

# UZBEKISTAN

## Ozone layer monitoring

In Uzbekistan ozone layer monitoring is performed by the Administration of Environmental Pollution Monitoring (UMZ) of the Main Administration on Hydrometeorology (Glavgidromet). At present time systematic daily observations of total stratospheric ozone continue at two stations:

Tashkent (41.2° N, 69.2° E, 478 m altitude asl, since 1989)

Termez (37.1° N, 67.2° E, 311 m altitude asl, since 1989)

Unique stations as Kumbel and Abramov Glacier stopped in 1999 ozone measurements because of the equipment disrepair and lack of financing for its reconstruction.

Total ozone measurements are made by ground techniques using filter ozonometer M-124, manufactured in Russia. In spite of the ozonometer has not been calibrated for many years (due to financial problems), according to the report of the Central Aerological Observatory (CAO) (Dolgoprudny, the suburbs of Moscow) stratospheric ozone data from the Tashkent station are in good agreement with satellite data.

Systematic measurements of tropospheric ozone and other trace gases (CO<sub>2</sub>, CO, NO<sub>2</sub>) are made in all big cities. Samples are taken twice a day - in the morning and in the midday beginning from April through October. Tropospheric ozone is defined using photometry method based on ozone drive of iodine when its absorption by potassium iodine solution. Evolved iodine is defined by spectrophotometric measurement of light absorption by iodine ions when the wavelength is 352 nm. Annual concentration of surface ozone in Tashkent exceeds Maximum Permissible Concentration (MPC) by 1.3-3 times what corresponds to 39-69 mkg/m<sup>3</sup>. Daily averaged MPC amounts to 30 mkg/m<sup>3</sup>. The most ozone amount is registered in Bekabad town (2-3 MPC), what is caused by high atmospheric air pollution level. Yearly increase in surface ozone concentrations is observed from May through September, in October ozone content a little decrease. The data obtained are published in yearly reviews of atmosphere pollution. Data of high ozone concentrations are submitted to the Bodies of Goskompriroda according to exchange information scheme adopted in the Republic.

## Information

Daily averaged data of total ozone content from the Tashkent station are sent to the Voeikov Main Geophysical Observatory (MGO) (St-Petersburg, Russia) one time a month where they are generalized and then transmitted to the WMO World Ozone Centre in Toronto (Canada). The last transmission of the information was on January 2002.

Total ozone observation data from the Tashkent station are transmitted to CAO\_(Dolgoprudny, suburbs of Moscow) for the inclusion of this information into the agreed international framework of the data exchange.

During winter season (December-March) similar information is three times a week being transferred to the WMO Ozone Mapping Centre in Tessalonoki University (Greece).

The information from the Termez station is used for research.

The whole primary data are stored in the archive of Glavgidromet of the Republic of Uzbekistan.

## Studies

Research and experimental studies related to the investigation of ozone layer state in Uzbekistan are carried out in Central Asian Research Hydrometeorological Institute (SANIGMI) in the Laboratory of Ozonometry and Ionosphere Studies.

Investigations are aimed at study of regional peculiarities of total ozone amount variations, tendencies to change and assessment of time characteristics of ozone change over the Uzbekistan' territory.

The variations of monthly averaged values of total ozone amount over Tashkent and Termez are presented in the figures 1 and 2. This information was obtained during the period 1979-1993. These figures were constructed on the base of the NIMBUS-7 satellite data during the period 1979-1993 and ground based observations during the period 1989-2001, that is, there was period when satellite and ground based observations were conducted simultaneously. There is a good agreement in these data. In both figures the trend is shown which has been revealed using standard function of trend construction on the base of 4 Degree Polynom in EXCEL. One can see that during the last years (since 1997) the trend has changed the sign. Long-term decrease in ozone layer density over Uzbekistan stopped and opposite process has begun. As ozone-depleting substances discharges into the atmosphere have not reduced during the last years the total ozone trend change can not be explained only by change of anthropogenic factors influence. Very likely in nature there are more powerful processes, influence of which has not been taken into consideration. Obviously, long-term global variation of ozone layer density takes place or the reason is the highest solar activity at the end of millenium.

The investigations of spectral composition of time variation of total ozone amount have begun in order to assess particular physical parameters and global macro processes of non-anthropogenic character (meteorological conditions, 26 month variations of stratospheric winds, notation of the Earth Pole, solar activity variation cycles, for example, 100 years cycle, maximum of which falls at 2000 and other climate phenomena), which influence ozone layer formation over the North Hemisphere, that is, the investigations aimed at sharing and quantitative evaluating the portion of anthropogenic and non-anthropogenic components in ozone layer formation over the North Hemisphere.

