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Abstract

Selected Translated Abstracts of Russian-Language Climate-Change Publications

I. Surface Energy Budget

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Contents

Abstract

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This report presents abstracts (translated into English) of important Russian-language literature concerning the surface energy budget as it relates to climate change. In addition to the bibliographic citations and abstracts translated into English, this report presents the original citations and abstracts in Russian. Author and title indexes are included, to assist the reader in locating abstracts of particular interest.

Introduction

On May 23, 1972, Richard Nixon, President of the United States, and N.V. Podgorny, Chairman of the Presidium of the Supreme Soviet of the USSR, signed an Agreement on Cooperation in the Field of Environmental Protection Between the United States of America and the Union of Soviet Socialist

Republics. This agreement was to be implemented for the following areas: air pollution; water pollution; environmental pollution associated with agricultural production; enhancement of the urban environment; preservation of nature and the organization of preserves; marine pollution; biological and genetic consequences of environmental pollution; influence of environmental changes on climate; earthquake prediction; arctic and subarctic ecological systems; and legal and administrative measures for protecting environmental quality.

Working Group VIII (WG VIII), established to address the issue of influence of environmental changes on climate, now includes five projects: climate change; atmospheric composition; radiative fluxes, cloud climatology, and climate modeling; data exchange management; and stratospheric ozone. The Office of the Deputy Assistant Secretary for International Affairs of the National Oceanic and Atmospheric Administration is the U.S. coordinating agency for WG VIII projects, while the State Committee for Hydrometeorology has been the coordinating agency within the former USSR. The Carbon Dioxide Information Analysis Center (CDIAC) has, since 1990, been active in the WG VIII project on data exchange.

CDIAC's participation in WG VIII activities has been facilitated by its participation in the Quantitative Links initiative of the U.S. Department of Energy's Global Change Research Program (USDOE/GCRP). CDIAC's role in this initiative has been to provide the quality-assured data sets needed for quantifying the relationship between changes in atmospheric composition and changes in climate. In support of this role, CDIAC has been collaborating with research institutions in the former USSR to identify, quality-assure, document, and package selected data sets as CDIAC numeric data packages (NDPs). In 1991, CDIAC published the NDP *Atmospheric* CO_2 *Concentrations Derived from Flask Samples Collected at U.S.S.R.-Operated Sampling Sites* (ORNL/CDIAC-51, NDP-033), compiled by Thomas A. Boden of CDIAC, with data contributed by A. M. Brounshtein, E. V. Faber, and A. A. Shashkov of the Main Geophysical Observatory (St. Petersburg, Russia). This NDP presents daily atmospheric carbon dioxide concentrations at four sites--Teriberka Station, Ocean Station Charlie, Bering Island, and Kotelny Island. CDIAC has also hosted visits by Russian scientists, and CDIAC staff have visited Russian geophysical research institutions and data centers.

CDIAC sent a survey to 172 researchers in eleven countries in which they were asked to suggest data sets that would be of particular importance to the quantification of the links between changes in atmospheric chemistry, the Earth's radiative balance, and climate, but that were of limited usefulness because of problems with availability, documentation, or quality, or that did not currently exist but could be compiled from separate extant data sets. More than one hundred data sets were suggested, in areas ranging from climate and the cryosphere to the Earth's surface or cover and trace gas emissions and concentrations. This, and a follow-up, survey, indicated that researchers in this area were especially interested in the Earth's surface energy budget, clouds, aerosols, and general circulation models.

To respond to the interest in these four areas, CDIAC and the All-Russian Research Institute of Hydrometeorological Information--World Data Center (RIHMI-WDC) in Obninsk, Russia, began a collaborative project to produce a series of dual-language bibliographies of Russian literature that had not previously been translated into English. This project included the assignment of RIHMI-WDC technical translator Carolina B. Ravina to CDIAC to work on these bibliographies. As part of this work, CDIAC and RIHMI-WDC decided to evaluate new personal-computer-based software to translate from Russian to English. This report is the result of that project; it is hoped to produce future reports on clouds, aerosols, and general circulation models.

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On behalf of the Carbon Dioxide Information Analysis Center (CDIAC), the Research Institute of Hydrometeorological Information--World Data Centre (RIHMI-WDC), Carolina B. Ravina, and Marvel D. Burtis, I would like to thank the following individuals who have contributed, either directly or indirectly, to the production of this report:

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About the Translator

Carolina B. Ravina has been working as a translator and head of a translation group at the All-Russian Research Institute of Hydrometeorological Information--World Data Center since 1970.

She holds three master's degrees from the Moscow Foreign Language Institute (now the Linguistic Academy) in English language interpretation/translation, high school teacher of English, and University teacher of English.

She is a translator-interpreter of international class who participates as a simultaneous translator in many international fora which are held under the auspices of such United Nations Organization bodies as Intergovernmental Oceanographic Commission, World Meteorological Organization and International Atomic Energy Agency. She co-authored an English-Russian dictionary of abbreviations and acronyms. She has a number of published Russian-English translations in various branches of science and technology including plasma, solid-state and nuclear physics; climatology; oceanography; hydrology; mathematical modeling; environmental pollution; computer science; and many others.

Bibliography

Abramov, R. V., L. V. Kool, Yu. A. Shishkov. 1987. Meteorological conditions, atmospheric circulation, and ocean-atmosphere heat exchange in the Gulf Stream energetically active zone in the winter of 1983-84 and summer of 1984. Variability of Hydrological Structure and Heat Exchange with the Atmosphere in the Gulf Stream. Moscow. pp. 76-101.

Research results in the energetically active zone of the Gulf Stream were obtained on cruise 38 of the r/v *AKADEMIK KURCHATOV*, cruise 5 of *VITYAZ* in the winter of 1983/84, and cruise 40 of the R/V *AKADEMIK KURCHATOV* in the summer of 1984. The long-term evolution of aerophysical fields in the atmospheric circulation is considered. It is shown that the atmospheric circulation over the North Atlantic is characterized by rather significant anomalies in winter. Statistics of various hydrometeorological and actinometry parameters are given. Their diurnal, synoptic, and random variability estimates were obtained with the help of variance analysis. Values of amplitudes, phase, and other characteristics of diurnal variations of the first three harmonics of hydrometeorological characteristics and diurnal characteristics are given. The spatial distribution of heat fluxes is considered, and estimates of their dependence on the underlying surface state and heat and cold advection in the atmosphere are given.

Agayev, F. G., N. L. Girnykh, V. A. Skorodinsky, and N. N. Ushakov. 1989. Mathematical models of heat and mass exchange processes in the forest underlying surface. Prepr. Sci. Prod. Assoc. Space Res. 84:1-63.

