ANALYSIS OF AN ELONGATED NARROW CORONAL STREAMER OBSERVED AT THE 1973 SOLAR ECLIPSE

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Abstract. A detailed photometric analysis has been made of a narrow elongated coronal streamer observed at the 1973 total eclipse. After deriving real intensity distributions, the electron density has been deduced under the assumption that the distribution is axially symmetric and that the decrease in density from the central axis follows the gaussian law. The results show that the gradient of the electron density is much steeper at the lower part, nearest to the solar limb, than those reported previously for larger scale streamers.

1. Introduction

As was pointed out by Waldmeier (1972), a type of coronal streamer which is much elongated but with very narrow width can occasionally be observed during total eclipses. At the 1973 eclipse, such a streamer was visible rising perpendicularly at around PA = 326°. Figure 1 shows an enlarged image of the streamer taken by the Kwasan and

![Fig. 1. Enlarged image of the 'elongated and narrow' coronal streamer observed at the 1973 eclipse in Mauritania.](image)

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Hida observatories expedition of Kyoto University (M. Kanno, T. Tsubaki, and H. Kurokawa). The observations were made with a coelostat and 30 cm aperture refractor \( (f = 4593 \text{ mm}) \) at Atar, Mauritania. The combination of the orange filter and the sensitivity of the emulsion produced the effective wavelength of around 6000 Å.

Using one of the original negatives, a detailed photometric analysis has been done. The purpose of the present paper is to describe the procedure and to discuss the results.

2. Photometries

Digitizing with an interval of 5 \( \mu \text{m} \), microphotometric scans were carried out along the direction perpendicular to the streamer axis with a height interval of 150 \( \mu \text{m} \), which corresponds to 5000 km on the Sun. After converting photographic density into light intensity using a technique developed by Tsubaki and Engvold (1975), contributions from the background corona have been subtracted to obtain real intensity distributions at each height. The background corona was determined by interpolating the intensities at both sides of the streamer: that is, least squares fittings to the second order polynomial were made for the intensity distributions at both sides. An example of this procedure is given in the upper part of Figure 2.

![Figure 2](image)

Fig. 2. Illustration of the method for deriving real intensity profile of the streamer: the upper part shows the observed intensity with the interpolated background, and the lower shows the real intensity and the fitted gaussian profile.

For the real intensity distributions thus obtained, least squares fittings to the gaussian curve have been done to determine three fundamental quantities: the maximum intensity at the central axis, the position of the axis, and the width of the streamer at each height. In doing this, a technique developed by Tsubaki (1975) was applied, and the fittings have been quite good, as illustrated in the lower part of Figure 2.

All scans (46 in total) whose height corresponded to 0.08–0.4 \( R_{\odot} \) above the limb, have been processed in this way, and nearly half of the results (for 22 scans) are shown...