GEORGIA

INTRODUCTION

In Georgia the examination of the atmospheric ozone (total ozone, ozone vertical distribution and surface ozone concentration) were started almost 50 years ago. Several decades were conducted only scientific studies of atmospheric ozone.

Later the Cabinet of Ministers of Republic of Georgia decided in Decision N711 of 8 November, 1995 that Georgia shall accede to "the 1985 Vienna Convention for the Protection of the Ozone Layer" and "the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer". On 21 March, 1996, Georgia acceded to these international documents and sufficiently these documents entered into force for Georgia on 19 June, 1996.

The National Country Programme for phasing out of ODSs was developed jointly with the scientific study programmes of ozone and approved in 1997 through assistance of United Nations Environment Programme and United Nations Development Programme and financial support of Multilateral fund so as to enable the country to implement obligations under the Montreal Protocol on the Substances that Deplete the Ozone Layer. The institutional framework was established to ensure the implementation of the Action Plan in the Country Programme. The National Ozone Unit the Ministry of Environment Protection and Natural Resources of Georgia is a coordinating body for the implementation of all activities under the Montreal Protocol.

OBSERVATIONAL ACTIVITIES

Column measurements of ozone and other gases/variables relevant to ozone loss

The regular observation of total ozone started at Abastumani Astrophysical Observatory of Academy of Sciences of Georgia (41° 45' N, 42° 50' E, 1600 m asl) in 1957. A second station was established in Tbilisi (41° 41' N, 44° 57' E, 450 m asl) by the Hydrometeorological Service of Georgia in 1964. Total ozone observation were also carried out at the observational post of the Institute of Geophysics of Academy of Sciences of Georgia in Telavi (41° 48' N, 45° 30' E, 600 m asl) from 1973 till 1987. All observations are carried with ozonemeters of M-124 type constructed in the Main Geophysical Observatory (MGO) in St. Petersburg (Russia).

Regrettably, both Tbilisi ozonemeters were broken in 2001. At present only Abastumani ozonemeter is under working conditions.

The regular measurements are conducted of surface ozone concentration with the use of the OMG-200 type ozonemeter since 1980 to the present in Tbilisi and Telavi.

Note

Using standard actinometrical observations for eight Georgian locations (Tbilisi,1928-1991; Telavi,Tsalka – 1457 m, Anaseuli – 158 m, Senaki – 40 m, Sukhumi – 116 m,-in the mid. 1950 – 1991; Jwari Pass – 2396 m, 1973 – 1985;Kazbegi – 3656 m,1955-1964), the Atmospheric Aerosol Optical Depth was established (Institute of Geography and Institute of Geophysics of Academy of Science of Georgia). In 1991, actinometrical observations were stopped because the instruments were not tested.

The measurements were renewed of the Atmospheric Aerosol Optical Depth from 2003 in Tbilisi (Institute of Geography and Institute of Geophysics of Academy of Science of Georgia).

Profile measurements of ozone and other gases/variables relevant to ozone loss

The vertical distribution of ozone in Georgia by optical method and with the electrochemical ozonesondes was carried out in 1973-1982. In recent years, such measurements are not conducted.

Note

The photometric measurements of twilight sky brightness in different narrow intervals of the visible spectrum have been carried out in Abastumani Astrophysical Observatory since 1940. Such measurements allow to determine aerosol loading in the stratosphere and mesosphere as a function of height.

UV measurements

Unfortunately, UV- measurements in Georgia are not conducted because of the absence of equipment.

Calibration activities

The calibration of the ozonemeters was made every two years in the MGO during the existence of the former Soviet Union. After 1990 due to financial difficulties the calibration of Abastumani ozonemeter was carried out only in 1994, the calibration of ozonemeter of the Institute of Geophysics did not calibration after 1988, the calibration of Tbilisi ozonemeter was carried in 1999. Therefore, at present the Abastumani ozonemeter dates of total ozone in Georgia are unreliable.