The problems are solved on the basis of the Laplace functional transfer. The fundamental computational relations for defining parameter fields of objects under study are given in the real variable field, which considerably simplifies the identification procedure. Deterministic approaches to construct mathematical models of the underlying surface (integral) thermal coefficients make it possible to forecast the formation of the sought-for temperature fields in the multidimensional object class under consideration.

Akhmedganov, Kh. A., and I. A. Khan. 1984. On turbulent heat exchange computation technique in the glacier surface air. Proc. Kazakh. Reg. Sci. Res. Inst. Goskomgidromet. 82:55-61.

The paper is devoted to the problem of calculating vertical turbulent heat exchange in the glacier surface air on the basis of gradient observation data. The advantages of using glacier surface data for comparing different methods of turbulent heat flux calculation are shown. A formula for calculating small flux velocities is offered that explains the nature of changes in turbulent exchange caused by temperature contrast change with constant velocity better than any of the previously known formulas.

Aksyonov, V. N., Ye. G. Andreyev, and K. Ye. Kuzmin. 1985. Field observations of temperature profiles in the thin layer of the atmosphere over the ocean. Bull. Moscow State Univ. Phys. Astron. 6:79-81.

An increase in the inversion layer temperature difference has been found to be dependent on the total heat flux increase from the ocean to the atmosphere.

Aliyev, A. S., I. A. Alekperov, and **T. M. Tatarayev**. 1986. Some results of experimental investigations of turbulent heat exchange coefficient in the ocean-surface air layer. Bull. Acad. Sci. Azerbaijan, Earth Sci. Ser. 3:148-152.

Simultaneous measurements of turbulent heat flux H, mean wind speed u_z and air temperature T for 10-m height, water-air temperature difference as well as wave characteristics were made in the Caspian Sea at a distance of 20 km from the shore. It was found that the turbulent heat exchange coefficient C_θ in the formula $H = pC_p CO \Delta T u_z$ is not constant but varies with varying stratification of the water surface air layer. C_θ increases with moderate wind speed (to 9 m/sec^{-1}) and decreases with high wind (over 9 m/sec^{-1}). The value of C_θ becomes smaller as transition from developing to attenuating waves takes place. The Reynolds analogy $C_u = C_\theta$ has only been confirmed for developed wave conditions.

Aliyev, A. S., N. I. Achmedov, and A. I. Gumbatov. 1985. On the dependence of turbulent heat exchange coefficient on waves and the atmosphere over the ocean. Bull. Acad. Sci. of Azerbaijan, Earth Sci. Ser. 4:152-156.

The turbulent heat exchange coefficient is determined from observed data to be dependent on the Richardson number in the atmospheric layer over an undulating water surface.

Andreyev, Ye. G., and A. Yu. Pyrkin. 1982. On the estimation of the ocean-atmosphere heat flux components. Bulletin of Moscow State Univ. Phys. Astronomy. 23(3):72-74

The results of investigating the total heat flux and effective long-wave radiation of the sea surface during 1977-1979 cruises in the open ocean are given. Diurnal variation curves (ocean-atmosphere) for heat flux components were constructed.

Andrushchenko, Ye. N., N. Z. Ariel, I. I. Ivanova, N. A. Kuravlyova, S. Malevsky-Malevich, and **A. V. Murashova**. 1987. Variability of monthly mean ocean-atmosphere energy exchange characteristics in the North Atlantic. Proc. Main Geophys. Obs. 506:93-107.

An indirect technique for computing variances of monthly mean thermal fluxes at the ocean surface is substantiated. Computations were made for 5° grid points over the North Atlantic. The results were presented as maps of sensible heat flux variance and phase transition heat and heat balance at the ocean surface. Tests of the technique are described.

Anisimova, Ye. P., A. A. Speranskaya, O. A., Speranskaya, and V. V. Shigayev. 1987. On the generation of convective motion in the ocean surface air layer. Water Resour. 1:47-51

Results of an experimental study of temperature and humidity fields in the thin water surface air layer under water-air free convection conditions with a low water-air temperature lapse rate are analyzed.

Arapov, P. P., A. M. Kriegel, and V. G. Morachevsky. 1990. Ways of improving the accuracy of techniques of measuring glacier surface air characteristics. Advanced Methods of Environmental-Geographical Research. Materials of 9th Congress of Geographers. Kazan, USSR. Leningrad. pp. 9-13.

The analysis of cruise observations on a number of glaciers showed that anomalous temperature patterns and humidity characteristics that do not obey the Monin-Obukhov similarity theory are frequently observed in the glacier surface air layer. The existing techniques of gradient observation data processing can no longer be applied because of the anomalies. A technique for calculating sensible and latent heat turbulent fluxes on the basis of vertical temperature profiles and the mass fraction of water vapor (taking into account water phase transitions) is suggested. In this case, processing of observed data is reduced to solving a set of nonlinear algebraic equations by successive approximations using the least-squares method. A set of European Series computer-based procedures was developed for solving the problem. It is shown that for determining glacier surface heat balance the heat balance components must be found accurate to at least 1 W/m^2. To achieve this, the number of measurement levels should be increased from the usual two to at least five and the instrumental error decreased about tenfold.

Arapov, P. P., and **V. G. Morachevcky**. 1988. A study of some characteristics of the surface air over glaciers. Mater. Glaciol. Res. (Moscow) 61:137-139.

A quasi-homogeneous glacier surface air layer model was suggested and numerically implemented on the basis of observed data from the Vavilov Glacier in the Soviet Arctic and Tuyuksu Glacier in the Zailiisky Alatau Ridge. Latent heat flux values and directions were computed from gradient measurement data for heights to about 8-10 m. The ablation value and sign were calculated from the energy balance equation.

Ariel, N. Z., and A. V. Murashova. 1981. Calculation of revised nomographs for determining resistance, heat, and moisture exchange coefficients over the ocean. Proc. Main Geophys. Obs. 454:9-23.

Revised nomographs are given for determining resistance, heat, and moisture exchange coefficients over the sea by using standard ship measurements (Bortkovsky-Bütner model). The revision was made on the basis of generalizing and analyzing the results of field experiments on the dependence of resistance coefficient on (1) wind speed with neutral stratification and (2) the universal functions of wind, temperature, and moisture profiles.

Aripov, S. L., M. B. Dianov, and **S. V. Kotov**. 1988. Variations of the turbulent heat and moisture fluxes caused by air transformation over the Aral and White seas. Interinst. Proc., Leningrad Hydromet. Inst. 100:117-122.

