180.

The article presents the history of the scientific career of the outstanding scientist Mikhail Isaakovich Yudin, Doctor of Physical and Mathematical Sciences, Honored Worker of Science and Technology of the RSFSR, laureate of the A.A. Fridman. Professor Yudin, the author of fundamental research on numerical forecasting methods, dynamic and applied meteorology for various sectors of the national economy and defense of the country, devoted his professional activity to serving the cause of science at the Main Geophysical Observatory named after. A.I. Voeikov. Yudin's scientific reputation was impeccable, his research had a significant impact on the development of new directions in hydrometeorology in Russia, and he successfully represented Soviet science abroad. Biographies of M.I. Yudina is a bright example of how science can become a vocation and a profession.

Keywords: Yudin, biography, scientific career, Main Physical Observatory, atmospheric physics, numerical forecasting methods, dynamic and applied meteorology.

Fig. 6. Ref. 3.