

Observations of Total Solar Eclipse of February 16, 1980

V. P. Gaur, K. R. Bondal, K. Sinha, G. C. Joshi and M. C. Pande

Uttar Pradesh State Observatory, Naini Tal 263 129.

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Abstract

The instrumental setup and preliminary results of the experiments performed during the eclipse are briefly reported.

Following experiments were planned for the total solar eclipse of February 16, 1980 :

- (1) Recording a time sequence of slitless flash spectra, just before and just after the totality, in the wavelength region near H and K lines of Ca II.
- (2) Slit spectrograms of corona in the wavelength regions $\lambda\lambda$ 4800-6800 Å and $\lambda\lambda$ 3860-4100 Å.
- (3) Coronal pictures at λ 6500 Å using short and long focal length cameras through HN-38 type polaroid at four orientations 45 degrees apart from each other.

record the coronal spectrum in the wavelength region $\lambda\lambda$ 4800-6800 Å. Exposure times for recording the coronal spectrum were 14.4, 28.8 and 67.2 seconds.

For white light photography, we used a 10 cm aperture refractor of 229 cm focal length. Also mounted on this telescope was a Contax camera body with a 11 cm achromat of 33 cm focal length. The corona was photographed with both the telescopes through filters with peak transmission at 6500 Å and HN-38 type polaroids in four different orientations, 45 degrees apart. The Kodak Linagraph Shellburst 2474 film was used in the long focal length camera, while Kodak SO-115 film was used for the short focal length camera. The respective exposures given in long and short focal length pictures were 1/25 and 1/10 sec and 1/100 to 1 sec.

After carrying out a site survey, in collaboration with Osmania University scientists, a small village Palem, in district Mahboobnagar, Andhra Pradesh (110 km south - west of Hyderabad) was selected for observing the eclipse.

OBSERVATIONS

We have successfully photographed flash spectrum sequences just before and just after the totality. About 25 frames on each occurrence of flash were registered. Figure 2 shows one frame of the flash spectrum sequence before totality. It is clear from this photograph that four lines i. e. H₈ and He I (3889.05 Å and 3888.65 Å, not separated in our spectrum), Ca II (3933.66 Å), Ca II (3968.47 Å) and H₇ (3970.07 Å) are very intense and show changes in their intensities with height. H and K lines appear equally strong. Superimposed on these lines one also notices four prominences. Figure 3 shows one frame of the flash sequence taken just after totality. Analyses of these observations are in progress. Flash spectrum in the wavelength region $\lambda\lambda$ 4000-7000 Å was also recorded on a Kodak 103 aF plate just after totality.

The coronal spectrum was also attempted as per our programme. But the exposure times and / or the slit width used by us were perhaps not appropriate to register the coronal spectrum.

A photograph of the corona taken at Palem with short focal length camera through HN-38 polaroid and red filter on SO-115, 35 mm film is shown in Figure 4. Similar photograph through long focal length camera, but in different orientation of polaroid is given in Fig. 5.

INSTRUMENTATION

The schematic diagram of the instrumental setup used by us for recording the flash spectrum and the coronal spectrum is given in Figure 1. We utilized a λ cm coelostat with 10 cm f/15 objective lens L₁ to form 514 mm image of the Sun on a slot or slit S of the spectrograph. A field lens (11.25 cm diameter and 180 cm focal length) and a collimating lens (15 cm diameter and 300 cm focal length) were used for illuminating a Bausch and Lomb grating (ruled area 102 mm \times 128 mm) blazed for wavelength 5000 Å in the first order. A camera lens C₂ (10 cm aperture, f/15 system) was utilized to obtain a linear dispersion of 11.3 Å mm⁻¹ at λ 3950 Å. To record flash spectra on a SO-115 film, an automatic 35 mm Robot recording camera was utilized. This camera was equipped with an electronically operated sequential timer. The Robot camera was triggered about a minute before the totality at the second contact and also a few seconds earlier than the end of totality at the third contact. The exposure times for both these flash sequences were 0.24 sec with a time resolution of 0.18 sec.

In the other first order, the camera (11.25cm aperture achromat C₁, f/8) gave a dispersion of 17.8 Å mm⁻¹ at λ 5000 Å. Kodak 103 aF plates were used to

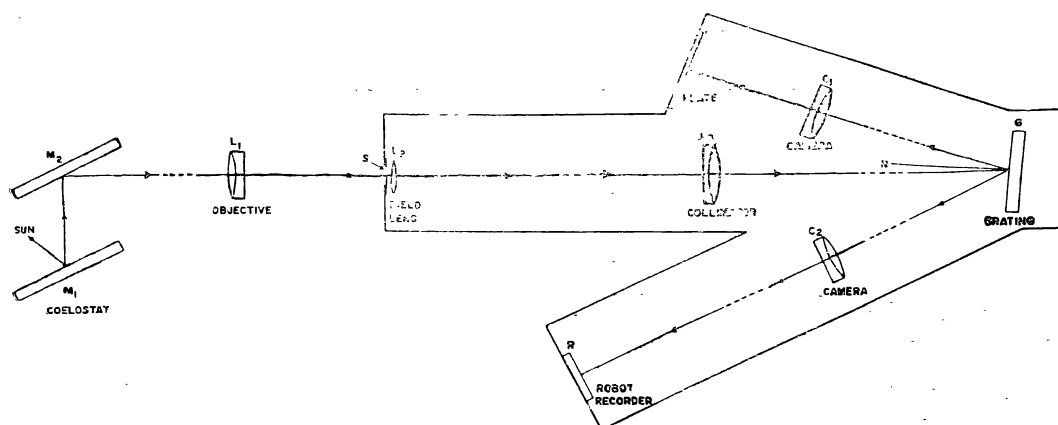


Fig. 1 : Schematic diagram of the coelostat and the spectrograph used for February 16, 1980 solar eclipse at Palem.

