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UBV photometry of comet Swift-Tuttle (1992t)

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Abstract. The comet Swift-Tuttle (1992t) was observed through *UBV* filters during twelve nights in December 1992. Magnitude variations of six circular zones from the centre of the cometary head have been given. On the night of 17 December 1992, sharp magnitude variations have been noticed in all the three filters during a span of one hour observations.

Key words : comet—UBV photometry

1. Introduction

The periodic comet Swift-Tuttle (1992t) was detected by National Astronomical Observatory (NAO), Tokyo Astronomer, Tsuruhiko Kiuchi (IAU Cir. No. 5620). Various observations for measuring its position and orbital elements were reported by many observers. For the present observations, the relevant data have been taken from IAU Cir. No. 5636. We have observed the head of the comet during twelve nights in December 1992 to study its brightness variation with respect to heliocentric distance r and geocentric distance Δ.

2. Observations

UBV observations of the comet head were taken on eight nights using six diaphragms D1, D2, D3, D4, D5 and D6 of sizes 40, 52, 75, 100, 105 and 300 arcsec respectively to estimate zonal magnitude variations, and four nights of *UBV* observations were taken through a single diaphragm of 105 arcsec to notice the total magnitude variation of the comet head. For the 1 AU geocentric distance of the comet, these diaphragms would correspond to circular areas of 2.90×10^4 km 3.77×10^4 km, 5.44×10^4 km, 7.25×10^4 km, 7.61×10^4 km and 21.76×10^4 km in diameter respectively, centred on the cometary nucleus. Since the comet's geocentric distance varies daily, therefore, the corresponding area would also vary. The values of geocentric and heliocentric distances of comet used by us are taken from IAU Cir. No. 5636. The telescope used was 38-cm reflector using a cooled (–20°C) 1P21 photomultiplier tube and *UBV* filters of the Johnson and Morgan system and a d.c. amplifier.

A total of twelve nights of observations were secured on the following nights in December, 1992 (Dates : 1, 2, 3, 4, 5, 7, 8, 14 and 9, 10, 15, 17). Two comparison stars and five standard stars were also observed to find the daily magnitude variation of the comet, and to reduce the data to the standard system respectively.

3. Discussion

The comet was available for about one hour for taking observations in December, 1992. The atmospheric conditions were good for measurements of photoelectric observations. The observations were planned for two different purposes. Firstly, eight nights of observations were taken to find magnitude variations in different zones (shells) encircling the comet's nucleus. For these observations, the comet was observed in six diaphragms of different sizes. The mean differential magnitudes, thus, obtained on each night and for each diaphragm, are plotted against log r in figure 1.

The individual diaphragm size and filters used, by us, are written just above the respective light curves in figure 1. The light curves (figure 1) indicate that the comet's magnitude was found minimum on 6 December 1992 when the heliocentric distance was about 0.964 AU.

Secondly, four nighs of observations in December 1992 (Dates : 9, 10, 15 and 17) were taken in a single diaphragm (105 arcsec). On two of the nights i.e. 9 and 17 December, we secured significant number of individual observations, whereas, on remaining two nights,