The calibration of actinometer was carried out in 2002 years through the financial support Institutional Straitening Project of UNEP and NOU of Georgia.

RESULTS FROM OBSERVATIONS AND ANALYSIS

In recent years is continued the study of long-term variations of atmospheric ozone (total and surface) and aerosol in Georgia and their connection with human health, photochemical smog in the atmosphere of Tbilisi and its influence on the people health, quasi-biennial variations of the stratosphere ozone and solar activity, the evaluation of the influence of lasting variations in the total ozone content on the changeability of the regime of biologically active ultraviolet solar radiation in Georgia, radioactively active small atmospheric admixtures climatic effects in Georgia, Interaction of the ozone and aerosol, etc. The enumeration of the published works is represented lower.

THEORY, MODELLING, AND OTHER RESEARCH

Calculation of the effect some radiatively active small atmospheric admixtures on the direct and diffuse solar radiation in Georgia have been carried out for the clear sky conditions. Estimation of the effect of the variations of water vapour, total ozone, aerosols in the atmosphere and underlying surface albedo on the short-wave solar radiation were given (see [14,19,22]).

DISSEMINATION OF RESULTS

Data reporting

The total ozone data of Tbilisi station (including 2000 year) are regularly (every day) sent to the Main Aerological Observatory near Moscow, where all analogous information received from the countries of the Commonwealth of Independent States is collected. Twice a year the daily total ozone values are sent to the Main Geophysical Observatory in St. Petersburg. These data after

quality control in MGO are sent to the WMO World Ozone and UV Data Centre (WO3UDC) in Toronto.

The total ozone data of Abastumani station are kept in the Abastumani astrophysical observatory in the tables form. The total ozone data of Telavi and surface ozone concentration data of Tbilisi and Telavi are kept in the Institute of Geophysics in the tables form and computer data base form.

The Atmospheric Aerosol Optical Depth data are kept in Institute of Geography and Institute of Geophysics in the computer data base form.

The stratosphere and mesosphere aerosol data are kept in Abastumani astrophysical observatory in the tables and computer data base form.

Information to the public

The National Ozone Unit the Ministry of Environment Protection and Natural Resources of Georgia on regular bases (3 times per year) publishs UNEP OzonAction bulletin in the Russian language. The popular book “Twenty questions and answers about the ozone layer” was produced by NOU in Georgian language in 2005. Institute of geophysics through the press and television inform the population of Georgia about the ecological problems, connected with atmospheric ozone (not regularly)

Relevant scientific papers

The results of the research works are published in the form of two monograph and in more than one hundred various articles. The most recent ones are:

Amiranashvili A., Amiranashvili V., Tavartkiladze K,Gabedava V. – Spatil-temporary characteristics of the aerosol pollution of the atmosphere in Georgia, Proc. 1st Int. Conf . on Ecology and Environmental Management in Caucasus, Tbilisi, Georgia, October 6-7, 2001, 57-58.

Kharchilava D., Amiranashvili A., Amiranashvili V., Chikhladze V., Gabedava V. - Long-term variations of atmospheric ozone in Georgia and their connection with human health, Proc. 1st Int. Conf . on Ecology and Environmental Management in Caucasus, Tbilisi, Georgia, October 6-7, 2001, 80-82.

Amiranashvili A., AmiranashviliV., Davituliani A., Nodia A., Kharchilava J., Chikhladze V., Chelidze L. – Photochemical smog in the atmosphere of Tbilisi and its influence on the people health , Ecological problem of Tbilisi, 2002, 147-152, (in Georgian).

Amiranashvili A., AmiranashviliV., Tavartkiladze K., Laulainen N. – Monitoring of aerosol pollution in Georgia, Transactions of the Institute of Hydrometeorology of Georgian Academy of Sciences, ISSN 1512-0902, vol. 108, 2002, 19-23, (in Georgian).

