

VARIABILITY OF POLARISED LIGHT OF VENUS FROM GROUND BASED OBSERVATIONS IN 1980;

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For studying of polarization characteristics of various regions on Venus, in particular, of the dark and bright ultraviolet (UV) cloud markings, the planet was photographed in 1980 from March 6 to April 29 (14 days) and from August 29 to October 7 (15 days). The 70 cm reflector of the Kharkov Astronomical Observatory was used. The photographic images were taken at the Cassegrain focal length of 30 m through a calcite crystal, covering four spectral regions ($\lambda_{\text{eff}} = 630, 530, 435, 365 \text{ nm}$) within the phase angle range of $70,4^\circ$ to $103,5^\circ$ in spring and of $89,5^\circ$ to $68,8^\circ$ in fall.

As a result of photometric data treatment, for each date and spectral region the relative intensity and the degree of polarization distribution along the intensity equator and perpendicular to that in the near-terminator zone have been obtained as the mean values for three images.

Short-term periodic variations in the near-terminator zone are found at all wavelengths with a mean period of about 4,5 days [1]. Changes of the polarization at different wavelengths are practically in phase.

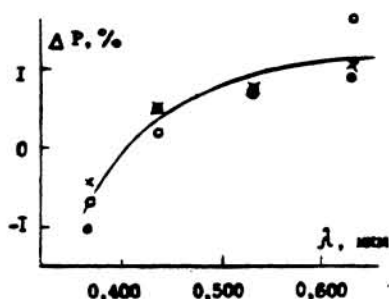
The correlation between the polarization and UV contrasts depends on the phase angle but is little significant as a whole. It is evidence of small influence of the UV absorber to polarization changes.

The fact that short-term periodic variations are in phase for all wavelengths limits the possible sizes r of particles, which are probably responsible for these variations. Analysis of the changes of linear polarization with the size parameter $\rho = 2\pi r/\lambda$ for single scattering [2] indicates for r : $r < 0,2 \mu\text{m}$ or $r > 0,35 \mu\text{m}$. This doesn't contradict the mean particle size $0,49 \mu\text{m}$ of the high-altitude equatorial haze [3].

Besides the short-term variations also systematic differences in polarization at spring (the evening quadrant) and fall

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(the morning quadrant) elongations are found. The figure shows the spectral variation of the differences between the degree of polarization at fall and spring, mean for the range of angles of incident light $45-80^\circ$ at equatorial region.



The opposite sign of the polarization differences in ultraviolet and red light can be attributed to the additional aerosol layer of small particles overlying the main cloud layer or to the increasing of the optical thickness of the additional layer. The sign inversion at $\lambda \sim 400$

nm gives the possibility to estimate the particle size of the additional layer. If the refractive index of the additional particles is the same as for the main cloud then analysis of the changes of polarization with ρ [2] indicates that r is about $0.22 \mu\text{m}$. This agrees well with the haze of submicron-sized particles, found by the Pioneer Venus Orbiter Cloud Photopolarimeter experiment [4]. At low latitudes substantial diurnal variations exist for this haze: its optical thickness decreases away from the morning terminator region to the noon meridian. But according to [5] the equatorial haze reveals variations with a time scale of several months. Long-duration observations are needed for choosing between diurnal and temporal explanation of the observed spring-fall asymmetry in polarization.

References: (1) Starodubtseva O.M., 1985, *Pis'ma Astron. Zh.*, v.11, p.156 (in Russian).

(2) Hansen J.E., Hovenier J.W., 1974, *J. Atmos. Sci.*, v.31, p.1137.

(3) Esposito L.W., Travis L.D., 1982, *Icarus*, v.51, N2, p.374.

(4) Kawabata K., Coffeen D.L., Hansen J.E., et al, 1980, *J. Geophys. Res.*, v.85, p.8129.

(5) Kawabata K., Sato M., Travis L.D., 1981, *An International Conference on the Venus Environment*, Hyatt Ricketts, November 1-6, California: Palo Alto, p.51.