Characteristics of space-time variability of the sea surface heat balance components were determined for the Aral and White seas, taking into account the air mass transformation of the land-ocean interface. The average error in turbulent heat and moisture flux calculations for the Aral and White seas is shown to decrease by about 30-40% by taking this process into account.

Bachvarova, Ye. K., and D. Yordanov. 1988. Theoretical and experimental investigation of minor constituent transport in the surface layer under conditions of breeze. Meterol. Aspects of Atmos. Pollut. (Leningrad) pp. 42-49.

A model of formation for the thermal internal boundary layer (TIBL) in the air flow running from the sea onto land is offered. As a result of using the integral relations method, the heat transfer equation is reduced to a common differential equation that describes the increase in TIBL height as it moves offshore. An analytical expression for a maximum concentration of the constituent in the TIBL that is transported to the atmosphere from a source over the sea is obtained with the use of similarity theory notions. The results of an experiment in the Black Sea coastal area in August 1983 were used for choosing similarity constants and for comparison with calculated values for concentration.

Barakhtin, V. V., and V. M. Tokarev. 1982. Statistical analysis of the temperature field characteristics in the atmospheric lower boundary layer from aircraft experiment data. Proc. West Sib. Reg. Res. Inst. 52:116-123.

Aircraft temperature pulsation data for the lower part of the atmospheric boundary layer were processed and analyzed. The following temperature field disturbance characteristics were analyzed: pulsation occurrence per kilometer, amplitude pulsation average, and temperature root mean square deviation. The analysis of statistical results confirms the hypothesis of the merging of thermics with height. A double maximum in the diurnal variations of the temperature field disturbance characteristic was detected. This phenomenon is caused by the effect of thermal and dynamic factors on turbulent exchange intensity.

Belevich, V. V. 1982. Variability of the ocean surface heat balance and its components in the tropical Atlantic. Proc. State Oceanogr. Inst. 160:83-96.

The analysis is based on data obtained by eleven Soviet research vessels that participated in the First GARP (Global Atmospheric Research Program) Global Experiment (FGGE). A rather high interdiurnal variability of the ocean surface heat balance [σ to10 MJ/(m^2d)] was observed. Causes of such a high variability are investigated. The high interdiurnal variability found was confirmed by the data obtained during FGGE.

Beschastnov, S. P., and **S. N. Netreba.** 1981. Determination of variance of temperature pulsations, turbulent shear stress and heat fluxes in a stably stratified atmospheric boundary layer. Proc. Inst. of Exp. Meteoro. USSR Goskomgidromet. 27:12-21.

Relatively simple analytical expressions were obtained for calculating temperature pulse variance, turbulent shear stress, and heat fluxes for given meteorological fields with stable stratification of the atmospheric boundary layer on the basis of simplified differential equations for second single-point moments. The computed turbulence characteristics are compared with those from an experiment that obtained measurements at the surface and at the top of a 300-m meteorological tower.

Bortkovsky, R. S., and S. Yu. Sprigul. 1987. On the possibility of calculating turbulent fluxes over a thermally inhomogeneous and nonstationary ocean surface. Proc. Main Geophys. Obs. 506:147-158.

Maximum horizontal and vertical (water surface to top of air layer) temperature gradients are determined for which integral formulas based on quasistationary hypothesis can still be used for computing vertical turbulence fluxes. The possibilities of using such formulas in the energetically active zone of the ocean in close proximity to ocean fronts are estimated.

Bortkovsky, R. S. 1981. Ocean-atmosphere heat and moisture exchange under calm and gentle wind weather conditions. Proc. Main Geophys. Obs. 454:3-8.

A method of calculating fluxes over the ocean surface in calm weather is offered; the method utilizes data on water-air temperature and humidity lapse rate. The contribution of fluxes to the climatological means for calm and gentle wind conditions is estimated.

Budnikov, A. A. 1982. Model of temperature inversion layer formation in the water surface thin air layer. Bull. Moscow State Univ. Phys. Astron. 23(4):83-85.

An approximated mathematical model that takes into account major air-sea interactions is considered. A temperature inversion layer if formed by the effect of a three-dimensional heat source.

Bykova, L. P. 1982. Numerical modelling of the influence of radiant heat exchange on processes in the atmospheric boundary layer. Proc. Main Geophys. Obs. 468:16-27.

The numerical model of diurnal variations in atmospheric boundary layer meteorological elements incorporates radiative heat influxes. The turbulent energy dissipation equation is used for closing the system. The results showed that radiative transfer of heat is one of the major mechanisms contributing to the formation of the boundary layer thermal and turbulence conditions. The restructuring of the turbulence field caused by radiation absorption in the atmosphere shows the necessity of refining the existing semi-empirical closure models for a stratified boundary layer.

Demetrashivilly, D. D. 1988. Nonstationary quasi-one-dimensional model of the Earth's planetary boundary layer. Proc. Transcaucasian Reg. Sci. Res. Hydromet. Inst. 91:84-93.

A nonstationary model of the planetary boundary layer with rather a detailed vertical resolution is described. Equations of the earth surface heat balance and molecular heat conductivity of the active soil layer are considered that take into account heat exchange with the underlying surface. The large-scale relief and background processes are taken into account in the first approximation. Turbulence coefficients for pulsation and heat for the surface layer are calculated on the basis of the Monin-Obukhov similarity theory, whereas beyond the layer they are *a priori* set. A numerical scheme is used for solving the problem. Numerical experimentation results are given.

Desyatkov, B. M. 1980. Energy analysis of nonlinear interactions in the barotropic atmospheric boundary-layer problem. Proc. Central Asian Reg. Sci. Res. Inst. Goskomgidromet. 68/149:57-64.

The energy of nonlinear process interactions of different horizontal scales in stationary and autocorrelation modes is investigated on the basis of a two-dimensional barotropic model. The role of horizontal turbulence is estimated, and the effect of mesoscale processes on large-scale ones is considered.

Dickinov, Ch. Zh., and V. D. Zholudev. On determining turbulent heat, moisture and momentum fluxes in the ocean surface air under stormy sea conditions. Tropical Meteorology of Nalchik 1981; Leningrad 1983. pp. 184-190.

Two methods of calculating vertical turbulent pulse and latent and sensible heat fluxes over the ocean are described. One of the methods is based on the similarity theory for the ocean surface atmospheric layer, making use of certain known universal functions of the atmospheric parameter distribution. The other one is based on integral aerodynamic formulas. Turbulent fluxes for conditions of tropical hurricanes Inez (1966) and Hilda (1961), as well as storm conditions at OWS PAPA (50° N, 145° W) were determined using the above relations with one-dimensional modelling of air-sea interaction.