Amiranashvili A., Bregvadze A., Tavartkiladze K., Toroshelidze T., Kharchilava J., Melkonyan D., Krasovski A., Kolev S., Desyatkov G., Semionov V., Tarannikova R.- Monitoring of Total Ozone Content in Georgia. Prospects of International Cooperation on the Perfection of Operation of Ozonometer Stations Network and Organization of Surface UV Solar Radiation Measurements , Transactions of the Institute of Hydrometeorology of Georgian Academy of Sciences, ISSN 1512-0902, vol. 108, 2002, 45-51, (in Georgian).

Kharchilava J., Chikhladze V., Kharchilava M. – Variability of surface layer ozone concentration in Tbilisi and in a countryside, Transactions of the Institute of Hydrometeorology of Georgian Academy of Sciences, ISSN 1512-0902, vol. 108, 2002, 52-58, (in Georgian).

Toroshelidze T., Shefov N. - Quasi-Biennial Variations of the Stratosphere Ozone and Solar Activity , Bull. of the Georgian Academy of Sciences ., vol. 166, N1, 2002.

Kharchilava J., AmiranashviliV., Chikhladze V. – Interrelation of ozone, temperature and humidity of air in the atmospheric surface layer on an example of Tbilisi, Transactions of Vakhushti Bagrationi the Institute of Geography of Georgian Academy of Sciences, ISSN 1512-1224, vol. 21, 2003, 100-109, (in Georgian).

Kharchilava J., Chikhladze V. – The basic chemical reactions of formation and disintegration of ozone and estimation of their constants in the lower polluted layer of tropospheric air in conditions of Tbilisi,

Transactions of Vakhushti Bagrationi the Institute of Geography of Georgian Academy of Sciences, ISSN 1512-1224, vol. 21, 2003, 110-115, (in Georgian).

Amiranashvili A., AmiranashviliV., Tavartkiladze K . – Some characteristics of the aerosol pollution of the atmosphere in Eastern Georgia, Proc. 3th Int. Conf. "State and the conservation of air pond and water-mineral resources of health resort- recreational regions ", Kislovodsk, Russia, 21-24 April 2003 , 17-18, (in Russian).

Kharchilava J., Amiranashvili A., Chikhladze V.– Some results of studies of the surface ozone concentration in Ruispiri and Tbilisi in 2002 year, Proc. 3th Int. Conf. "State and the conservation of air pond and water-mineral resources of health resort- recreational regions ", Kislovodsk, Russia, 21-24 April 2003 , 37-38, (in Russian).

Amiranashvili A., AmiranashviliV., Gogua R., Matiashvili T., Nodia A., Kharchilava J., Khunjua A., Chikhladze V., Tavartkiladze K., Gabedava V. - The estimation of the risk of some meteorological- geophysical factors for the health of people under the conditions of Eastern Georgia (based on the example to Tbilisi), Proc. 3th Int. Conf. "State and the conservation of air pond and water-mineral resources of health resort- recreational regions ", Kislovodsk, Russia, 21-24 April 2003 , 74-76, (in Russian).

Amiranashvili A., AmiranashviliV., Kharchilava J., Tavartkiladze K., Toroshelidze T., Gabedava V. - The evaluation of the influence of lasting variations in the total ozone content on the changeability of the regime of biologically active ultraviolet solar radiation in Georgia , Proc. 3th Int. Conf. "State and the conservation of air pond and water-mineral resources of health resort- recreational regions ", Kislovodsk, Russia, 21-24 April 2003 , 76-77, (in Russian).

Amiranashvili A. , Amiranashvili V. , Tavartkiladze K. - Effect of the variability of some radiatively active small atmospheric admixtures (RASAA) on short-wave solar radiation fluxes, IUGG 2003 Abstract, , Sapporo, Japan, June 30-July 11, 2003, MI02a/30P/D-017.

Amiranashvili A. , Amiranashvili V., Kirkitadze D.,Chiabrishvili N., Chochishvili K. – To a question about the formation of secondary aerosols in the atmosphere, Transactions of Institute of Geophysics of Georgian Academy of Sciences, ISSN 1512-1135, vol. LVIII , 2003, 119-126, (in Russian).

