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I. PHYSICS

Astrophysics (Solar Corona)

ECLIPSE OBSERVATIONS OF CORONAL Fe XIV EMISSION

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THIS experiment was designed to investigate mass flux in magnetic loops associated with coronal active regions by interferometric measurements of the inner Fe XIV corona. An associated aim was to obtain direct observations of details of coronal structure close to the solar limb at second and third contacts. This model was planned to take advantage of the occurrence of a total solar eclipse at a time close to the maximum activity phase of the solar cycle.

Keywords : Coronal Fe XIV Emission; Mass Flux; Solar Limb; Solar Cycle; Fabry-Perot Etalon.

EXPERIMENT

Description of Equipment

The observing system consisted of an *f*/7.7 Cassegrain telescope, a secondary optical system and a 35-mm motor-driven camera. The secondary optics comprised a lens system used to collimate the primary image, a solid Fabry-Perot etalon located at the image of the objective as formed by the collimating lens, an isolation filter of 12 Å FWHM centered at 5303 Å, followed by the 35mm camera. Panatomic-X film, although slow speed, was used because of its relatively high resolving power.

The optical configuration resulted in the superposition of the relayed coronal image and a circular Fabry-Perot interference pattern, the dimensions scaled to a solar image of 17mm diameter. By comparing the form of a calibration interference pattern with that obtained in photographing the Fe XIV ($\sim$ 5303 Å) emission corona at eclipse, line widths and line shifts associated with coronal structure can be deduced.

SUMMARY OF PRELIMINARY RESULTS

Both photometric and interferometric calibration records were obtained in the partial phases before and after totality. During the total phase, a sequence of exposures were obtained immediately following second contact and just prior to third contact, without the etalon in the optical path. Fortuitously, the most active part of the green-line corona at that time almost coincided in position angle with the first part of the disk to be exposed at third contact. The angular resolution in these images is estimated to be between 2 and 3 arcsec and some loop structure is clearly evident. One isolated, single loop, extending to a height of 2.4×10^4 km, is clearly recorded. Although microdensitometer tracings are required for confirmation, a visual indication is that one leg of the loop disappears, or almost so, before reaching the limb,

apparently providing an indirect measure of the temperature at a specific height in the extreme inner part of the corona.

During the major part of totality, the main experiment was carried out, with the etalon inserted in the optical path. Exposures reveal the first maximum in the transmission function. One of these images is reproduced in Fig. 1. To highlight the maximum region, an image of the corona without the etalon has been subtracted from one with it. This subtraction is very imperfect however, due primarily to the different contrast ratio in details in the two images. While the eclipse records are rich in structure detail, precise information cannot be simply extracted, since this detail itself complicates the reduction. Therefore, to deduce accurate line profiles and line shifts, especially in the vicinity of loops, requires computer processing of the data. This work is proceeding.

Location

Japal-Rangapur Observatory, Andhra Pradesh.

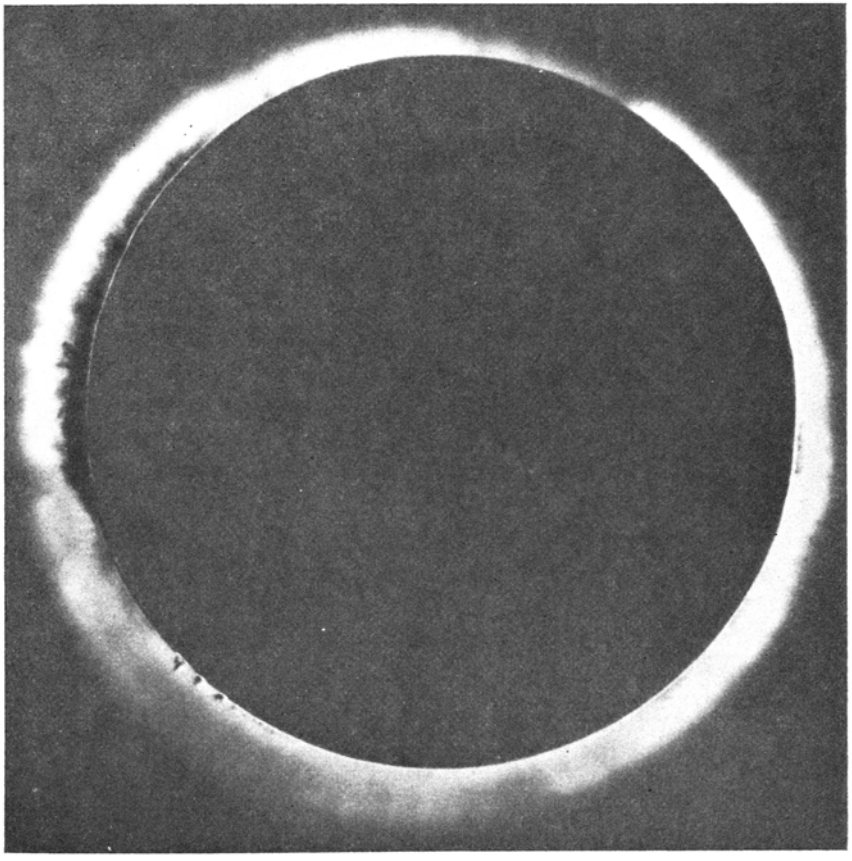

Fig. 1

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