Drozdov, O. A., Yu. Yu. Gubanova, and **G. I. Mosolova.** 1990. Estimation of global surface air temperature. Bull. Leningrad State Univ., Series 7, 3:60-65.

Various reconstructions of the Northern Hemisphere surface air temperature variations are compared. Differences between them are not significantly different from those forecast for the end of the century.

Dvoryaninov, G. S. 1981. Motion in the atmospheric boundary layer induced by the ocean temperature oscillations. Theory of Oceanic Processes. Sebastopol, pp. 95-102.

Stationary transport generation in the ocean surface atmosphere induced by the ocean surface temperature oscillations is analyzed. On the basis of the Boussinesq approximation, a problem has been formulated whose solution leads one to conclude that an essential stationary flux in the direction opposite to that of wave propagation is possible. It is also shown that a vertical gradient of the average temperature occurs as a result of work that is carried out by buoyancy forces per unit time.

Fomin, V. M. 1989. Consideration of the second moment in the calculation of heat influx by radiation in forecasting and general circulation models, Part I. Heat Emission (effective Earth radiation). Proc. West Siberian Reg. Sci. Res. Inst. 89:32-41.

A technique for computing heat flux by radiation is suggested on the assumption that small-scale moisture fluctuations in the integration cell obey certain laws of statistics. It enables one to take into account the cloud water content, cloud specific humidity, and boundaries. This statistical approach makes it possible to take into account moisture phase transformations, diagnose cloudiness, and calculate radiative fluxes from unified theoretical standpoints.

Grishakov, F. F., S. N. Dubovitsky, N. F. Pogodin, and Yu. I. Shalatov. 1986. Investigation of the atmospheric structural characteristics and conditions of atmospheric heat exchange with the ocean in the area of the Newfoundland energetically-active zone. Hydrometeorological regularities of mid-latitude energetically-active zone formation. P. I. M., pp. 74-82.

The results of higher-resolution upper-air soundings of the atmosphere in the subpolar hydrological front region are considered. It is shown that the effect of the underlying surface thermal conditions is observed to at least 5 km height. The major reason for the polar atmospheric front formation and the active cyclogenesis region is the presence of a hydrological front.

Ingel, L. Ch. 1986. On the large-scale dynamic effect of the heat source in a uniform layer of rotating fluid (linear approximation). Proc. Exper. Meteorol. Inst. Goskomgidromet. 39/122:118-130.

Disturbances that are introduced by the heat source to pressure and speed fields of a uniform ideal fluid are studied in a linear approximation. Estimates show that a neutrally stratified atmospheric layer is easily perturbed by relatively low-intensity heat sources. Along with the general solution, cases of a stationary source and periodic sources are analyzed in detail, as well as the evolution of disturbances after an abrupt cessation of heat source action.

Ingel, L. Ch. 1986. On convective turbulent jets associated with the effect of vertically stretched three-dimensional heat sources. Proc. Exper. Metrorol. Inst. Goskomgidromet 39/122:115-118.

A nonlinear integral model of turbulent convective jets initiated by vertically stretched heat sources is analyzed. The accurate and approximate solutions found show, in particular, that in the case of stable stratification and heat release increasing with height, jets are characterized by neutral buoyancy: buoyancy increase in each element of the jet due to heat release is compensated (accurately or approximately) by buoyancy decrease due to its ascending to denser medium layers. The characteristic ascending speed is defined by the formula: $w(z) \sim Q(z)/(\gamma - \gamma_a)$ where Q is the intensity of the heat source (in °C), z is the vertical coordinate, is the atmospheric lapse rate -dT/dz, T(z) is the temperature of the medium, and γ_a corresponds to neutral stratification.

Islamov, K. A. 1980. On complete energy conservation for a barotropic model of the atmosphere written in terms of the Fourier coefficients. Proc. Central Asian Reg. Sci. Res. Inst. Goskomgidromet. 68/149:65-73.

It is proved that the two-dimensional spectral barotropic model of the atmosphere conserves full energy if the desired horizontal fields are expanded into a truncated Fourier series with respect to the basis $\{e\lambda^{tm}\}$, λ where is the latitude and m is the wave number.

Kader, B. A. 1987. Anisotropic wind speed and temperature variations in a neutrally stratified surface air layer. Meteorol. Res. (Moscow) 28:26-35.

A modified dimensions analysis based on different and independent-length scale dimensions for vertical and horizontal directions is used for the analysis of turbulence structure in an unstably stratified surface layer of the atmosphere. Special emphasis is placed on the analysis of spectrum shapes of turbulent speed and temperature pulses in the region of wave numbers that correspond to large-scale anisotropic disturbances. The theoretical results obtained are compared with the experimental data available.

Karimberdiyeva, S. 1980. Investigation of diurnal variations of heat balance components of the active surface. Proc. Central Asian Reg. Res. Inst. Goskomgidromet. 68/149:32-42.

Diurnal variations of the active surface heat balance components are considered. An algorithm for solving a heat balance equation is constructed and computer-tested. Numerical experimentation results are given.

Kazakov, A. L., and V. N. Lykosov. 1982. On the parameterization of the atmosphere interaction with the underlying surface in numerical modelling of atmospheric processes. Proc. West Siberian Reg. Sci. Res. Hydromet. Inst. 55:3-20.

An atmospheric constant-flux layer parameterization model is formulated to be used in numerical models of hydrodynamics of the atmosphere. The effects of the molecular properties of the air in close proximity to the underlying surface as well as thermostatic and hydrostatic stability effects are taken into account in estimating heat, moisture, and momentum fluxes. The algorithms are described. The influence of incorporated effects are shown on the example of standard ship data processing.

Khodakov, V. G. 1989. Current climate stability and variability as it relates to growing season in the U.S.S.R. Moscow. Nauka. pp. 151.

The research is based on the calendar of successive change of macrocirculation processes in the Northern Hemisphere, which was compiled mainly at the Institute of Geography of the Academy of Sciences of the U.S.S.R. over the period 1899-1985. The atmospheric circulation, through synoptic processes, controls heat and moisture distribution processes, thus maintaining their balance. The constancy of surface air temperature and precipitation fields (major climate indices) facilitates balance maintenance. In individual years, the variability of circulation disturbs the heat and moisture balance that causes air temperature and precipitation anomalies. Climate variability however is not very well pronounced within a decade (the minimum time scale of climatic averaging).

Khvorostyanov, V. I. 1988. Research using a three-dimensional numerical model of fog and cloud dissipation with solar heating of a nonuniform albedo surface. Proc. Central Aerol. Obs. 171:62-72.

