SURFACE PHOTOMETRY OF COMETS: OUTLOOK FOR SMALL TELESCOPES

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The small telescopes of observatories in Ukraine have one useful characteristic, which can give a new life for these instruments. With wide angle astrographs and cameras one can obtain the images of extended sky objects for different purposes, in particular for studies of surface brightness distributions. The examples of successful use of the results of surface photometry of comets are presented.

INTRODUCTION

One can consider what small telescopes can't compete with giant telescopes on the ground and in space. However, some of these telescopes have characteristics which are useful for study of extended sky objects. Observatories in Ukraine have some telescopes with a short focal length and sufficient aperture (for example, DShA, SBG, AFU and others), which can be used to obtain the images of such objects, in particular, images of comets. We supply below some examples of successful study of comets by means of images obtained with small telescopes.

SYNCHRONIC BANDS OF COMET C/1975 R1 (WEST)

We observed the Comet West early spring 1976 on Peak Terskol, Northern Caucasus. The images of comet were obtained with camera AFU–75 (210/735). On the pictures one can see the five bright bands formed the dust tail of Comet West. The synchrone–syndine analysis shows that the axes of bands are classic synchrones. We obtained photometric scans along the directions, which are *loci* of synchrones. The distributions of brightness in synchronic bands have been compared with the calculated distributions of brightness. To calculate the distributions we used the modified Finson–Probstein method. The results of our study are as follows: the size distributions of comet particles are obtained; the rate of dust production is computed and the duration of rise of dust emission is determined; the dependence of dust ejection velocity on particle size and heliocentric distance of the nucleus is derived. We estimated the duration of rises of dust emission used the measures of the width of the synchronic bands.

So, we have found the basic characteristics of dust particles ejected during active processes in nucleus of Comet West and the characteristics of these processes using images of the comet tail obtained with a very modest telescope.

EXTENDED SOURCE OF C_2 MOLECULES IN THE COMA OF COMET C/1995 O1 (HALE–BOPP)

The images of Comet Hale–Bopp were obtained with the double astrograph (400/2000) at the Main Astronomical Observatory of NAS of Ukraine in Kyiv in January–April 1997. Some of them were taken through special filters which allow to isolate the $C_2(\nu = +1)$ emission and nearby continuum. After subtraction of "cont" image from "C_2" image according to a special procedure we obtained the brightness isophotes. The isophotes on April 21.77, 1977 have one additional center of brightness near the nucleus. The secondary peak of brightness is shifted by $\Delta\alpha = 1.15$ arcmin and $\Delta\delta = 0.25$ arcmin relatively to the nucleus. The angle from the projected solar direction to the secondary peak direction is about 60°. On March 13.04, 1997 there is no secondary peak of brightness, but one can see a prominence in the outward isophotes. The angle between the sunward direction and to the prominence is of 60°.

It was suggested [1] that a portion of the C_2 emission in the coma of Comet Hale–Bopp was formed by the destruction of small organic dust grains. The small particles (0.1–0.3 μm) reflect light with the wavelengths 0.4–0.5 μm weekly. Therefore, there is no significant contribution to the dust brightness from the grains and at same time we can see the additional brightness of C_2 emission in the regions, where the dust grains release the C_2 parent molecules.

CONCLUSIONS

So, we have found the basic characteristics of the dust particles ejected during active processes in the nucleus of Comet West and the characteristics of these processes using the images of the comet tail obtained with a very modest telescope. Also we have given new arguments, which support the hypothesis [1], by using our small telescope. We hope to take new images of the bright comets in future with telescopes of our observatory and new detectors of light.

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REFERENCES

[1] *Sekiguchi T., et al.* Observations of C_2 Molecules in the Coma of Comets at Mitaka // Abstracts Book of the First International Conference on Comet Hale–Bopp.–1997.