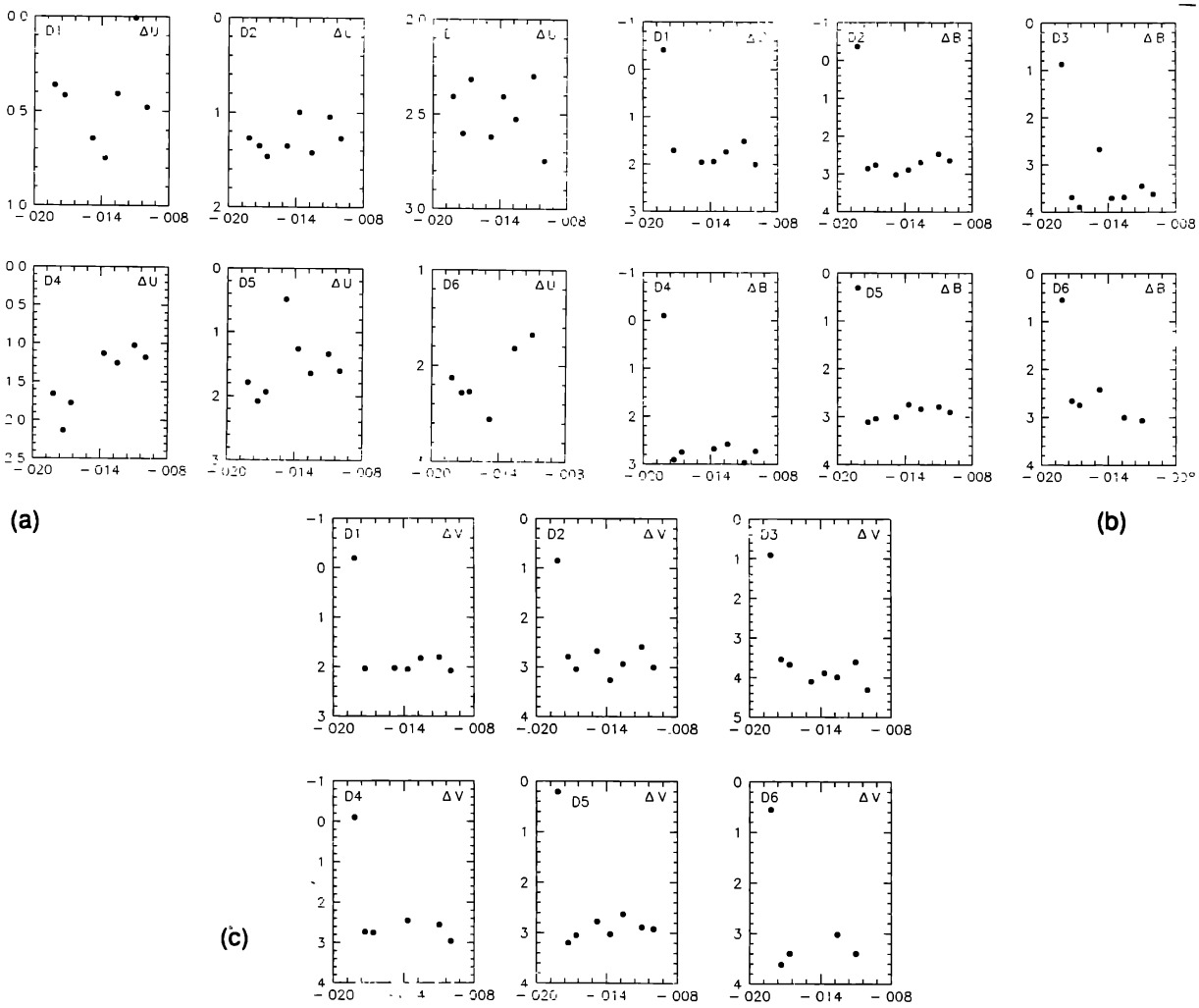
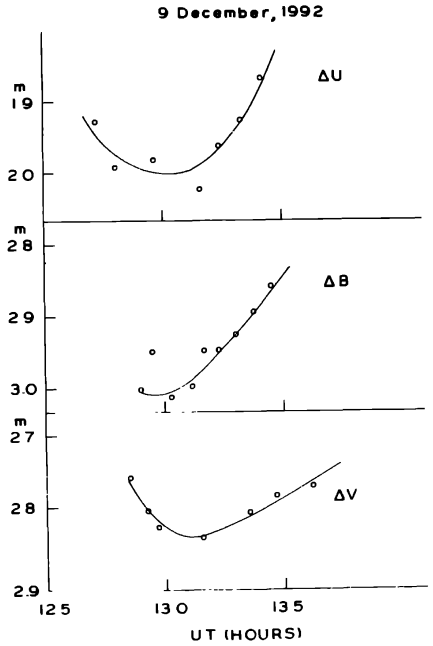
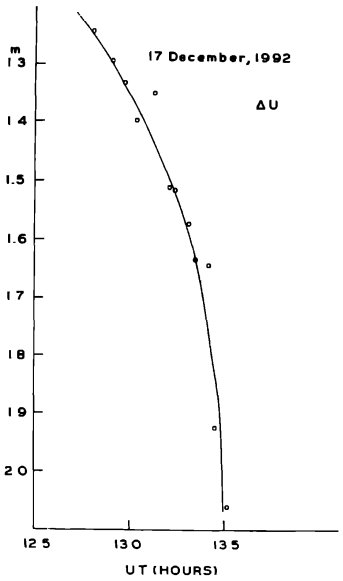


Figure 1. Variation of mean differential magnitude of comet Swift-Tuttle (1992t) on eight nights of observations in *UBV* filters against heliocentric distance r. Each point of the individual light curves represent the mean magnitude of the comet observed on a single night. The various diaphragm sizes used are written above each light curve.

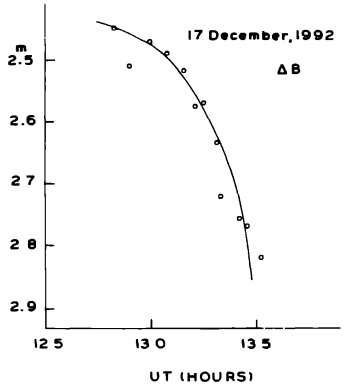
the observations were scanty. The individual magnitudes in *UBV* filters of the comet on two nights are plotted against UT for each night in figures 2 and 3. An inspection of the light curve (figure 3) indicates a sharp variation in magnitude of the comet. The magnitude variation is maximum in *U* filter. The reason for this sharp variation may be ascertained due to two reasons : one may be due to intrinsic, and the other may be coupled with solar-activity. The light curve (figure 2) shows the typical variation in the brightness of the comet during one hour of observations.



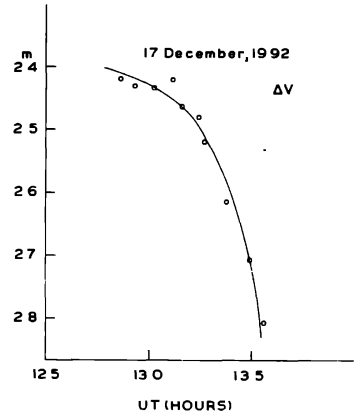


3(a)

Figure 2. Magnitude variation of the comet on the night of 9 December 1992.



3(b)



3(c)

Figure 3. Sharp magnitude variation of comet Swift-Tuttle during a time span of about forty minutes on the night of 17 December 1992.