The general structure of a three-dimensional numerical model designed for calculating meteorological field disturbances caused by nonuniform radioactive heating the underlying surface is described. A method and algorithm are described for computing solar radiation in the atmosphere, taking into account the presence of a few dissipating and absorbing substances. The structure of three-dimensional temperature fields, fields of radiation and heat balance, turbulence, water content, and visibility range in fog and cloud in the course of their dissipation over a black spot with an albedo A = 0.1 surrounded by snow surface with an albedo A = 0.7 is described. The size of the spot is chosen to approximately imitate fog and cloud dissipation either over a runway and the surrounding constructions or over several parallel runways. It is shown that, with a large enough spot, the airport can naturally be opened in the daytime.

Krenke, A. N., and **A. N. Zolotokrylin.** 1988. Climate research programme according to the coordination plan "Geography." Mater. Meteorol. Res. (Moscow) 14:3-7.

The climate research program, according to the coordination plan "Geography" (Institute of Geography of the USSR), is devised to define the climatic effect of land-atmosphere interaction. Heat and moisture transfer from the land surface is discrete because it is mostly concentrated in energetically active zones. Methods for determining heat and moisture fluxes in natural and man-made landscapes, as well as river basins in certain areas at a regional level are still to be developed. The scientific and practical value of the program lies in determining the regularities of differentiating the geographical environment in connection with peculiarities of heat and moisture exchange and the sensitivity of the climatic system to changes in the land surface. It also lies in compiling geographical forecasts of natural environment changes and using the results obtained in climate forecasting. Field observations; plotting different scale heat-balance maps; developing computational formulas and formulas for parameterization of heat and moisture fluxes of different size areas, regions, zones, etc.; investigations aimed at establishing the dynamics of heat-balance components of different zones; and studying the effect of land surface on climate formation are all suggested as research methods.

Kuznetsov, I. M. 1985. On changes in the air temperature over various underlying surfaces. Proc. Arctic Antarctic Res. Inst. 396:146-151.

Temperature variations over melting ice, snow-broth, water, dry and wet sand are considered.

Kuznetsova, I. N. 1989. Mixing layer height and turbulence coefficient as an index of vertical exchange in the atmospheric boundary layer. Proc. Hydromet. Res. Centre of U.S.S.R. 299:99-103.

The mixing layer height, which is used in the operational practice of forecasting meteorological conditions of air pollution, is compared with the turbulence exchange coefficient, which is computed in heat and moisture exchange problems as an index of vertical mixing with different types of air temperature vertical distribution. The usefulness of incorporating the turbulence coefficient computed value as an additional predictor in the scheme of forecasting meteorological conditions of air pollution is shown.

Levin, V. V., and Khvorostyanov, V. I. 1988. Modelling of minor constituent transport in the atmospheric boundary layer taking into account temperature and turbulence diurnal variations. Proc. Central Aerol. Obs. 170:17-25.

A two-dimensional nonstationary mathematical model of minor constituent transport in the atmospheric boundary layer is formulated. Diurnal variations of long-wave and short-wave radiation fluxes are calculated as well as their effects on the temperature, dynamic characteristics, and various heat balance components of the underlying surface. The spatial distribution of the relative concentration of the minor constituent from a constant linear source lifted above the surface at different time of the day is studied.

Loginov, V. F., and **E. V. Rocheva**. 1990. Relationship between the characteristics of air-sea energy exchange and variations of 500-mb height and air temperature. Proc. Main Geophys. Obs. 531:16-24.

Synchronous relationships are described between energy exchange characteristics for 1953-1972, calculated from observations of five weather research vessels and the Northern Hemisphere 500-mb grid point atmospheric circulation parameters. The net and virtual heat fluxes, momentum flux, clouds, and total solar radiation proved to be the most informative energy exchange characteristics. As for asynchronous connections between air temperature and hydrothermal coefficient (HTC) for economic regions, they were most closely correlated with air humidity and net heat flux. The data given in the paper confirm the usefulness of the above characteristics when forecasting temperature and HTC for economic regions.

Makshtas, A. P., P. V. Bogorodsky, and **E. L. Andreas**. 1986. Small-scale air-sea interaction in the Mod-Bank area. Inf. Bull. Sov. Ant. Exp. (Leningrad) 108:67-71.

The major heat balance components of the underlying surface in the Mod-Bank area were estimated on the basis of the "Weddell-POLEX-81" expedition. The sea-surface radiation balance was characterized by rather well-pronounced diurnal variations. Its amplitude was about an order of magnitude higher than that of vertical turbulent fluxes of sensible and latent heat. During most of the day, the radiation balance was negative, was directed towards the underlying surface, and was positive only for a short period at night. An increase in the radiation balance value from the north to the south, with a maximum near the supposed Weddell Polynia, was observed. Turbulent heat fluxes during the experiment were insignificant and mainly positive. Their absolute values were so small that the heat flux from the underlying surface to the atmosphere appeared to be negative.

Mandarov, A. A., and **I. S. Ugarov**. 1989. Automation of heat balance, hydrothermal, and microclimatic observations at fixed field points. Geogr. Nat. Resour. 4:142-144.

Heat balance observations obtained by remote sensing and automatic data recording were carried out at the Amchinsk site over the period 1983-1987. The following parameters were measured: (1) radiant energy fluxes in the surface atmosphere; (2) air temperature, humidity, and wind speed at heights of 0.5 and 1 m; (3) air temperature in the vegetation cover at a height of 2 m and soil temperature at a depth of 2 m; (4) heat fluxes in soil; and (5) soil moisture. The instruments and measurement methods are described.

Masagutov, T. F., and M. I. Yaroshevich. 1986. The effect of splashes on temperature profiles in the surface air layer. Water Resources. pp. 65-68.

It has been shown experimentally that, given the positive water-air temperature difference, the occurrence of splashes in the water surface air layer results in a temperature inversion in the profile that originally diminished monotomically.

Melkaya, I. Yu, Ye. D. Nadezhdina, and **O. B. Shklyarevich**. 1987. Calculation of the nighttime atmospheric boundary layer evolution, taking into account radiative heat exchange. Proc. Main Geophys. Obs. 506:29-39.

The role of radiative heat exchange in the evolution of atmospheric boundary layer characteristics is analyzed by using an integral model of the nighttime boundary layer. Two radiative heat influx parameterization methods are considered. Results of comparisons with a multilevel model are given. The possibility of using an integral model for estimating field characteristics is discussed.

Perkauskas, D. Ch. 1980. On calculating the development of an urban heat island of a city. Atmos. Phys. Vilnius 6:107-120.

A nonstationary problem describing the propagation of a "heat island" from a flat surface source and the occurrence of a local "city wind" is discussed. The solution of the set of equations obtained makes it possible to estimate the difference between the "heat island" temperature and that of the surrounding area as well as its vertical propagation.

