RESULTS OF POLARIZATION OBSERVATIONS OF THE OUTER CORONA FROM A JET AIRCRAFT*

C. F. KELLER
University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

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Abstract. White-light photographs of the solar corona were taken during the March 1970 eclipse from an Air Force NC-135 jet aircraft at an altitude of 36 380 ft. Four photographs each were made for several exposure times varying from 0.1 to 10.0 s. Three each were made with plane polaroid filters whose orientation was varied at 60° intervals. Stabilization of the camera was approximately 10° even during the longest exposures. The corona was recorded to distances beyond 12 $R_\odot$.

A preliminary study of per cent polarization as a function of position with respect to the solar disk for a set of 1.0 s exposures shows an inversion in per cent polarization in the region 6 to 8 $R_\odot$ - polarization decreasing outward to the region and increasing again beyond it. This inversion is most apparent along the major streamers.

Intensities traced outward from the Sun in both polar and equatorial directions are compared with previous observations.

1. Introduction

The third in a series of airborne solar eclipse expeditions was carried out by the University of California’s Los Alamos Scientific Laboratory in March 1970. Observations were made from an Air Force NC-135 aircraft at an altitude of 36 380 ft over the Gulf of Mexico just off the coast of Mexico. A brief description of the experiment’s apparatus has already been given (Keller et al., 1970).

2. Observations

White light ($5500 \leq \lambda \leq 7000$ Å) photographs were taken from a stabilized camera. Four each were made for six exposure times ranging from 0.1 to 10.0 s. Three each were made through plane polaroid filters whose orientation was varied at 60° intervals. Kodak 2475, 70 mm roll film was used. The field of view was approximately 6°. One streamer was recorded to 13 $R_\odot$ and six others can be seen beyond 7 $R_\odot$.

3. Reduction

A. PHOTOMETRY

To date only preliminary reduction of the set of 150 exposures has been made. Only relative intensities have been calculated and it is thought that development of a more precise characteristic curve relating photographic density to coronal intensity will

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cause some changes in the results presented below. It is not thought, however, that the
basic trend of these results will be altered. Tracings of the four 10° exposures were
produced by an Isodensitracer. Streamers can be followed on these tracings as far as
they can be seen on the negatives. A general elliptical shape of the isophotes is evident
on all four tracings. This seems to indicate an asymmetric, relatively unpolarized
component of the corona.

In order to make quantitative reductions the negatives were scanned by a Mann
densitometer which produced a matrix of density points 119 x 119 in size. These
points were averaged and the matrix size reduced to 60 x 60. Laboratory tests, as well
as studies of the light scattered into the Moon's disk on the actual photographs,
indicate no significant scattering beyond 4 \( R_\odot \). Separation of the sky background has
not been done to date, but it is estimated that it amounts to \( \approx 30\% \) of the intensity at
10 \( R_\odot \).

![Graph](image)

**Fig. 1.** Intensity vs \( R/R_\odot \). Results from 1965, 1966 eclipses are plotted. Present results are nor-
malized to these for comparison (see text).