PREFACE

Dynamics of the ozone layer of the Earth's atmosphere for the last decades which can produce serious ecological effects attract close attention of the whole mankind to this problem. Scientists of many countries consolidate their efforts to develop integrated monitoring of ozone and components of its cycle. By way of example I can refer to the foreign projects UARS, DIANA, TOR, TESLAS, and others. In January of 1991 the long–term integrated program on stratospheric and tropospheric ozone SATOR (Stratospheric and Tropospheric Ozone Research) was formed and started at the Institute of Atmospheric Optics. In 1991 this program united the efforts of nine laboratories of the Institute. In addition, the specialists from four more laboratories were enlisted by individual contracts. The majority of the SATOR projects is oriented on obtaining the long–time series of the experimental data on atmospheric ozone and other gaseous and aerosol components of the atmosphere which make a noticeable contribution to the formation and decomposition of ozone under different meteorological situations in different seasons and time of day. It is very important that all observations of aerosol and gaseous composition, meteorological parameters, and dynamics of the atmosphere were performed on the same time scales with different devices gathered in the same place (at the Station of High–Altitude Sounding of the Atmosphere of the Institute of Atmospheric Optics in Tomsk).

In 1991 the main purposes of the SATOR program were:

1) to investigate the dynamics of the vertical distribution of stratospheric ozone and aerosol over Tomsk and to study the microstructure of the stratospheric ozone and interconnections between the variability of ozone and aerosol contents in the stratosphere and

2) to investigate the time variations of the ozone concentration in the lower troposphere as functions of variability of the aerosol and gaseous composition of the surface layer of the atmosphere (a) and dynamics of the boundary layer of the atmosphere (b).

To solve the first problem three stationary stratospheric lidars were used. The lidar sensing of the stratosphere was accompanied by launching of the sounding balloons with meteorological and ozone sondes. Due to the photon counting mode of recording the sensing laser radiation reflected from the stratosphere, the lidar observations were performed only at night owing to the limitations imposed by the background. To solve the second problem we used the optical and laser multiwave base gauges of the aerosol and gas composition operating along the special path located between two buildings of Tomsk Akademgorodok (the distance between the buildings was about 0.5 km, the path ends were located at altitudes of 12 and 18 m). In addition, measurements of the aerosol and gas composition by the contact methods and direct intakes of the air samples with their subsequent chemical analysis were carried out at the start of the path at the Station of the High–Altitude Sounding of the Atmosphere (SHASA). Here average and instantaneous temperature, speed and direction of wind, and air humidity were measured at two points located at different altitudes. To investigate the dynamics of the boundary layer of the atmosphere we employed temperature and wind lidars, and to determine the depth of the mixing layer we employed the sodar. When solving the second problem, the measurements were performed continuously (except the lidar which operated only at night).

Undoubtedly, like the other long–term geophysical experiments, the main results of the SATOR program will be available only after acquisition of the large representative series of data. However, the analysis of the results of the experimental and theoretical investigations obtained as part of this program in 1991 allows us to present a number of original results which provide the basis for this thematical issue. Of course, these results are preliminary and some conclusions are formulated hypothetically. The further acquisition of data will allow us to assess them more correctly and adequately.

The SATOR program is continuously developing. In 1992 we plan measuring the spectral transparency of the atmospheric column in a wide wavelength range on the basis of the solar and stellar observations with possible reconstruction of the total content of ozone and other main gaseous components of the ozone cycle, mastering the lidar sensing of the vertical distributions of ozone and aerosol over the entire depth of the troposphere, and obtaining the data on heat and moisture fluxes in the boundary layer of the atmosphere. We plan to increase the number of the examined gases in the surface layer of the atmosphere adding such important components of the ozone cycle as NO_x, methane, some nonmethane hydrocarbons (NMHC), formaldehyde, and acetone. The success of the program, naturally, is directly connected with its financing. Thus, for example, high prices of the flight time do not allow us to use the unique possibility of the aircraft–laboratory of our Institute for the comprehensive, routine, and integrated analysis of the troposphere state on various spatial scales. The minimum sufficiency of financing of this initiative program of our Institute will make it impossible to perform the integrated radiation experiment as early as in 1992.

SATOR means ploughman in Latin. This meaning quite exactly reflects the essence of the complicated geophysical experiment. This is mainly the long–time routine synchronous observations in the real atmosphere at any time of day performed by different groups of investigators using various, as a rule, unique equipment. This work is complicated and sometimes even exhausting. Therefore, on behalf of the management of the program I would like to acknowledge all its participants for their significant contribution to the program in 1991 and to wish them not to slacken the achieved race of work in the following years in spite of many difficulties of the current stage.

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