Perkauskas, D. Ch. 1980. Heat propagation from a surface source. Atmosph. Phys. Vilnius 6:98-107.

The propagation of a "heat island" from a flat surface source, for example, a lake whose water is used for cooling large nuclear or thermal power plants is investigated. A city can also serve as such a source. The numerical solution of the diffusion equation obtained is a difference between the heat island and the surrounding area. It makes it possible to estimate the horizontal and vertical pollution propagation with different wind speeds.

Petrichev, A. Z., and G. I. Anzhin. 1987. Latent heat transport over the Kuroshio area in November 1982. Proc. Far Eastern Reg. Sci. Res. Inst. Goskomgidromet. 127:77-87.

Computations and analysis of latent heat horizontal flux and horizontal divergence fields over Kuroshio were performed using ship aerological long-term averages for November 1982. It is shown that in 1982 the area in question was a "source" of latent heat for the East Pacific. This was one of the reasons for the shift of intense cyclonic activity to the east of its average long-term position.

Poodov, V. D., and **S. A. Petrichenko**. 1986. Thermal structure of the ocean surface air layer and heat exchange in the tropics. Proc. Exp. Meteorol. Inst. Goskomgidromet. 39:106-112.

Results of investigating the water surface air layer (SAL) pressure during the TYPHOON-81 expedition in September-December 1981 in the Philippine and South China seas are presented. It is shown that there is always a temperature inversion in SAL under several types of meteorological conditions. Two SAL structure types are specified characteristic of cases with or without direct solar radiation. Energy exchange in the case of direct solar radiation has an "explosive" character. During the daytime, two "turbulence explosions" were observed, while at nighttime and with overcast skies, no explosions were observed. A sharp increase in humidity in the SAL occurred during explosions, and lower-layer cumulus started to form.

Pretel, Ya., Ya. Zeleny, L. Kirschnerova, and P. Krzhizhek. 1987. On the parameterization of vertical heat fluxes in the atmospheric boundary layer. Meteorol. Res. Moscow, 28:134-140.

Parameterization of vertical heat fluxes over a nonuniform underlying surface is considered by using direct total radiation measurements. The results obtained are compared with those of heat flux measurements.

Rozhdestvensky, A. Ye. 1989. A parameterization system for seasonal energy fluxes in the ocean and the atmosphere. Large-Scale Air-Sea Interaction and Hydrophys. Field Formation, Moscow. pp. 30-42.

A method of energy flux parameterization with cyclic processes in environments is suggested. The method has a thermodynamic substantiation for systems close to equilibrium. Thermal and mechanical energy parameterization systems for the ocean and atmosphere and their interface are considered by using the method as applied to air-sea interaction [processes in their seasonal variation (i.e., to quasi-static motion systems)]. The system is satisfactorily described by using six independent parameters, four of which describe the major peculiarities of seasonal energy fluxes. The novelty lies not only in finding the energy sources but also their sinks. There is also the potential of creatively expanding the parameterization system by increasing the number of main parameters on the basis of the general structure of the energy flux expression that incorporates a cyclic thermal process.

Rozhdestvensky, A. Ye., and G. A. Malyshev. 1989. Calculation and analysis techniques of large-scale heat transport in the atmospheric seasonal cycle. Proc. State Oceanog. Inst. pp. 65-73.

A method is suggested that allows, without any preliminary spectral processing, natural separation of the atmospheric large-scale heat transfer "oscillatory" component from the seasonal cycle on the basis of annual surface temperature oscillations. The method is based on the identification of integral cycle heat transfer with temperature oscillation phase characteristics. Such an approach makes it possible to change over from meridional wind component data containing considerable noise to noise-free temperature data. Using this method, the authors managed to obtain a more detailed microstructure of large-scale circulation cells in the surface atmosphere compared with existing results.

Rudakov, Yu. A. 1986. On calculating turbulent heat and moisture fluxes over the thermal front in the ocean. Bull. of Leningrad State Univ. 4:100-103.

Criteria have been developed for evaluating the contribution of horizontal advection and vertical turbulent transfer over the thermal front in the ocean to heat conductivity and moisture transport equations for the sea surface air. It becomes possible to use commonly accepted techniques for calculating the characteristics when vertical heat and moisture exchange prevail.

Samarina, N. N., and **A. A. Tokarenko**. 1988. Underlying surface heat balance during spring. Mater. of Meteorol. Res. (Moscow) 14:42-47.

Snow cover heat balance structure peculiarities in spring are analyzed using heat balance observations from the U.S.S.R. Academy of Sciences/Institute of Geography Kursk biospheric station over the period March-April, 1987.

Savelyeva, T. A., and L. M. Khachaturova. 1987. Characteristics of vigorous temperature inversions from high meteorological tower data. Proc. Exper. Meteorol. Inst. Goskomgidromet. 41/126:71-77.

Temperature inversions of 10 in a 300-m layer are analyzed by using three-level data from the Experimental Meteorology Institute high meteorological tower over the period 1971-1980. The recurrence and duration of vigorous inversions as they relate to time of day, clouds, and wind speed and direction is considered. As a result of analyzing radiosonde data for the station Dolgoprudnoye and synoptic maps, it is shown that, as a rule, vigorous inversions commonly occur in anticyclonic situations with strong radiational cooling when inversions become stronger as a result of either weak heat advection aloft or sinking of higher inversion layers to the 300-m height.

Schneidman, V. A., and M. V. Tregubova. 1989. Assessment of urban effect on the boundary layer integral characteristics. Odessa Hydromet. Inst. Odessa, 30 pp.

Results from calculating atmospheric boundary layer characteristics for Moscow and suburban stations are given. The urban effect on the boundary layer characteristics is analyzed. For revealing the thermal effect of the city, surface sublayer gradients were calculated, as well as ground temperature differences and boundary layer characteristics: external and internal stratification parameters and turbulent heat flux. Heating due to urban energy sources is easily traced. The dynamic speed, boundary layer height, maximum turbulence coefficient, and surface wind were considered in identifying the dynamic influence of the city. The change in these characteristics confirms an increase in turbulence over the city and the presence of an inhibiting effect. Changes in integral characteristics of the main stream are analyzed. A dynamic and thermal trace of the city has been confirmed. Thermal and dynamic effect estimates were obtained. The possibility of a model to calculate boundary layer conditions for urban and suburban areas was confirmed.

Semyonova, A. P., and T. V. Kozlenko. 1988. Conditions for the formation of heat and moisture exchange processes on the active surface in summer in Southern Ukraine. Proc. Ukr. Reg. Sci. Res. Hydromet. Inst. 227:97-100.

