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STRIP PHOTOMETRY OF COMET HALLEY

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RESUMO. Observaçoes pos-perihelicas do Cometa Halley foram feitas em 25 noites no refletor de 50 cm da UFRGS usando a tecnica de fotometria de varreduras. Uma fenda de dimensoes 8' x 8" varreu a imagem do cometa a velocidade de 1.345" x cos(declinacao)/seg, no sentido este-oeste ou inversamente. Para a fotometria usamos filtros interferenciais da NASA : C2, C3, CO+, H2O+, λ 4845 e λ 6840. Para a calibracao foram usadas estrelas padrao IHW e varreduras de estrelas de campo. Sinais significativos foram detectados para H2O+, C2 e C3. A evolucao temporal da coma pode ser acompanhada a partir dos perfis. Nao e observado efeito de cor a partir dos filtros do continuo.

ABSTRACT. Post-perihelical observations of Comet Halley were performed on 25 nights at the 50-cm reflector of UFRGS by the technique of strip photometry. A slit of dimensions 8' x 8" scanned the comet image at a speed of 1.345" x cos (declination)/sec, in east-west direction or inversely. For photometry we used NASA interference filters C2, C3, CO+, H2O+, λ 4865 and λ 6840. Calibration used IHW standard stars and scans of field stars. Significant signals are detected for H2O+, C2 and C3. Time evolution of coma is seen from profiles. No color effect was observed from the continuum filters.

Key words: COMETS-HALLEY — PHOTOMETRY

I. INTRODUCTION

Strip photometry as an observational technique is specially suited to be applied on diffuse objects, where a compromise between resolution and signal to noise ratio must exist. In this method, a long and narrow slit is scanned across the image, providing resolution in one dimension. Corrections for seeing can be made from scans of field stars, used also for the corrections for sky and instrumental background. This technique is able to produce useful photome-

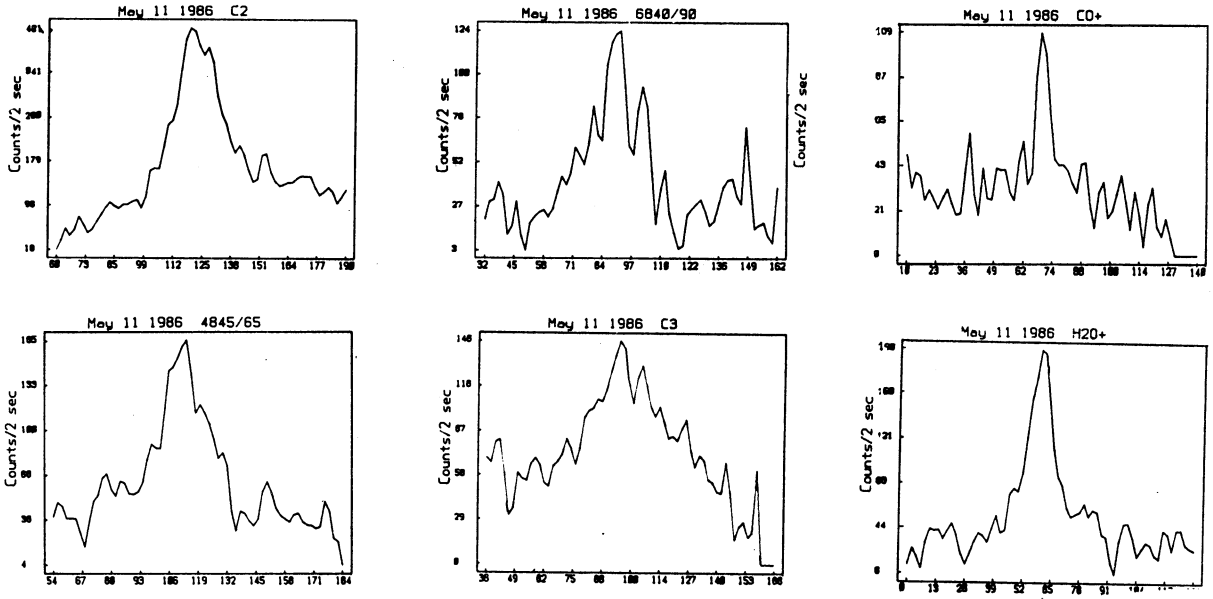

Fig. 1. Profiles for May 11, 1986 smoothed with a five points filter and corrected for sky, without atmospheric extinction correction. These measures were obtained through a slit of dimensions 8' x 8"; profiles for molecular bands include the continuum contribution. Abcissae are in seconds of scanning time (see text). Sampling interval is two-seconds integrations (1600 km); approx. 130" of comet's image were scanned in this profile.

