

Variations in P/Halley, 1986 January

Dear Sir

UBV photometric observations are important and can provide very interesting and valuable information on the brightness and colours of comets. In this letter we present the observed standard UBV magnitudes and U-B and B-V colour indices of comet P/Halley obtained during the preperihelion period.

We planned to observe comet P/Halley regularly during 1986 January, but were prevented by cloudy skies. We observed on only eight nights between January 8 and 23. The observations were made with the UBV photometer at the Cassegrain focus ($f/15$) of the 380mm reflector of the Uttar Pradesh State Observatory, Naini Tal, using a 1P21 photomultiplier thermoelectrically cooled to -20°C . The standard U, B and V filters of Johnson and Morgan and standard dc techniques were employed for detecting the signal. The signal was recorded on a Honeywell strip chart recorder. An entrance diaphragm of 75 arcseconds was used, allowing the whole head of the comet to fall on the photomultiplier. The comparison stars 10 Tau and Eta Aqr were observed to derive extinction coefficients and to determine the differential magnitudes. The recorder deflections were converted to instrumental magnitudes by applying air mass corrections. The differential magnitudes were converted to the standard UBV magnitudes with the help of standard stars, observed during the same period. The total standard magnitudes and U-B and B-V colour indices of comet P/Halley are listed in Table 1.

In general, it is standard practice to correct the photometric magnitudes of comets for aperture effect, as described by Morris¹. For comet P/Halley, however, Morris², has found that no aperture correction is required for observations made from 1985 July to September. Although an aperture correction does become necessary in later months, by 1986 January we were making observations with a smaller aperture instrument, which minimises the aperture effect³. Therefore, for the present observations no aperture correction has been applied.

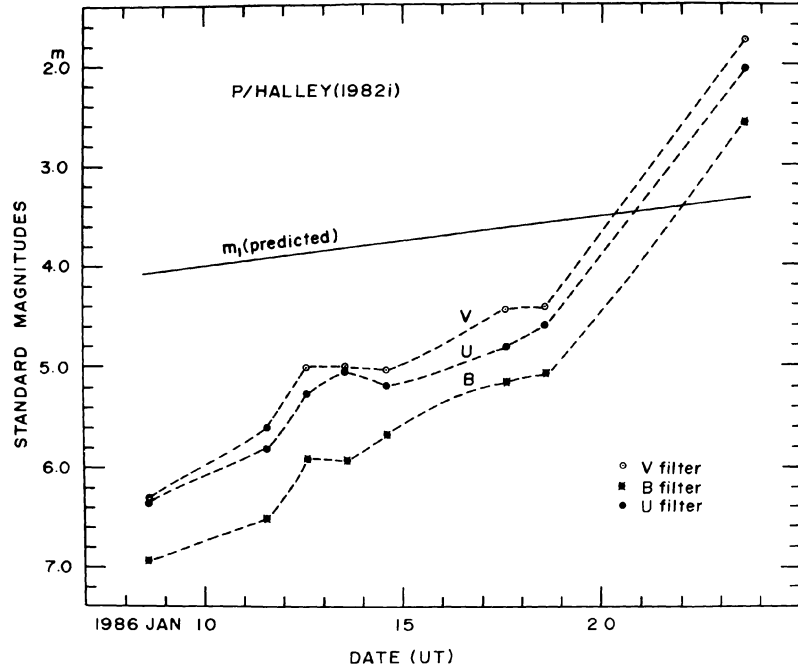


Figure 1. The observed light curves of P/Halley during 1986 January.

Our measurements of the UBV magnitudes are displayed in Figure 1. The dashed lines (joining the observed points) represent the light curves of P/Halley in the three filters. We have also plotted the predicted light curve of P/Halley (solid continuous curve) during the same period, obtained from the total visual magnitude (m_1) data given by Yeomans³. Figure 1 shows that the observed light curves deviated strongly from the predicted light curve in 1986 January. The behaviour of the visual light curve of P/Halley from 1984 November to mid-1985 December was described by Morris². He found that the comet deviated from the regular trend in 1985 December as it approached perihelion. Our observations show that this deviation persisted into 1986 January.

The light curves in Figure 1 make it obvious that comet P/Halley displayed night-to-night variations in its brightness in all three filters during 1986 January. The comet was fainter than predicted till January 20, and became relatively brighter than the predicted brightness after January 22 in all three filters.

In conclusion, comet P/Halley has shown active behaviour. It is likely that the brightness variations may have been caused by irregular transient events of nuclear activity in the form of outbursts.

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Yours faithfully

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- 1 Morris, C.S., *Publ. astron. Soc. Pacific*, **85**, 470 (1973).
- 2 Morris, C.S., *IHW Newsletter No. 8*, 2 (1986).
- 3 Yeomans, D.K., *The Comet Halley Handbook* 2nd edition (1983).

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Table 1
Total standard UBV magnitudes and colour indices of comet P/Halley

| Date (UT) 1986 January... | Δ (AU) | r (AU) | U | B | V | U-B | B-V |
|------------------------------|------------------|-------------|-----------------|-----------------|-----------------|------------------|------------------|
| 8.569 | 1.30 | 0.90 | 6.33 ± 0.03 | 6.92 ± 0.03 | 6.30 ± 0.03 | -0.59 ± 0.04 | $+0.62 \pm 0.04$ |
| 11.569 | 1.35 | 0.85 | 5.82 ± 0.07 | 6.50 ± 0.05 | 5.61 ± 0.04 | -0.68 ± 0.05 | $+0.89 \pm 0.07$ |
| 12.569 | 1.37 | 0.83 | 5.26 ± 0.05 | 5.92 ± 0.05 | 5.00 ± 0.05 | -0.66 ± 0.05 | $+0.92 \pm 0.06$ |
| 13.556 | 1.38 | 0.82 | 5.03 ± 0.03 | 5.93 ± 0.03 | 5.03 ± 0.03 | -0.90 ± 0.04 | $+0.90 \pm 0.05$ |
| 14.570 | 1.40 | 0.80 | 5.18 ± 0.03 | 5.66 ± 0.03 | 5.03 ± 0.05 | -0.48 ± 0.05 | $+0.63 \pm 0.06$ |
| 17.570 | 1.43 | 0.77 | 4.80 ± 0.05 | 5.15 ± 0.05 | 4.43 ± 0.04 | -0.35 ± 0.06 | $+0.72 \pm 0.07$ |
| 18.559 | 1.45 | 0.76 | 4.58 ± 0.04 | 5.07 ± 0.04 | 4.42 ± 0.03 | -0.49 ± 0.05 | $+0.65 \pm 0.06$ |
| 23.559 | 1.50 | 0.70 | 2.05 ± 0.05 | 2.57 ± 0.03 | 1.76 ± 0.10 | -0.52 ± 0.08 | $+0.81 \pm 0.12$ |