Estimation of anthropogenic heat flux during the heating period in cities of Improved scheme of heat and moisture exchange between land and atmosphere for MGO regional climate models. Kozlov A. V., Pavlova T. V., Shkolnik I. M. Proceedings of the GGO. 2024. V. 613. P. 6–75.

An improved parametrization scheme of the processes in “atmosphere-land-cryosphere” system as a component of the modular system of regional climate modeling and projection is described. Verification is carried out through simulations in a stand-alone mode based on the ESM-SnowMIP protocol. The results of modeling snow mass dynamics, surface air and soil temperature as well as surface albedo are in agreement with that of ESM-SnowMIP models that describe the above characteristics with relatively small errors.

Keywords: climate, land–atmosphere interaction, climate model, snow, soil active layer

Tab. 7. Fig. 10. Ref. 74

Estimation of anthropogenic heat flux during the heating period in cities of the Russian Federation with a population of at least half a million. Frolkis V. A., Evsikov I. A. Proceedings of the GGO. 2024. V. 613. P.76–133..

Based on data from the open web platform OpenStreetMap and the Yandex Maps website, geometric models of the development of 37 largest cities in Russia were constructed. The areas of enclosing structures and the volumes of buildings are calculated. Estimates of anthropogenic heat flux (AHF) during the heating season are given, which were obtained under the assumption that urban buildings meet building standards for the thermophysical properties of enclosing structures. AHF also depends on the difference between the internal and external air temperatures. Two algorithms for calculating the AHF are considered. The first algorithm uses the concept of the basic value of the re-quired resistance to heat transfer of the enclosing structure; the second is the calculated value of the specific characteristic of the consumption of thermal energy for heating and ventilation of the building. The AHF is assessed from the territory of the city within the administrative boundaries and from the urbanized territory, which is determined by multistorey buildings. Anthropogenic energy during the heating season from the territory of Moscow is in the range of 132.1–294.4 (PJ), for St. Petersburg in the range of 79.3–171.7 (PJ), for cities with a population of at least a million from 13.5–20.6 to 29.7–70.7 (PJ), and for the rest from 3.94–4.7 to 16.6–38.3 (PJ) by both algorithms. Maps of the spatial distribution of AHF density are presented.

Keywords: anthropogenic heat flux, characteristics of the heating period, anthropogenic heat flux distribution maps, administrative and urbanized territory

Tab. 12. Fig. 9. Ref. 25.

On modeling dispersion of atmospheric pollutants from moving sources.
Genikhovich E. L. Proceedings of the MGO. 2024. V. 613. P. 134–155.

In this paper, I discuss the problem of atmospheric diffusion of the emissions from moving and other non-stationary sources. I use the analytical solution of the non-stationary advection-diffusion equation derived in 1984 by I.A. Krotova to illustrate the characteristic features of the non-stationary concentration distribution in space and time. I also discuss an approach based on transformation of the non-stationary problem of defining pollutant distribution into a stationary problem of determining the accumulated dose of pollutants. Finally, I describe the method of derivation of the formula for quantifying the dispersion of the pollutants from a moving source, which is included in the current national guideline "Methods for calculating the dispersion of atmospheric pollutants", and critically discuss the paper "Effective ways of calculating maximum instant concentrations under the conditions of non-stationary and asynchronous emissions and moving emission sources" published by A.D. Ziv in the same issue of the Proceedings of the MGO.

Keywords: Air pollution, modeling, dispersion calculations, stationary source, non-stationary source, moving source, advection-diffusion equation, concentration, dose

Ref. 19.

The turbulent surface layer spatiotemporal electrical structure research.
Timoshenko D. V., Kupovykh G. V. Proceedings of the GGO. 2024. V. 613. P. 156–168.

The paper presents the surface layer spatiotemporal electrical structure in the turbulent electrode effect approximation modeling results. The characteristics under study are the electric field and current density, and the model parameters are air conductivity, turbulent mixing coefficient, and the characteristic scale of the electrode layer. As a result of the ionospheric potential global unitary variation the influence, daily changes in the profiles of electric field strength, turbulent current and conduction current in the surface layer are constructed and their dependence on the degree of turbulent mixing in the atmosphere is investigated.

Keywords: turbulent surface layer, electric field, global unitary variation, conduction current, turbulent current.

Tab. 3. Fig. 7. Ref. 14.

Investigation of the effect of an electric field on the ice-forming efficiency of clusters formed during aluminum sublimation in conditions of high relative humidity. Zalikhanov M. Ch., Khuchunaev B. M., Gekkieva S. O., Budaev A. Kh. Proceedings of the GGO. 2024. V. 613. P. 169–177.

This article presents the results of a study of the effect of an electric field on the ice-forming efficiency of aluminum oxide clusters formed during the sublimation of aluminum in the presence of water vapor, at an electric field strength of 0 to 3000 V/cm in the temperature range from -3 to -12 °C. It was found that with an increase in the electric field strength, the specific yield of aluminum oxide particles increases, reaching maximum values of up to 10^{12} g^{-1} at a temperature of -8 to -12 °C. The practical focus of the work is to increase the efficiency of pyrotechnic compositions used in anti-hail products such as "Alazan-6" and "Alazan-9".

Keywords: active effects, pyrotechnic composition, reagent, ice-forming particles, aluminum, aluminum oxide, clusters, nanotubes, electric field.

Tab.1. Fig.3. Ref. 13.

Analysis of the results of anti-hail works in the Krasnodar Territory over the past 20 years. Appaeva Zh. Yu. Proceedings of MGO. 2024. V. 613. P. 178–188.

Based on the collected and processed data on hail in the Krasnodar Territory in the period 2000-2023, the results of the average annual and maximum number of days per year with hail (with and without damage), the average annual area of hail damage in terms of 100% damage, the average annual percentage of seeded impact sites of various categories and the number of anti-hail missiles fired, as well as the coefficient of hail hazard of each season (April-September) in the period under review is calculated.

Keywords: hail protection, hail hazard, impact objects, damage area, hail damage.

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