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NARROW-BAND ISOPHOTES OF COMETS TAGO-SATO-KOSAKA AND BENNETT

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Isophotes of Comets Tago-Sato-Kosaka and Bennett as observed through interference filters are presented for several nights. The filters show the comets in the light of the continuum, the CN band at 3883 Å and the C_2 band at 5165 Å.

Key words: comets — cometary photometry — photographic photometry

Photographic observations of Comet Tago-Sato-Kosaka (1969 *g*) and Comet Bennett (1969 *i*) were made through three narrow-band filters. The filters were chosen to show the comet in the light of the continuum at 4870 Å, the CN band at 3878 Å, and the C_2 band at 5117 Å. Intensity tracings of Comet Bennett, perpendicular and parallel to the tail, on three nights have been presented in paper I (Borra and Wehlau 1971). Details of the observational procedures are described there.

The transmission of the filters was measured with a light beam converging at *f*/2.7 to match the convergence of the light for the Schmidt camera with which the comet plates were taken. The three filters had essentially the same transmission curves with a half-intensity width of 60 Å and central wavelengths of 3878 Å, 4870 Å, and 5117 Å. The locations of the passbands with respect to the comet spectrum are shown in plate I of Paper I.

The photographs were all taken with an 8-inch Schmidt camera, which gave a plate scale of 373 arc seconds mm^{-1}. A typical photograph is shown in Plate II of Paper I. The exposure times with Kodak Royal Pan film ranged from two minutes to one hour. For Comet Bennett the nucleus appeared stellar through the 10-inch refractor used for guiding so it was possible to guide directly on the comet. For Comet Tago-Sato-Kosaka it was necessary to use offset guiding on a star in the field.

On most nights two photographs were obtained with each filter. They were of different exposure times and densities. Comparison of the results for the different exposures indicated that results for densities less than 0.1 were unreliable and have not been used here.

In this paper we present isophotometric contours for the two comets on several nights. The photographs were scanned with an Optronics Digital Microphotometer which measures the density at discrete intervals separated by 50 microns along adjacent strips over the whole film and records the value on magnetic tape. The analyzing aperture on the film was 50 × 50 microns which corresponds to 18.6 arc seconds on the sky. The densities were printed out in a rectangular grid. The separation between successive points corresponds to 50μ on the photograph, or to 18.6 arc seconds on the sky.

The photometric scans of the photographs were displayed as densities rather than intensities to avoid computing that would have been required to read the characteristic curve for each point recorded. Contours of constant density were drawn in by hand for each photograph of the comet. These contours for several nights in 1970 are shown in Figures 1 through 8. The characteristic curves for the films have been used to give the relative intensities of the contours for each photograph. The intensities corresponding to the densities for each contour are given in the figure captions. Since the contours were drawn for selected densities the interval in intensity between successive contours is not uniform. For most photographs the background density due to the sky was insignificant, in other cases a correction has been made to remove the effect of the sky.

Comet Bennett showed a strong continuum as can be seen on the spectrum reproduced as

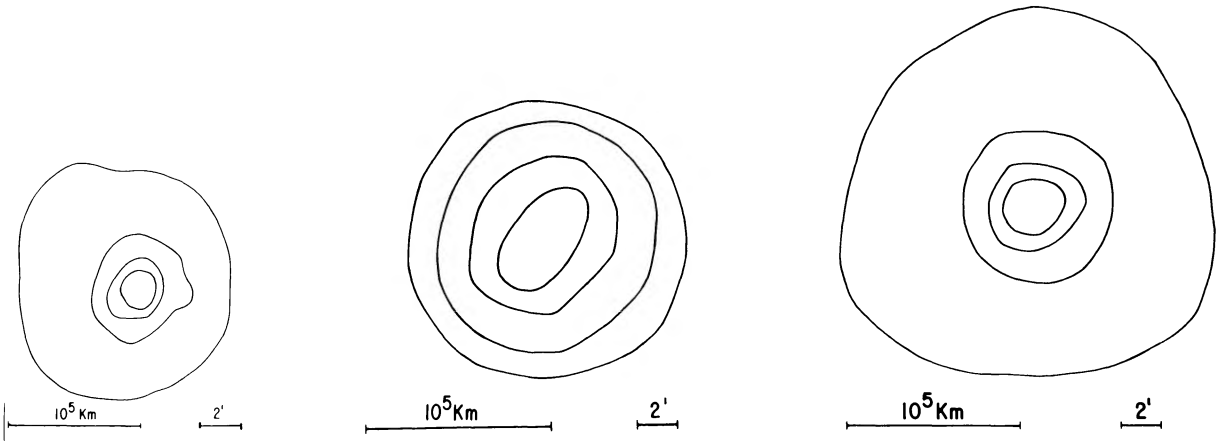

FIG. 1 — Comet Tago-Sato-Kosaka, isophotes obtained with the 3878 Å filter. From left to right, the UT of observation and corresponding values of log I for the isophotes are January 22.0, 0.90, 0.67, 0.46, 0.0; February 7.0, 1.35, 0.95, 0.52, 0.0; February 4.0, 0.80, 0.62, 0.40, 0.0.

