ASTRONOMICAL OBSERVATIONS AT POLARIMETRIC MEASUREMENTS OF THE SKY. P. V. Nevodovskyi[1], A. V. Morozhenko[1] and A. P. Vidmachenko[1, 2], [1]Main Astronomical Observatory of National Academy of Sciences of Ukraine, Str. Ak. Zabolotnogo, 27, Kyiv, 03143, [2]National University of Life and Environmental Sciences of Ukraine, St. Heroyiv Oborony, 12, Kyiv, 03041, nevodpetro@i.ua.

For the study of aerosols in the Earth's stratosphere, projects of its remote polarimetric measurements in the ultraviolet spectral region from satellites were proposed. Information on the physical properties of aerosol in the upper atmosphere of the planets can also be obtained using the results of polarimetric and photometric sky measurements at ground-based observations [4-7, 10, 16]. But preparation for their implementation in Ukraine is very slow. Therefore, in [3, 9] considered one more method of obtaining information on the physical properties of the aerosol in the stratosphere for the results of polarimetric measurements of the twilight sky. It is known that the most reliable information about the refractive index and on particle size distribution function can be obtained from the analysis of the phase and spectral dependence of the degree of polarization and reflectivity in a wide range of wavelengths and phase angles [1, 2, 8, 17].

As a modification of the observation process in [3], it was proposed to install the telescope not into zenith, but along the coordinate to the declination of the Sun. In this case, by changing the hour angle of the telescope pointing, we can expand the interval of phase angles, and plan it in advance to obtain information on a selected altitude in the atmosphere, scattering above which is recorded during observations. We carried out polarimetric observations on 09/26/2017 on the AZT-2 telescope at the Main Astronomical Observatory of the National Academy of Sciences of Ukraine. A few days and nights before this date, and after it - were cloudless with very low humidity. The observations were carried out with the modernized ultraviolet polarimeter model [7, 12]. We directed the telescope to a region in the sky with the angle of declination of the Sun $\delta \approx 0°$ at an hour angle of -1^h. Work began at 14:00 of Kyiv time; observations were carried out until 20:00.

A filter with λ=362 nm was used, a diaphragm of Ø≈0.5 mm cut out a region of the sky, and a piezomotor turned the modulator with a phase plate at an angle of 45° with an exposure time of 2 seconds. The dark flux was 10–20, and the useful signal in the daytime exceeded 300,000 pulses per second. Our calculations gave values of degree of polarization on the phase curve, which vary from -3 to + 32%.

Comparing our observational data in the daytime with the results of calculations [3, 18] shows that these observations best fit the calculations of polarization phase curves for spherical particles with a normal-logarithmic distribution law on their size, and dispersion of sizes 0.1, with size of particle r_o=0.16 μm and with real part of the refractive index n_r=1.33; and the results of observations of the twilight sky after sunset – indicate a slight increase in the refractive index to n_r=1.42, and almost on the same size of aerosol particles [13-15]. Data on the size of aerosols is important for determining the degree of transparency of the atmosphere, because the purification of its upper layers occurs mainly due to the sedimentation of particles under the action of gravity, the speed of which, for example, during Stokes subsidence, is inversely proportional to the square of their radius [3, 11]. For a more unambiguous interpretation when estimating the imaginary part of the refractive index, we plan to complement polarization observations with a definition of the reflectivity of the twilight sky under the same conditions.

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