Relationships between heat balance components were estimated. Also, characteristics of heat and moisture exchange in the surface air and their time variability and correlation structure for the summer season were calculated using Southern Ukraine heat-balance station data from 1961-1984. Changes in the surface air parameters were considered to be dependent on the area humidity.

Sherstyukov, B. G., and R. H. Reitenbach. 1990. Vertical atmospheric temperature and humidity profiles under different cloudiness and circulation conditions. Proc. RIHMI-WDC. 143:70-82.

Climatic vertical air temperature and humidity profiles for a surface to 30 km under different total cloud amount conditions were obtained for several U.S.S.R. stations. The profiles take into account diurnal and annual variations of meteorological parameters. Analysis of variance was performed and estimates of the cloudiness contribution to the total air temperature variance at different levels were obtained from the surface level. Conditions were isolated under which air temperature is significantly affected by clouds. An integrated comparative analysis was performed in which data from the Moscow station were used and in which the roles played by total and low cloud amount and synoptic situation in forming the tropospheric and stratospheric temperature/humidity profiles were determined. It is shown that clouds have a pronounced effect on temperature profiles (10% contribution to total variance) in the surface and boundary layer atmosphere at any time of the day in winter and in the daytime in summer. This being the case, the fraction of the surface temperature variance due to cloudiness amounts to 20-50% in winter and 10-30% in the daytime in summer for most of the U.S.S.R. stations. Higher up, the effect of clouds diminishes. Cloud amount is connected with synoptic situation; however, the circulation conditions and radiative processes, which are controlled by clouds, affect thermal conditions differently. Alternating cyclonic and anticyclonic conditions account for 10-16% of the temperature variance in Moscow in the 1-8 km and 12-14 km layers, whereas changes in cloud amount affect only the subcloud layer temperature, with a maximum effect at the earth's surface. Low cloudiness conditions in wintertime in Moscow account for 35% of the temperature variance and 37% of the humidity variance at the surface, whereas total cloudiness conditions account for 23% of the temperature variance and 21% of the humidity variance.

Shklyarevich, O. B. 1987. Evaluation of heat radiation influxes in the nighttime atmospheric boundary layer. Proc. Main Geophys. Obs. 506:53-63.

Radiation heat influx variability in a stably stratified atmospheric boundary layer is analyzed, and different methods of parameterization are considered. The transmission function is used for calculating long-wave radiative fluxes.

Shmakin, A. B. 1988. Methods of computing turbulent fluxes for high-mountain cross plateau conditions. Materials of Met. Res. Moscow. P. 33-37.

Various techniques were used to calculate sensible and latent heat turbulent fluxes (TF) from heat balance component field measurements made in August 1986 and July 1987 on the plateau Kinjal (Central Caucasus north slope), and the results were compared. By using similarity theory and dimensions, essential errors arose in calculating TF. The following scheme for using heat balance observations to calculate TFs for a high-mountain plateau is offered. Using statistical data on surface air temperature and the vertical humidity profile, a layer of TFs, which is constant with respect to height, is selected for the areas in which air mass advection from the neighboring areas plays an essential role. TFs are then calculated by using some of the methods commonly used for this layer. It is found that TF is best calculated by using the Bowen method.

Shmakin, A. B. 1988. The heat balance of different types of underlying surfaces in flat country and mountain conditions (Review). Mater. Meteorol. Res. (Moscow) 14:8-22.

Laws of heat balance formation and methods of its research are considered. An investigation of heat balance is essential to analysis of climate genesis, in particular, when studying space and time climate variability. It is also essential in microclimatology and climatology.

Shvets, M. Ye., and **B. Ye. Shneyerov**. 1983. On the dynamics of the atmospheric planetary boundary layer. Proc. Main Geophys. Obs. 481:41-58.

A method for calculating characteristics of the atmospheric boundary layer is suggested. The method uses a closed set of equations, including the equations of motion, heat influx, turbulence energy balance, and turbulence scale, and makes it possible to obtain turbulence condition characteristics for the atmospheric boundary layer.

Simonov, V. V. 1989. On the statement of the problem of calculating the atmospheric boundary layer over the sea. Math. Modelling of Processes in the Atmosphere and the Ocean Boundary Layer. Moscow. pp. 116-121.

The peculiarities of the model of the atmospheric boundary layer (ABL) over the ocean are discussed. ABL interaction with the disturbed surface involves energy exchange between two media formed by kinetic energy fluxes of differing nature. Incorporating the moving underlying surface relief is necessary for taking into account the energy exchange. The problem must be formulated with the identification of the wave sublayer and the overlying part of the atmospheric boundary layer. A fixed neutrally stratified ABL is considered. Two input equations are used: one for longitudinal and vertical (in the wave sublayer) velocities and the other for longitudinal and transverse (in the upper atmosphere) velocities. The problem is reduced to a single 4th order equation by introducing the stream function. Tangential stresses are introduced according to the Boussinesq equation. The turbulence coefficient is determined by a conventional method through turbulent energy and dissipation. Boundary conditions are given in detail. The results of numerical experimentation with the model will be considered in future publications.

Simonov, V. V. 1991. Numerical experiments of computing energy exchange in the ocean-atmosphere system with different methods of setting the surface velocity. Proc. Main Geophys. Obs. 530:3-12.

Results of numerical modelling of the air flow structure over a rough surface under varying surface velocity conditions at the interface are considered in the paper. The correct choice of the boundary condition is especially important for calculating energy flux due to friction forces.

Sizov, A. A., and **V. K. Kosnyrev**. 1982. Thermodynamic interactions of the ocean and the atmospheric boundary layers near the northern boundary of the intertropical convergence zone. First GARP Global Experiment, 1978-1979. Leningrad. 5:53-61.

Many characteristics of disturbances in air-sea boundary layer thermodynamic interactions are closely related with the ITCZ. The ITCZ influence on the boundary layer contributes to the correlation of thermal and dynamic fields and changes the scale of energy fluctuations. The correlation between the latitudinal ITCZ displacement and the space variability of the salinity field in its subsurface maximum layer is rather high. The latitudinal displacement of the ITCZ is simultaneous with that of the intertrade wind countercurrent.

Sokolova, G. P., and **Ye. Ye. Fedorovich**. 1991. Application of a numerical model to computations of turbulent fluxes and profiles of meteorological elements in the surface air layer from standard meteorological observations. Proc. Main Geophys. Obs. 530:100-108.

A numerical model has been developed for calculating turbulent heat and momentum fluxes as well as for the reconstruction of wind speed and air temperature profiles in the surface atmosphere from standard meteorological observations. Turbulent flux model results are compared with gradient method results obtained by various authors.