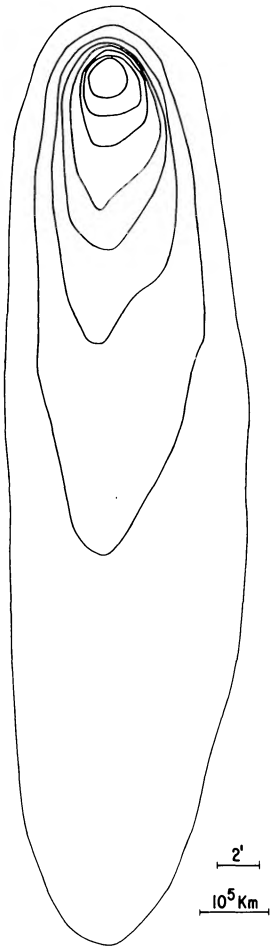

FIG. 2 — Comet Bennett with the 4870 Å filter on March 31.4 log I: 2.20, 1.78, 1.49, 1.18, 1.01, 0.79, 0.53, 0.0.

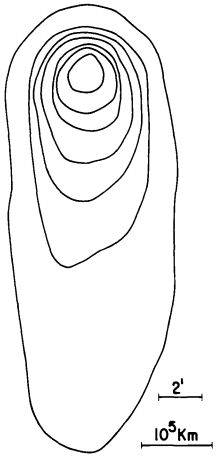

FIG. 3 — Comet Bennett with the 5117 Å filter on March 31.4 log I: 1.80, 1.12, 0.85, 0.58, 0.42, 0.24, 0.0.

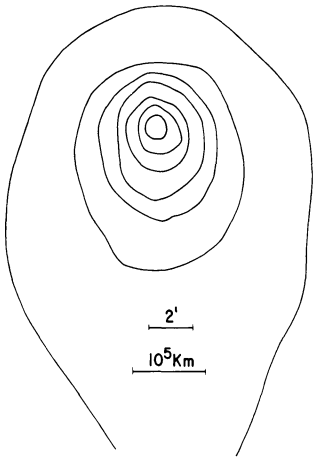

FIG. 4 — Comet Bennett with the 3878 Å filter on March 31.4 log I: 1.74, 1.20, 0.93, 0.65, 0.49, 0.29, 0.0.

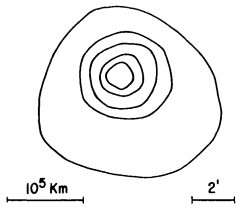

FIG. 5 — Comet Bennett with 3878 Å filter on April 6.4 log I: 1.28, 0.98, 0.62, 0.38, 0.0.

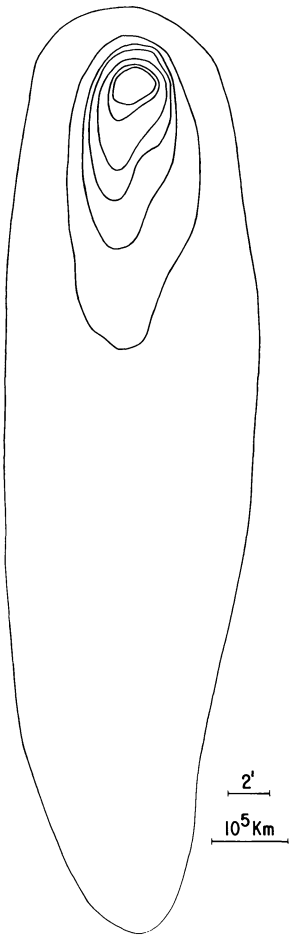

FIG. 6 — Comet Bennett with the 4870 Å filter on April 6.4 log I: 1.55, 1.24, 0.94, 0.79, 0.59, 0.36, 0.0.

