

Preface

This topical issue of *Atmospheric and Oceanic Optics* on the problem of climatic and ecological monitoring of the local atmosphere is the fifth in a series of similar issues (the first four were published in 1994, 1995, 1996, and 1998). It continues consideration of various problems of mesometeorology, regional ecology, and climate.

Thus, in the first of two papers by Komarov and Popov, devoted to the problems of mesometeorology, the authors propose new techniques and algorithms for estimating and predicting atmospheric parameters based on the theory of Kalman filtering and simplified dynamic model of behavior of these parameters in space and time. Their second paper discusses the results of experimental studies of the proposed techniques as applied to spatial prediction of mesoscale fields of the temperature and wind at a territory not covered by observations. The paper by Komarov, Popov, Popova, and Sineva considers the problems of statistical analysis of the time structure of mesoscale fields of temperature, specific humidity, zonal and meridional components of wind velocity in the atmospheric boundary layer, as well as the problem of analytical approximation of the corresponding correlation functions.

A series of papers deal with various problems of climatology. In particular, Suvorov and Panin discuss a new approach to the study of tendencies in climate changes based on the ideas and methods of the sensitivity theory of distributed systems as applied to atmospheric models. Ippolitov, Kabanov, and Loginov analyze long-term series of the surface air temperature (near Tomsk) using the wavelet transform simultaneously with the series of the annually mean Wolf number and critical frequencies of the $F2$ ionospheric layer. In the paper by Komarov, Barinova, and Matveev, the change in the urban meteorological conditions (first of all, temperature) as compared to the rural conditions due to the effect of water vapor and anthropogenic greenhouse gases is studied using the data of daily meteorological observations in Kemerovo and some sites situated far away from it, as well as the data on concentration of pollutants in these sites.

Arshinov, Belan, Ivlev, and Rasskazchikova, using the data of flight missions of 1991 and 1995, as well as pilot-balloon observations in 1997–1999, analyze peculiarities of air circulation in the hollow of Lake Baikal depending on synoptic conditions and local time. In the paper by Belan and Rasskazchikova, the comparative analysis of the effect of a city on the temperature and humidity of the atmosphere is conducted using the observations in Tomsk and Kireevsk situated 60 km apart.

Three papers are devoted to simulation of various atmospheric processes. Thus, the first paper (authors Suvorov and Kuleshov) considers simulation of the process of forced convection and cloud formation in cities, as well as application of the obtained model to forecast of storm precipitation. The second paper (authors Gudoshnikova and Matveev) proposes a numerical model of formation and evolution of smog; the model takes into account the dependence of its appearance on synoptic situation. The third paper (authors Soldatenko, Shcherbakov, Slown, Blocksam, and Misra) presents the results of numerical simulation (with the Models-3 information-prognostic system) of evolution of the concentration of sulfate aerosol and nitrogen monoxide and dioxide in the atmospheric surface layer, as well as spatial distribution of the aerosol and total content of NO , NO_2 , CO , and SO_2 .

Along with this, the topical issue includes a series of papers treating some problems and results of ecological atmospheric monitoring. Thus, Belan, Plotnikov, and Tolmachev in their paper analyze seasonal variations of the vertical distribution of tropospheric ozone (up to the height of 7000 m) using the data obtained by the OPTIK-E airborne laboratory over the southern region of the Western Siberia. Arshinov, Belan, Plotnikov, and Tolmachev study the effect of appearance of anomalously high night near-surface concentrations of ozone in Tomsk. In the paper by Belan, Rasskazchikova, Simonenkov, and Tolmachev, the mesoscale differences in the chemical composition of atmospheric aerosol are studied based on the data of synchronous measurements in Tomsk (Akademgorodok) and Kireevsk spaced by 60 km.

Introducing this thematic issue, we hope that its materials covering various problems of mesometeorology, climatology, and ecology will be interesting to a broad circle of readers.

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