TOTAL OZONE CONTENT IN ATMOSPHERE COLUMN AT THE KISHINEV SITE: COMPARISON WITH THE EP TOMS AND AURA OMI OZONE RETRIEVALS

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Since 2003 for the first time in Moldova regular measurements of total ozone content (TOC) in column of atmosphere are being fulfilled. The study was conducted at the ground-based solar radiation monitoring station at the Institute of Applied Physics using a hand-held microprocessor controlled MICROTOPS II ozonometer. Ozone measurement technique is based on the differential optical absorption of the direct solar UV radiance. Measurements of direct solar UV radiance and retrieving of total column ozone content are fulfilled with MICROTOPS using three UV channels: λ=305.5, 312.5 and 320.0 nm. Total column ozone is deduced from the ratio of direct solar UV radiance measured at two wavelengths, 305.5 nm and 312.5 nm. The third wavelength channel of 320 nm is used to make corrections due to aerosol influence. Comparison with the Dobson and Brewer spectrophotometers shows that MICROTOPS provides accuracy comparable to these recognizable spectrophotometers and agreement between these types of ozonometers is better than ±1-2%.

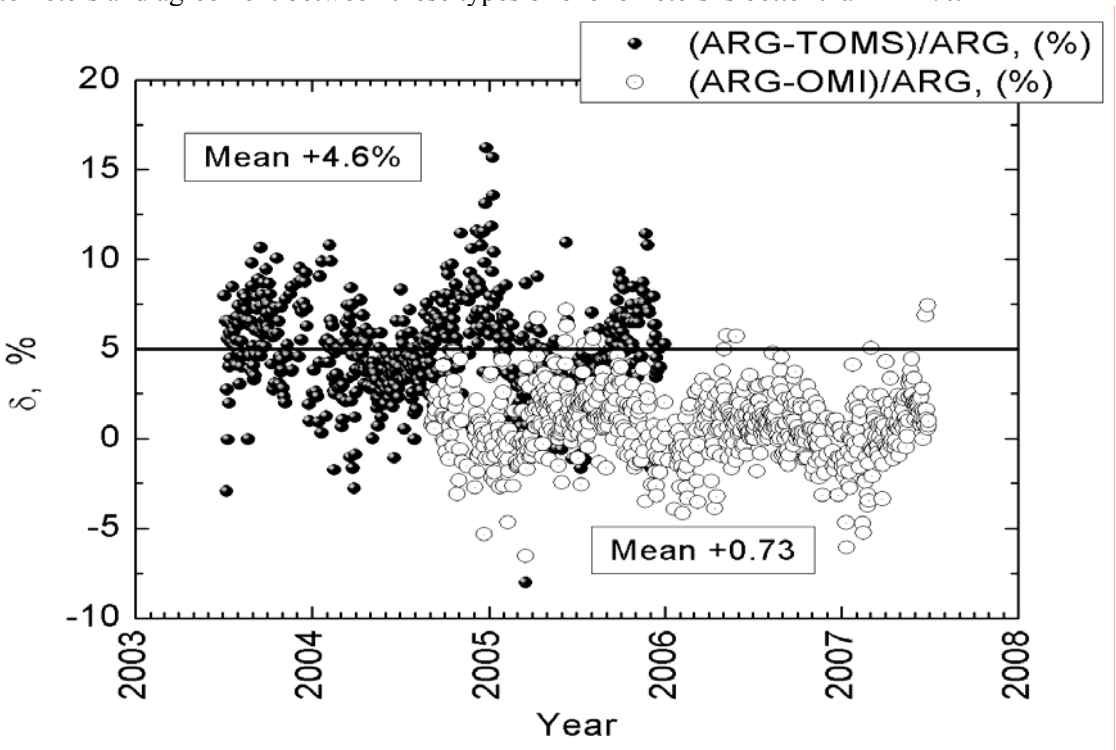

Fig 1. Seasonal variation of daily averaged bias values, δ_k (in %), calculated on basis of TOC values from ground measurements (ARG) and respective values of TOC retrieved both from the satellite EP TOMS and AURA OMI platforms measurements. These biases are further designated as δ_{TOMS} and δ_{OMI}.