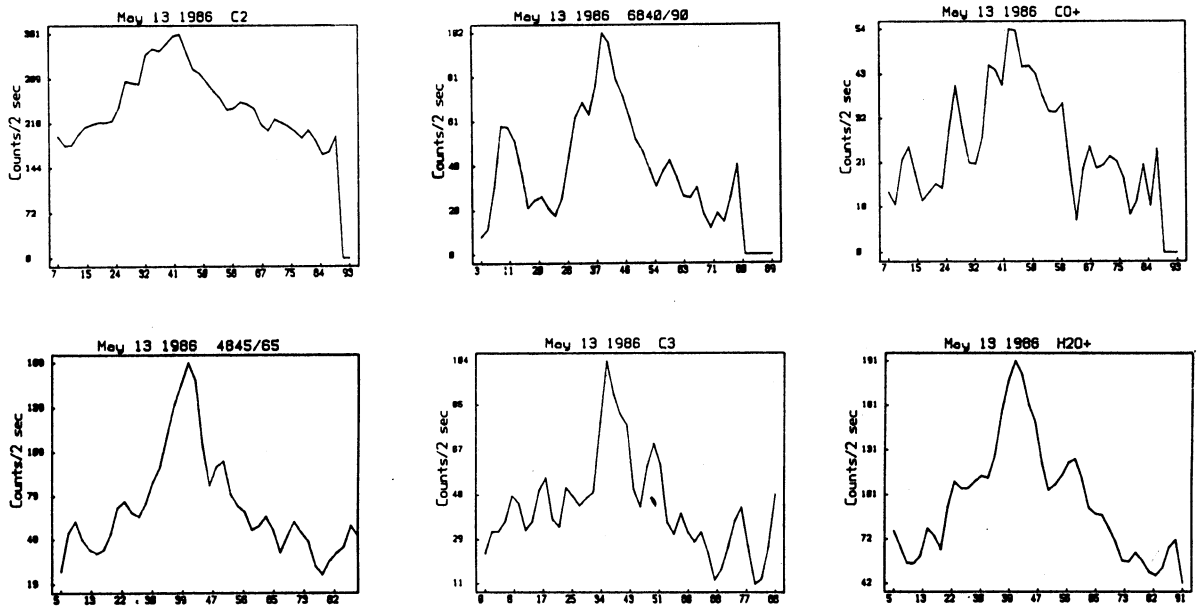

Fig. 2. Same as Figure 1 for May 13, 1986. 1 second of time is 858 km; profile show is 85" wide.

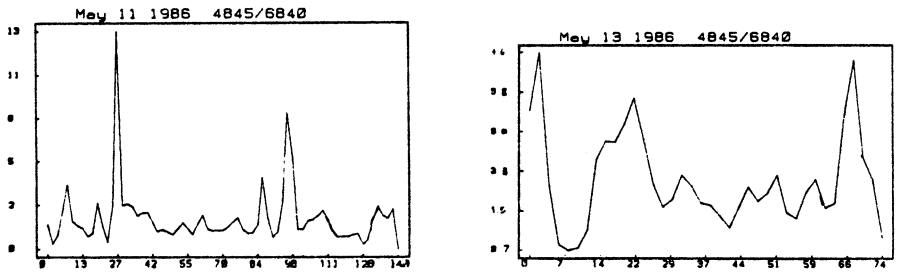

Fig. 3. Color index C(4845-6840) obtained by dividing corresponding profiles for May 11, 1986.

Fig. 4. Same as Figure 3, for May 13, 1986.

tric results (Meisel and Morris 1983); this has been done for comets, clusters and HII regions (Strauss 1977, 1978; Strauss et al. 1979), being well suited for objects of large angular size.

II. OBSERVATIONS

Obervations were made with the 50-cm aperture, f:13.3 Cassegrain telescope of UFRGS, located on Morro Santana, Porto Alegre. The photometer has a EMI9658 photomultiplier tube. The knife-edge slit has a width of 8" and a length of 8'; scans were made at the speed of 1.345" cos(declination)/sec, either in west-east or east-west direction. Counting times could be adjusted; we used two-seconds integrations by sample. Scans lasted from two to ten minutes, ending when only sky counts were recorded.

In the period March-June 1986 we collected data of Comet Halley for approx. 25 nights, which provided approx. 200 profiles, using NASA filters (kindly made available by Drs. I. Ferrin and E. Baker) C2, C3, H2O+, CO+, λ4845 and λ6840. At the same time we obtained scans of field stars at the same air mass, which provide the sky and instrumental background, and also a measure of the widening of profiles due to seeing. For calibration we measured International Halley Watch standard stars and extinction stars.

III. DATA REDUCTION

Smoothing of profiles were made by applying a numerical low-pass filter consisting of a five-point running average of the data with weigths (-1/16, 1/4, 5/8, 1/4, -1/16); at the same time, we tried to restore scans to their shape corrected for seeing and integration times (Strauss 1977 and references therein). Further analysis must be made in order to reduce noise introduced by these techniques.

IV. PRELIMINARY RESULTS

Figures 1 and 2 present scans for two typical nights (May 11 and May 13). Profiles are smoothed and sky was subtracted. Seeing widening for these nights was typically 6" to 8", measured on scans of field stars. In some scans spikes due to stars are present; they can be delected if necessary (as in λ6840 measures in May 11).

Measures at λ6840 and H2O+ show that, at this distance from the Sun (1.1 AU), water is still well above the continuum level, but concentrated mainly near the nuclear region, in contrast with the extended H2O+ profile measured some

days earlier (Ducati et al. 1986). The same is true for the λ 4845 and C2 profiles. For CO^+ the analysis is more difficult, since no accompanying continuum measure is available. A careful study is to be performed in this case, since at first sight it seems that only continuum was recorded in this passband.

Finally, comparing continua measures at λ 4845 and λ 6840 we could not detect any significant color effect as a function of the distance to the nucleus (Figures 3 and 4).

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