A NEW BOOK ON ATMOSPHERIC AEROSOL

G. Götz, E. Mészáros, and G. Vali,

Atmospheric Particles and Nuclei, Akadémiai Kiadó, Budapest (1991), 274 pp.

The Assembly of International Association of Meteorology and Atmospheric Physics (IAMAP) held in Vienna in August, 1991 has demonstrated an increase in interest in the problems of atmospheric aerosol and condensation nuclei (CN) associated first all with the new results of studies on a climate–formation role of aerosol.[1,2] The hypothesis set up by E. Mészáros, R. Charlson, et al. on gas–phase change reactions of dimethyl sulfide (DMC) produced by seaweeds and entering the atmosphere engendered wide resonance. The available estimates testify to the fact that the CN being the products of such reactions affect the processes of cloud formation and can cause variations in the Earth's radiation balance which are opposite in sign to intensification of greenhouse effect of the atmosphere and are comparable to it in magnitude. Several reports presented at the aforementioned Assembly of the IAMAP were devoted to analogous estimates related to the gas–phase reactions involving sulphur dioxide.

The field experiments carried out about 20 years ago as a part of the CAENEX (Complete Atmospheric Energetic Experiment) revealed the strong effect of anthropogenic aerosol on radiative properties of clouds. Striving for generalizing the available knowledge on climate–formation contribution of aerosol has led to a long–term program of the Soviet–American colloboration completed in 1991 by publication of the monograph *Aerosol and Climate*.[3]

Naturally, the three well–known scientists in the field of the aerosol and the CN studies G. Götz and E. Mészáros (Hungary) and G. Vali (USA) undertook writing the monograph which undoubtedly is full of interest and current concern.

In their small–volume (274 pages) book the authors succeeded in discussion, in a sufficiently rigorous and logical form, of a number of complicated and intricate problems in physics and chemistry of atmospheric aerosol, its role in phase changes of water and in climate formation. The monograph is addressed as a mannual for students and young scientists in the fields of meteorology and environment protection. Therefore it contains only well–established and accepted results of studies on atmospheric aerosol as well as the processes of its transformation.

In spite of conciseness of this book, it gives interesting and useful data taken from different sources and analyzed in a new aspect. Thus, e.g., in the chapter *Atmospheric Aerosol* (E. Mészáros) the comparison between the estimates of strength of different global aerosol sources published in 1971 and the data obtained by D. Prospero in 1984 leads to a conclusion that the majority of the first estimates were too approximated and underestimated. A noticeable tendency for increasing the strength of natural sources of aerosol is observed that apparently can be caused by the economic activities of a man.

Very useful are the data on the chemical composition of atmospheric aerosol presented in the book. It should be noted, however, that the monograph might benifit from the use of data of Soviet scientists whose works are represented obviously insufficiently. The selection of the material used by the authors reflects too "polar" their individual concepts concerning physics and chemistry of atmospheric aerosol as well as their own interests in science.

Given in the chapter *Cloud Condensation Nuclei* are the data being important for understanding the role of physicochemical properties of the CN in the formation of clouds and precipitations and, correspondingly, in the climate formation. The role of sulfate particles is especially stressed here since it describes, to a large extent, the effect of anthropogenic factors. It is shown that the condensation properties of particles vary appreciably with height. The observed results and their interpretation given in this chapter are very interesting. The last section of the chapter is devoted to brief description of the results of studies on the effect of artificial condensation nuclei on clouds (both the condensation nuclei added to obtain a certain effect and the nuclei resulted from the emission of different pollutants into the atmosphere are considered). The works by Chennon drew particular attention in which he discovered the effect of large industrial enterprises on the amount of precipitations in their vicinity. But the authors do not assess these results.

The chapter *Ice Nucleation* (G. Vali) is second by volume after the largest chapter *Atmospheric Aerosol*. It contains a great deal of concrete experimental material which includes both the results of laboratory studies of ice formation under regulated and controllable conditions and the results of studying the origin of natural nuclei of ice formation and the ice formation under field conditions.

In supercooled clouds the possible existence of ice crystals and their rapid growth to the elements of precipitations are determined by the presence of natural crystallization nuclei. If they are insufficient for efficient initiation of precipitations, then the clouds can be seeded with artificial nuclei used for stimulating the precipitations.

A large section of this chapter deals with the problem of cloud modification by coolers and aerosols, in particular, by silver iodide. This material is mostly presented at a descriptive level, but such a disadvantage is compensated by extensive bibliography.

The section of the last chapter *Aerosols and Climate* (G. Götz) devoted to the analysis of the effect of aerosol particles on radiative balance of the atmosphere is traditionally based on description of the effects of stratospheric and tropospheric aerosols. Of particular interest here are the estimates of the effect of albedo of stratospheric clouds of different optical depth on the temperature decrease in the ground air layer. In context of numerical modeling of aerosol effects on climate the author reproduce some estimates obtained using the models of different complexity. Brief discussion is presented of possible influence of volcanic eruptions and hypothetical nuclear war on climate as well as aerosol anthropogenic and biogenic effects on radiative properties of clouds. Unfortunately, the author of this chapter is not aware of many Soviet publications including those translated into English (e.g., K.Ya. Kondrat'ev, *Climate Shocks: Natural and Anthropogenic*, Wiley and Sons, New York (1988), 296 pp.).

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The appendices of the book are very useful. The first two of them deal with the foundations of theory of nuclei formation and growth of droplets, the third one presents the procedure for calculation of radiative transfer in the atmosphere, and the last appendix gives the terminology used in the monograph.

In conclusion it must be noted once again that the monograph under consideration is full of interest and has been written by distinguished scientists. From this book the reader can draw much valuable information.

REFERENCES

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3. K.Ya. Kondrat'ev ed. *Aerosol and Climate* (Gidrometeoizdat, Leningrad 1991).

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