Our (ARG) ground-based measurements of TOC were compared with the TOC values retrieved from the measurements fulfilled at the Earth Probe (EP) satellite platform with Total Ozone Mapping Spectrometer (TOMS) and AURA platform with the Ozone Monitoring Instrument (OMI). Seasonal variation of daily bias values δ_k (in %) calculated on the basis of TOC values from the ground measurements (ARG) and respective values of TOC retrieved both from the EP TOMS (δ_{TOMS}) and AURA OMI (δ_{OMI}) satellite platforms measurements are shown in Figure 1. Derived bias values, δ_{TOMS} and δ_{OMI}, are averaged over the time of observation which is specific to each of satellite platforms operation period and they amount to δ_{TOMS}~ +4.6 %, and δ_{OMI}~ +0.73 %. Relative large value of δ_{TOMS} was due to the TOMS instrument experienced calibration problems during the last years of operation of the EP TOMS. Bias value δ_{OMI} is small enough that consists of ~ 2 DU and lies within the MICROTOPS's accuracy range. OMI represents a new powerful generation of instrumentation with modified technique for

retrieving of the O_3, NO_2, SO_2, and some other gases, aerosols and UVB solar flux. In this connection, ground-based TOC observations are considered as the most accurate and reliable measurements, and it is these measurements are used in validation of the TOC values retrieved from the satellite platforms.

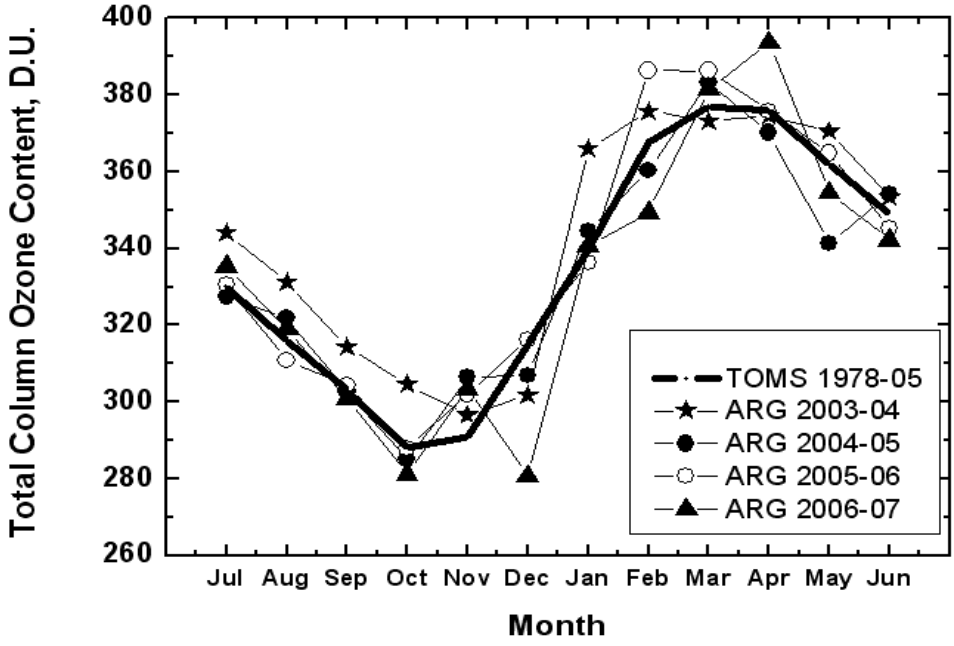

Fig. 3. Seasonal variation of monthly means of TOC measured at the ground-based station at the Kishinev site in comparison with the multi-year mean TOC values retrieved from the EP TOMS satellite platform measurements from 1978 to 2005.

Seasonal variation of monthly means of TOC measured at the ground-based station at the Kishinev site from July 2003 to June 2007 is shown in Figure 2. Multi-year mean of TOC values retrieved from measurements which have been carried out at the EP TOMS satellite platform from 1978 to 2005 are shown in Figure 2. It can be clearly seen the resemblance between the seasonal variation of TOC retrieved from the ground-based measurements and TOC values derived from multi-year statistics based on the long-time series (~27 years) of satellite measurements. It should be emphasized that seasonal variation of TOC reveals two distinct extreme: minimum in October-November and maximum in March-April. Maximum and minimum values of monthly means of TOC observed during 2003-2007 amounted to ~ 394 DU in April 2007 and ~ 281 DU in October-December 2006. Maximum and minimum records of daily mean values of TOC for this period of ground observations were equal to ~489 DU (February 12, 2004) and ~250 DU (November 27, 2006), respectively. Extremally low value of TOC observed in our region was due to the formation of a set of ozone mini-holes over the Europe. It should be noted, that mean value of TOC for this period amounts to 337.7 DU, taking into account that the climatic mean value of TOC is equal to 335 DU.