

## **A multi-wave method of total ozone measurement with the PION instrument**

Direct Sun spectral intensities are measured at a number of wavelengths (up to 20) within the spectral range 295 – 317 nm in dependence of total ozone value, weather conditions, and inclination angle of the Sun. They are grouped into several sets of 3 wavelengths, providing total ozone calculation with the every set of signals using linear aerosol dispersion model. An averaged calculated value then makes the resultant total ozone estimation. Thus, the higher the Sun, the better conditions of observations, at shorter wavelengths the signals are measured, the more precise total ozone estimations are gotten.

Two methods of estimation of the quality of total ozone measurements are used. The first is the calculation of standard deviation within the number of measurements. The second is atmosphere stability monitoring using Sun tracking system. The tracking system measures solar radiation in the red and near infrared spectral region. The last method greatly helps to exclude erroneous data obtained in conditions, when clouds begin covering or opening the Sun.

## **Sun tracking system of the PION instrument**

Sun tracking system of the PION spectrometer provides precise directing of the spectrometer optical axis to the Sun within 1 angle minute error. It permits also direct Sun radiation measurements in the red and near infrared spectral region. As there is no ozone absorption in this region, fluctuations of measured signals are due to aerosol and clouds only.

## **Operating of the PION spectrometer**

Operating of the spectrometer is fully automated, providing all light day measurements of total ozone (direct Sun and zenith sky), aerosol optical thickness in the UV and red spectral regions, direct Sun UV spectra, Sun halo, etc. Being directed to the Sun early in the morning, the PION spectrometer calculates the trajectory of the Sun, puts it in mind, and traces it through out the day, starting immediate measurements, if windows in clouds open. All measured and calculated data are stored for further treatment.

## **A concept of selfcalibration of the PION instrument**

Being designed as a net instrument for total ozone measurements, the PION instrument is to maintain its original parameters through a long period of time. There are several methods of laboratory testing of stability and adjusting of the parameters. Nevertheless, NOMREC follows a concept of selfcalibration of a net instrument in its operational mode. That is to make all possible testing and adjusting of the parameters in natural conditions of operation. NOMREC has proceeded significantly in this work with the PION instrument. At now it is accessible following operations:

- adjusting directions of optical axis of the spectrometer and the Sun tracking system;
- correcting of the orientation of the photo detector of the Sun tracking system;
- testing stability of wavelength setting;
- adjusting parameters of calculation to provide coincidence of total ozone data with the reference instrument.

At the stage of putting into use following operations:

- testing linearity of the electronic registration system;
- testing of the correctness of wavelength scale;
- testing stability of relative spectral sensitivity;
- testing stability of absolute sensitivity.

Being realized all mentioned operations would make unnecessary any laboratory testing of the instrument.