Tretyakov, A. S. 1989. On the surface air heat and moisture flux computational technique. Modelling of Hydrol. and Biol. Processes. Khabarovsk. pp. 11-17.

A method for computing surface heat and moisture fluxes is suggested that takes into account mutual effects. The air temperature gradient-air pressure gradient relationship is found to depend on the air temperature and agrees with experimental data rather well. The calculated daily vertical moisture transport velocity is lower than the daily integral coefficient of external diffusion for a water surface by a factor of 2.3 and ranges from 0.001 to 0.008 m/s.

Trifonov, M. I. 1980. The effect of emissive power variations on the accuracy of determining the underlying surface temperature. Prob. of Atmos. Phys. (Leningrad) 16:150-154.

The effect of emissive power variations and modelling properties of the underlying surface on the accuracy of determining its surface temperature by an indirect method is investigated.

Tsigelnitsky, I. I. 1982. The atmospheric boundary layer structure over the Eastern Antarctic. Antarctic. Moscow. 21:19-26.

Characteristics of the atmospheric boundary layer structure over the East Antarctic are investigated on the basis of long-term data of upper-air soundings at Soviet stations. Estimates of such major parameters affecting thermal and dynamic conditions as height, thermal stratification, geostrophic wind, angles of wind rotation and shear, and Ri parameter have been obtained. The character of the relationship between certain parameters is revealed.

Tsigelnitsky, I. I. 1985. Structure of turbulent heat fluxes in the ocean surface air over the Norwegian, Greenland, and Barents Seas. Proc. Arctic Antarctic Sci. Res. Inst. 398:83-87.

Estimates of heat balance components in the water surface air layer have been obtained on the basis of standard ship hydrometeorological observations performed by research vessels of the Arctic and Antarctic Scientific Research Institute in the North European Arctic Ocean over the period 1976-1980. The space-time structure of turbulent heat flux and heat expenditure by evaporation in this region is considered.

Vager, B. G., and **Ye. D. Nadezhdina**. 1981. On the variations in the upper boundary of the planetary boundary layer. Proc. Main Geophys. Obs. 437:39-45.

The dependence of the planetary boundary layer (PBL) height on heat and momentum turbulent fluxes near the earth's surface is studied with the help of a numerical model. Equations for horizontal wind speed components, the equation of the first law of thermodynamics, and the kinetic energy balance equation were used as basic equations. Closure is achieved by introducing a semi-empirical relation for turbulence scale. The dependence of the PBL height on the stability parameter is also studied. It is pointed out that the ability to model the PBL can be improved by incorporating the transfer equation for kinetic energy dissipation.

Vyazilova, N. A. 1984. On large-scale energy influxes in the intertropical convergence zone in the Arabian Sea from summer MONEX-79. Proc. RIHMI-WDC. 101:75-82.

Enthalpy, latent heat, and potential energy influxes caused by large-scale divergence and vertical velocity are considered for both a weak and well-developed intertropical convergence zones (ITCZs).

Computations are given for the atmospheric unit column from the sea surface level to 100 hPa from simultaneous sounding data at fixed points in the Arabian Sea. It was found that during the ITCZ intensification total energy influx is observed because of large-scale motions in the lower troposphere and midtroposphere (up to 300 hPa), whereas in the upper troposphere, removal of energy (mainly sensible heat) is observed. As for the weak ITCZ, the reverse takes place (i.e., energy removal in the lower troposphere and energy influx in the upper troposphere).

Woolfson, A. N. 1989. Parameterization of shallow convection on the basis of the moving convective front model as it is used in problems of large-scale weather forecasting. Mathematical Modeling of Atmospheric Convection and Modification of Convective Clouds, Proc. of Second All-Union Symp., Dolgoprudny, May 26, 1986. pp. 105-107. Moscow.

A heuristic equation is suggested that describes the evolution of the convective layer height in the diffuse turbulent convection problem in stably and neutrally stratified mediums assuming dependence on the integral heat flux on the underlying surface. The suggested relationship is similar to the equation for changing the complete mechanical energy of an elastic spring to a coefficient. The model developed is a generalization of existing Dirdorff-type models and agrees well with known experimental data. The results obtained can be used for calculating atmospheric boundary layer diurnal variations in convection parameterizations in (1) numerical weather forecasting and (2) general circulation models, as well as for computing diffuse convection.

Yakushevskaya, K. Ye. 1980. The effects of radiant and turbulent heat on the surface air temperature. Prob. Atmos. Phys. (Leningrad) 16:79-92.

This is a review of research papers that estimate the effect of turbulent and long-wave radiant heat exchange on the average surface-atmosphere temperature field. Papers written within the last 1.5-2 years are discussed.

Yefimova, L. K., and N. N. Zacheck. 1990. Assessment of the influence of changes in insolation and polar zone boundary on the thermal state of the atmosphere using an energy-budget model. Proc. Main Geophys. Obs. 531:69-74.

Data of numerical experiments with energy-balance models are analyzed that makes it possible to estimate possible temperature changes in seven different latitudinal belts with the solar constant varying by 2.5 and 5% and the polar zone boundary changing by 10° latitude.

Yordanov, D. L., and M. P. Kolarova. 1987. A model of the convective atmospheric boundary layer and its parameterization. Meteorol. Res. (Moscow) 28:123-133.

A convective atmospheric boundary-layer model is presented that is designed on the basis of a set of hydrodynamical equations by using the following assumptions: the turbulent exchange coefficient does not change with height over the surface layer and is calculated by the turbulent energy balance equation; dissipation is determined in terms of dimensions; nonlinear, nonstationary terms and horizontal diffusion terms are assumed to be height independent and are determined from the zero approximation by iteration. It is shown by using the available experimental data on temperature and wind data errors that the vertical distribution of kinetic energy and dissipation, as well as universal functions and friction laws and heat transfer, are reproduced by the model rather well.

Zhalmuchamedova, Zh. D. 1989. Heat balance of the flat area of Kazakhstan. Alma-Ata, Nauka. pp. 151.

Results of a long-term heat balance study are presented. Materials of field research in various regions of Kazakhstan, having different physical and geographical characteristics, were employed. Some heat balance measurement and calculation results are given.

Zubkovsky, S. L., and **A. A. Sushko**. 1987. Experimental investigation of the surface air temperature field space structure. Meteoro. Res. (Moscow) 28:36-41.

Results of experimental air temperature variation research at 3-m altitude over a uniform underlying surface with unstable atmospheric stratification are given. X- and Y-scales of correlation functions are equal to 30 and 10 m, respectively. Frozen turbulence transport speed, which is different from the mean wind speed, is determined by comparing space, time, and space-time correlation functions.

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