Kirkitadze D. – Some results of studies of the aerosol pollution of the atmosphere in Tbilisi, Transactions of Institute of Geophysics of Georgian Academy of Sciences, ISSN 1512-1135, vol. LVIII , 2003, 177-181, (in Russian).

Chikhladze V. – The results of studies of variations of surface ozone concentration in Tbilisi in 1984-2003, Transactions of Institute of Geophysics of Georgian Academy of Sciences, ISSN 1512-1135, vol. LVIII , 2003, 182-186, (in Russian).

Amiranashvili A.G., Amiranashvili V.A., Tavartkiladze K.A.- Influence of cloudiness and aerosol pollution trends on the total solar radiation in some non industrial regions of Georgia , Proc. 14th International Conference on Clouds and Precipitation , Bologna , Italy ,18-23 July2004.

Amiranashvili A.G., Amiranashvili V.A., Tavartkiladze K.A.- Effect of the variability of atmospheric aerosols on the short-wave solar radiation fluxes , Proc. 16th International Conference on Nucleation&Atmospheric Aerosols, Kyoto, Japan, 26-30 July 2004,706-709.

Amiranashvili A.G., Amiranashvili V.A., Kirkitadze D.D, Tavartkiladze K.A. - Some results of investigation of variations of the atmospheric aerosol optical depth in Tbilisi , Proc. 16th International Conference on Nucleation&Atmospheric Aerosols, Kyoto, Japan, 26-30 July 2004, 416-419.

Amiranashvili A.G., Chikhladze V.A., Kharchilava J.F, Buachidze N.S., Intskirveli L.N. -Variations of the weight concentrations of dust, nitrogen oxides, sulphur dioxide and ozone in the surface air in Tbilisi in 1981-2003 , Proc. 16th International Conference on Nucleation&Atmospheric Aerosols, Kyoto, Japan, 26-30 July 2004, 678-681.

Amiranashvili A.G., Amiranashvili V.A., Gzirishvili T.G., Kharchilava J.F., Tavartkiladze K.A. – Modern Climate Change in Georgia. Radiatively Active Small Atmospheric Admixtures, Transactions of Institute of Geophysics of Georgian Academy of Sciences, ISSN 1512-1135, Monograph, vol. LIX , 2005, 1-128.

PROJECTS AND COLLABORATION

Research Programme:

- Time variations of the total ozone and the surface ozone in several regions of Georgia and their dependence on the atmospheric processes;
- Trends and decline of the total ozone;
- Interaction of the stratospheric and tropospheric ozone;

- Increasing of surface ozone in Georgia and conditions for appearance of photochemical smog;
- Effect of ozone on local climate;
- Ozone, aerosols and ecosystem;
- Total ozone and solar activity;
- Vertical aerosol distribution in the stratosphere and middle atmosphere by the twilight sounding method;
- Effect of ozone and atmospheric aerosol on the direct and diffuse solar radiation including ultraviolet radiation.

FUTURE PLANS

- Installation of equipment for monitoring regularly total ozone, ozone vertical distribution, surface ozone, tropospheric and stratospheric aerosols, atmospheric aerosol optical depth;
- To continue research programme;
- Laboratory modelling interaction ozone with small atmospheric admixtures (aerosols, gases);
- Laboratory modelling interaction UV radiation with ozone, cloudiness, aerosols and gases.
- The organization of regular information campaign for the population of Georgia via the mass media on dangerous levels of surface ozone, solar UV-radiation and prophylaxis measures for mitigation of their negative effect.

NEEDS AND RECOMMENDATION

- There is an urgent need for financial assistance intended for the reparation of two ozone instruments M-124 and calibration of four ozone instruments M-124;
- There is an urgent need to purchase one or two more modern total ozone instrument and two or three UV-B solar radiation instruments;
- There is no funds available for periodic calibration of standard actinometrical instruments;
- A standard Dobson or Brewer spectrophotometers and more modern surface ozone instruments are essential to have In the future.

****