Plate I in Paper I. This continuum will contribute to the images photographed through the 3878 Å and 5117 Å filters, particularly in the tail. In this paper we have made no attempt to correct the isophotes for these two filters for the contribution from the continuum. The relative contributions

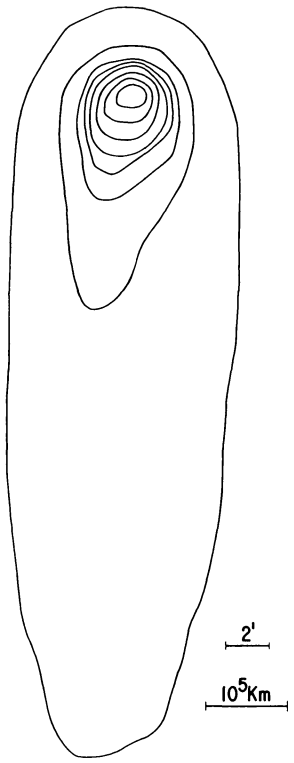

FIG. 7 — Comet Bennett with the 5117 Å filter on April 6.4 log I: 2.34, 1.73, 1.28, 0.98, 0.82, 0.62, 0.38, 0.0.

of the continuum are given in Paper I, where we assumed that the intensity in the tail of Comet Bennett for the 3878 Å and 5117 Å filters is due entirely to reflected sunlight. The contimuum for Comet Tago-Sato-Kosaka was not particularly strong as can be inferred from the fact that exposures with the 4870 Å filter produced no images, and from the spectra and discussion given by Dossin (1970). So the effect of the contimuum on the photographs with the 3878 Å and 5117Å filters is of less significance than for Comet Bennett, and is regarded as negligible here.

Orientation of the comet in the sky is indicated in Plate II of Paper I. In some cases, particularly for the photographs taken with the 3878 Å filter, star trails are lacking so there is an uncertainty in the orientation of the contours with respect to the direction of motion of the comet. Comparison of the contours presented here with the tracings parallel and perpendicular to the tail previously given, show agreement within the photometric uncertainties.

The isophotes of Comet Tago-Sato-Kosaka

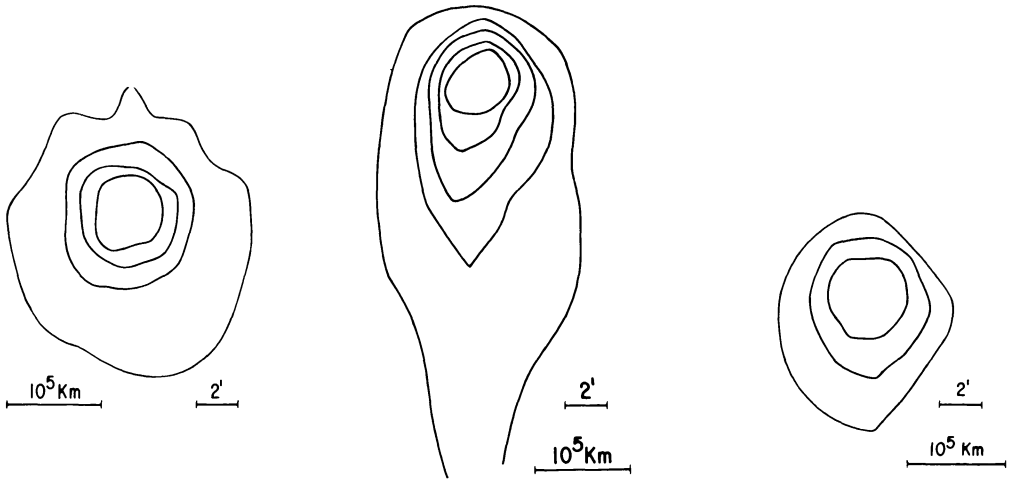

FIG. 8 — Comet Bennett on April 17.4. From left to right the filters and corresponding values of log I for the isophotes are 3878 Å, 0.82, 0.62, 0.38, 0.0; 4870 Å 1.13, 0.82, 0.62, 0.38, 0.0; 5117 Å 0.82, 0.38, 0.0.

show it before and during the "flare" which occurred in the middle of February 1970, as reported by Sekanina (1970).

Comet Tago-Sato-Kosaka was observed visually through the 10-inch refractor on all nights for which photographs were taken. On every night except one, the comet appeared diffuse without any conspicuous nucleus. However, on 7 February the comet appeared to show a nucleus of stellar appearance.

Additional contours from observations of Comet Bennett taken between 31 March and 27 April are available but will not be published because those given here are representative of most of the information available.

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