MONITORING OF THE ATMOSPHERIC AEROSOL OPTICAL CHARACTERISTICS AT THE IAP GROUND-BASED STATION, KISHINEV(MOLDOVA)

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Results of long-term measurements of aerosol optical and microphysical properties at the IAP's ground-based solar radiation monitoring station for the period of observations from 2004 to 2016 are presented. In 2003 for the first time in Moldova the IAP's ground-based station (47.0013°N, 28.8156°E; 205 m a.s.l.) for monitoring solar radiation, aerosol optical properties and total ozone content was created [1]. The station was registered in the Global Atmosphere Watch Station Information System (GAW SIS) as a Regional fixed station in WMO RA VI–Europe (https://gawsis.meteoswiss.ch/GAWSIS//index.html#/search/station/stationReportDetails/353). Since 1999 observations of aerosol optical characteristics have being carried out within the frame of the international Aerosol Robotic Network (AERONET) project managed by NASA/GSFC (http://aeronet.gsfc.nasa.gov/new_web/photo_db/Moldova.html) [2, 3].

Aerosol optical and microphysical characteristics in the column of atmosphere are retrieved from direct solar and sky diffuse spectral radiance measurements using a multi-wavelength sun-photometer Cimel CE-318 in seven spectral channels. Spectral aerosol optical depth (AOD) at set of wavelengths from 340 nm to 1024 nm is used to characterize the turbidity of atmosphere due to presence of the aerosol only(cloud free conditions). Time-series of monthly means of AOD at 500 nm, $<\tau_a(500)>_m$ measured at the ground-based station in the course of period from 1999 to 2016 is shown in Fig. 1. Multi-year monthly means of AOD $<\tau_a(500)>_{m, MY}$ are shown in Fig 2.

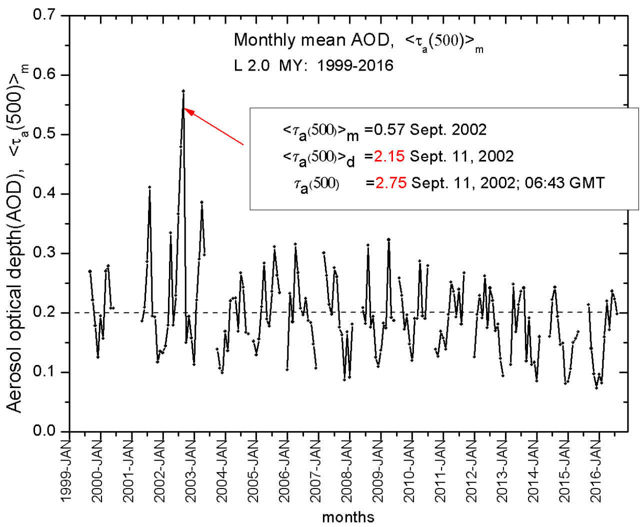

Figure 1. Time-series of monthly means of AOD $<\tau_a(500)>_m$ measured at the ground-based station at the Kishinev site in the course of period from 1999 to 2016. Multi-year mean value of AOD $<\tau_a(500)>_{MY}$ is marked as dashed line.

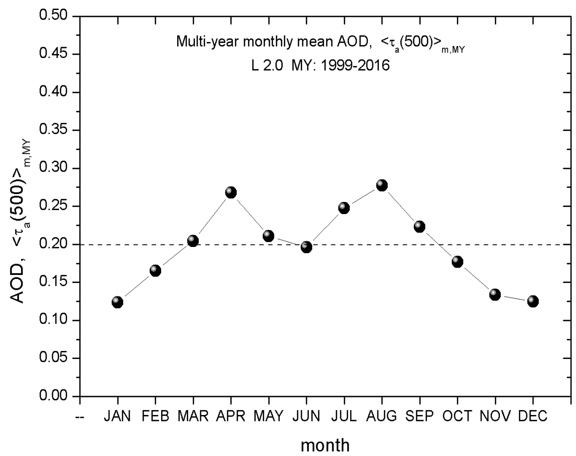

Figure 2. Multi-year monthly means of AOD $<\tau_a(500)>_{m, MY}$ measured at the ground-based station at the Kishinev site in the course of period from 1999 to 2016. Multi-year mean value of AOD $<\tau_a(500)>_{MY}$ is marked as dashed line.

Multi-year mean value of AOD is equal to $<\tau_a(500)>_{MY}=0.20 \pm 0.05$, indicating that the atmosphere is relatively clear(for cloud free conditions). High peaks of AOD observed in the course of 2001-2003 (see Fig. 1) are attributed to influence of aerosols (smoke, dust) in air masses transported from outer regions. Appearance of the largest peak of monthly mean AOD in September 2002 with $<\tau_a(500)>_m$ =0.57 is attributed to influence of highly polluted air masses loaded with smoke particulates and long-range transported from some regions of Russia, Belarus, and Ukraine: in these regions numerous loci with intensive biomass burning(forest and peat fires) were observed [4]. The highest ever measured instantaneous value of AOD $\tau_a(500)$ and daily mean $<\tau_a(500)>_d$ at the Kishinev site were observed on September 11, 2002 with values of $\tau_a(500)$ =2.75 and $<\tau_a(500)>_d$ =2.15, respectively. Peak value of AOD $<\tau_a(500)>_m$ observed on April 2001 was due to episode of the intensive dust outbreaks from Sahara and further transportation of air masses loaded with dust particulates through Moldova [5]. Multi-year monthly means of AOD $<\tau_a(500)>_{m, MY}$ measured at the ground-based station at the Kishinev site reveal the seasonal variability: with minimum value of AOD ~0.12 in December and January, and maximum value of AOD ~0.28 in April and August (see Fig. 2).

For comparison of the AOD values variability around worldwide, here are also presented (Table 1) multi-year mean AOD values $<\tau_a(500)>_{MY}$ for some analogous sites within the globally distributed AERONET network. Low values of AOD correspond to high transparency of the atmosphere, and vice versa, high values of AOD indicate an extremely low transparency of the atmosphere.

Table 1. List of sites with respective values of multi-year mean AOD $<\tau_a(500)>_{MY}$ within the global AERONET network. Period of observations: 1999-2016.

AERONET site	AOD $<\tau_a(500)>_{MY} \pm \sigma$
Dunedin(New Zealand)	0.05 ± 0.01
Bratts Lake(Canada)	0.10 ± 0.04
Evora(Portugal)	0.12 ± 0.03
Paris(France)	0.17 ± 0.04
Rome(Italy)	0.18 ± 0.03
Moscow(Russia)	0.19 ± 0.06
Chisinau(Moldova)	**0.20 ± 0.05**
Washington/Greenbelt(US) NASA	0.19 ± 0.11
Skukuza(Japan)	0.20 ± 0.07
Belsk(Polland)	0.21 ± 0.04
Sao_Paulo(Brazil)	0.24 ± 0.08
Bucharest(Romania)	0.24 ± 0.04
Alta Floresta(Brazil)	0.29 ± 0.30
Osaka(Japan)	0.30 ± 0.09
Solar Village(Saudi Arabia)	0.35 ± 0.12
Kanpur(India)	0.65 ± 0.13
Beijing(China)	0.71 ± 0.19
Xiang He(China)	0.75 ± 0.23

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