

OCCULTATION OF SAO 187255 BY TITAN:

TITAN'S ATMOSPHERE;

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On July, 3, 1989, Titan occulted SAO 187255, a K2-type star of visual magnitude 5^m.8. Photoelectric observations of the occultation were carried out at Chuguyevskaya station of the Kharkov Astronomical Observatory. We used high speed photometer on the 0.70-m telescope. The pulse-counting photometer was equipped with FEU-79 (S-8 cathode) photomultiplier tube and a B-filter was used. A 35 arcsec diaphragm was used. This was arranged to take one integration per 6 ms in a continuous sequence. Each integration was stored sequentially in the computer's memory.

It was unfortunately not possible to synchronize the high-speed photometer's clock with UT so no exact estimate of the eclipse beginning time was performed. The best estimations of this time are 22^h 37^m.170.2 UT [1].

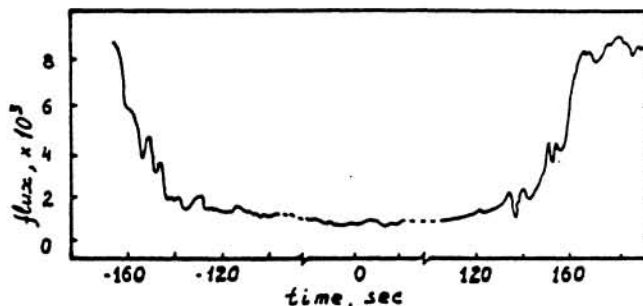


Fig.1

We note that there aren't any diffraction effect at the beginning and the end of the events. Duration of the covering at the 0.5 intensity level was 314.01 second. In assuming that the occultation was central with linear speed 21.75 km/s analyses of results for the average data with a period of 193 ms were made. The occultation light curve is shown in Fig.1.

In accordance with the accepted method [2] a model of the isothermic gaseous atmosphere of Titan was made. Extent of homogeneous atmosphere reaches 57.5 and 55.2 km for immersion and emersion, correspondingly. Estimation of the mean molecular weight of the atmosphere $\mu = 17$ was yielded in assumption that average temperature of the atmosphere in the model is 160 K and acceleration due to gravity is 1.4 m/s [3]. It disagrees with Voyager-2 determination [4].

Fig.2 shows deviations of real occultation light-curve from the model at the immersion and emersion moments vs star height over Titan's surface. By shading there is drawn a confidence interval of the Earth atmosphere twinkling ($\gamma = 0.99$). Results of the observations show four light-absorbing cloud layers in Titan's atmosphere in both cases. According to our model these layers take place at a respectful distance 330, 500, 610 and 750 km from surface (radius of solid surface

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is 2575 km). It supports the supposition made by Voyager-2 [5] that the Titan's covering clouds have a layer structure.

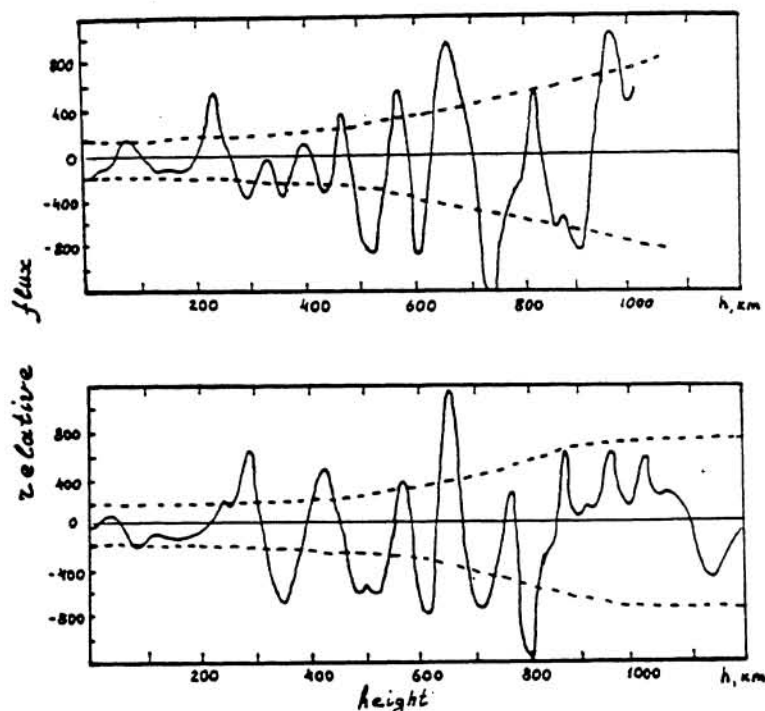


Fig.2

- References: 1) Velichko F.P. et al., 1989, submitted to Astron. Tzirkuliar (in Russian).
2) Sobolev V.V., 1985, Kurs teoretich. astrophys., M.: Nauka, p. 252-256 (in Russian).
3) Hunten D.M. et al., 1984, in "Saturn" Gehrels T. and Matthews M.S., Eds. Univ. of Arizona Press. Tucson, p. 671-759.
4) Smith B.A. et al., 1982, Science, v. 215, p. 504-537.
5) Rages K., Pollack J.B., 1983, Icarus, v. 55, p. 50-62.