In the frameworks of aerosol program in SANIGMI the investigations of atmospheric aerosol in surface layer are being conducted. Physic-chemical and disperse aerosol composition, processes and distance of aerosol transfer from different emissions sources as natural as anthropogenic with usage of ground observations and mathematical models are studied. Aerosol influence on the atmosphere transparency is being assessed.

In Uzbekistan the National Program to Stop the Use of Ozone-Depleting Substances (ODS) was developed and adopted by the Government in 2000. The Strategy and Plan of Actions on step-by-step stopping ozone-depleting substances usage were provided in this Program.

### **Problems and needs**

The current level of investigations implies availability of modern instruments and equipment. However due to financial problems equipment available does not meet current requirements. Filter ozonometers M-124 used at the ozone monitoring stations are obsolete ones. The last calibration of all instruments was done in 1993. Presently it is impossible to calibrate filter ozonometer in Tashkent because we have no a reference Dobson or Brewer spectrophotometer.

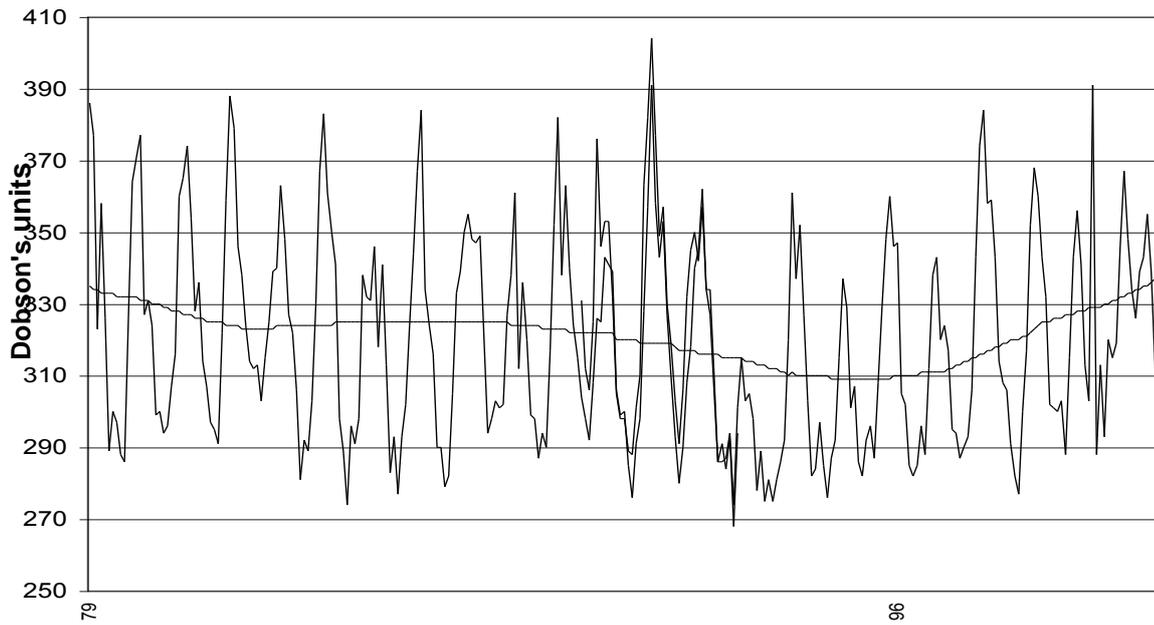
In order to obtain more comprehensive and reliable information on total ozone amount it is necessary to extend the network of regular daily observations. It can be realized under proper equipping stations with modern instruments and under financial support of the international organizations.

Unfortunately in the absence of instruments we could not begin monitoring of ultra-violet (UV-B) solar radiation alongside with total ozone amount measurements and experimental estimation of the decrease of the agricultural crops yield caused by the increase in solar UV-B radiation. To study spatial distribution and monitoring of total ozone amount over Uzbekistan can be used satellite data.

In Glavgidromet since January 2001 the station for receiving digital satellite data from satellites of the NOAA type has been operated. It has been obtained as humanitarian help of USAID. However we can not use total ozone amount data for lack of the TOVS software for decoding ozone data flow and funds for programs acquisition.

There is an urgent necessity in training for young specialists with purpose of learning modern instrumentation for measurement of ozone and UV-B radiation, halocarbon traces, learning new mathematical models, combining atmospheric chemistry and climate and also forecasting ozone layer behavior.

**Long-term variations of ozone above Tashkent during 1979-2001 years**



**Long-term variations of ozone above Termez during 1979-2001 years**