In Figure 4 one can notice the spreading of coronal light in the valleys of the moon. The appearance of lunar mountains is quite clear in Figure 5. Analyses to get coronal isophotes from our observations are in progress.

ACKNOWLEDGEMENTS

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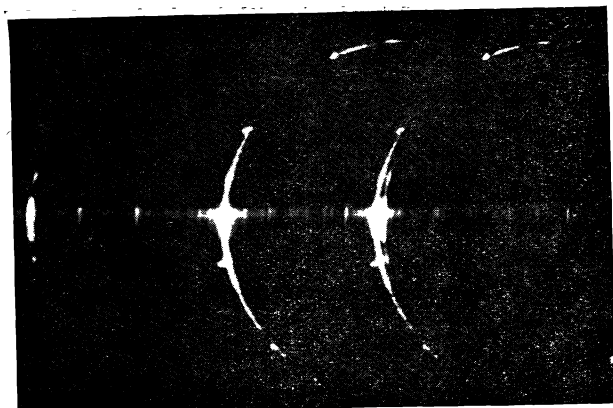


Fig. 2 : A frame of flash spectrum around H and K lines of Ca II recorded with the spectrograph, just before totality on 35 mm Kodak SO-115 film. Exposure: 0.24 sec.

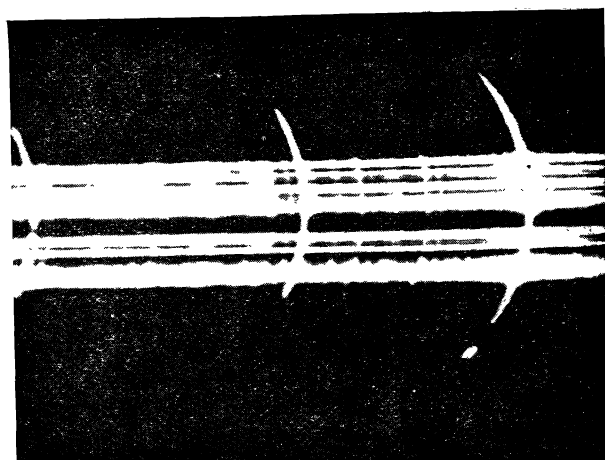


Fig. 3 : A frame of flash spectrum around K line of Ca II recorded with the spectrograph, just after totality, on 35 mm Kodak SO-115 film. Exposure: 0.24 sec.

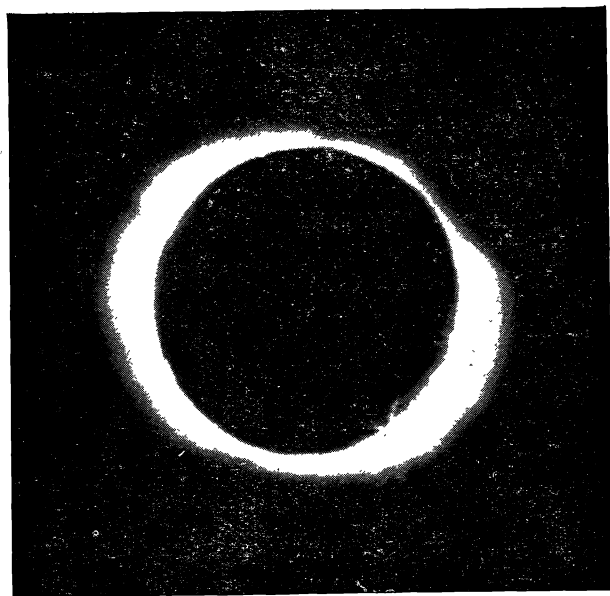


Fig. 4 : Photograph of the corona taken with a 11 cm achromat, $f = 33$ cm, through a broad band red filter and for one position of the HN-38 polaroid on SO-115, 35 mm film.

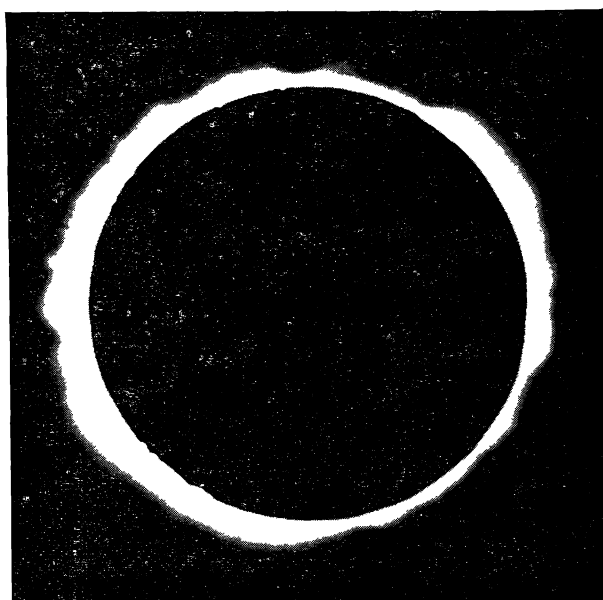


Fig. 5 : Photograph of the corona taken with a 10 cm achromat, $f = 229$ cm through a broad band red filter for one position of the polaroid HN-38 on 70 mm Kodak Linagraph Shellburst film.

