Preface

The primary goal of the Russian Aerosol Society as it was declared at its foundation is to unite all specialists in science and technology in their efforts toward more efficient use of the creative potential compiled so far.

Nowadays it is hard to imagine that any research field, a human activity, or a natural process that does not need information about the properties of aerosol particles. Even simple list of the problems that are, as a rule, considered at various scientific conferences gives an idea on how wide is the application of aerosol studies. Among these problems there are the problem on debris in space, ecological problems, fullerens, filtration, plant pollen, fuel spraying, aerosol in medicine, aerosol in agriculture, biological aerosols, ultra-fine powders, condensed particles in plasma, aerosols in geological processes, aerosols and Earth's radiative budget, problems of climate, and many others.

In collecting the material for this topical issue of the *Atmospheric and Oceanic Optics* journal we would like, on the one hand, to advertise the new stage in the activity of the Russian Aerosol Society, while, at the same time, we have selected for publication in it only the papers dealing with atmospheric problems, as its main topic.

Atmospheric aerosol is a part of the atmosphere, which plays an important role in formation of its optical state. At present, a great bulk of data has been compiled on optical and microphysical properties of aerosol, as well as on the main processes of aerosol formation and evolution at all altitudes where the aerosol essentially affects the optical state of the atmosphere.

At the same time, strong spatiotemporal variability of optical properties of aerosol and their connection with all atmospheric processes make it an urgent task to study in a more detail entire variety of its states. This is important in determining the role of atmospheric particles in global climate change, their effect on the processes occurring in the geosphere and biosphere and in attempts to improve the models of its optical properties needed for radiative calculations and estimations of the efficiency of optical systems operated through the atmosphere.

The aerosol studies are especially urgent in view of the need for studying the effect of growing anthropogenic impact on the Earth's atmosphere for correct estimation of possible negative climate change due to this effect.

The progress achieved in the development of the general atmospheric circulation models, in which the radiative block is one of the most important ones, dictates the necessity of achieving the corresponding level in the knowledge of the basic optical properties of aerosol. No matter how perfect the analytical and numerical methods for solving the radiative problems may be, it is clear that the success in forecasting the climate changes is mainly determined by the quality of data on optical parameters of the atmosphere and how correct is their variability under the effect of external factors is taken into consideration. In particular, it cannot be excluded that the correct account for aerosol optics and of the variability trends of different factors (especially, with due regard for anthropogenic sources) can compensate for the warming due to the greenhouse effect, which is predicted by current models.

The urgency of this problem is formally confirmed by the fact that the problems in aerosol-optics are an important part of many international, national, and regional programs and projects, among which there are, first of all, World Climate Research Program, International Geosphere-Biosphere Program, International Global Aerosol Program, National Program on Global Changes in the Environment and Climate, Regional Super Program "SIBIR," and others.

The last decades are characterized by an intense growth in the number of comprehensive studies of atmospheric aerosol. To a certain extent, this is caused by the development of new methods and technical means, which allow in-depth analysis of aerosol nature and its important role in almost all physical and chemical processes in the atmosphere.

Researchers from the Institute of Atmospheric Optics SB RAS have contributed significantly to the development of aerosol studies in Russia that gained international acceptance. The most important results obtained at the Institute include the development of ground-based, airborne, and spaceborne lidar systems, unique experimental results of airborne measurements in the troposphere, studies of stratospheric aerosol, and estimation of the effect of Mt. Pinatubo eruption.

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