

# OBSERVATIONS OF THE TOTAL ECLIPSE OF THE SUN OF JUNE 30, 1973

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## Introduction

The purpose of the expedition of the Astronomical Institute of the Slovak Academy of Sciences was to observe the third largest eclipse of the Sun in this century which took place on June 30, 1973 and whose totality zone also passed through the southern Sahara. The expedition consisted of 8 people and its observational program contained 6 experiments.

The instruments, auxiliary material, as well as the things necessary for life under difficult climatic conditions of the Sahara were transported from Tatranská Lomnica to the observation site in the Republic of Niger by a Tatra 148 van. Another automobile, an ARO M 461, was used to carry people. The route across the European continent led through Austria, Switzerland to France (Marseille). Transportation from Marseille to Algiers and back was by ship. The route then carried on from Algiers to El Meki (Republic of Niger) along the central Trans-Sahara road from Algiers, via Laghouat, El Golea, In Sallah and Tamanrasset to Agades (Fig. 1).

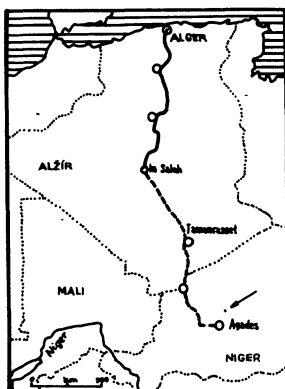


Fig. 1. The journey of the expedition along the central Trans-Sahara road (full line — asphalt road, dashed line — piste). The place, where the expedition worked is denoted by mark.

The site of observation of the expedition of the Astronomical Institute was near the village of El Meki and its geographic co-ordinates were

$$\lambda = -08^{\circ} 17',$$

$$\varphi = +17^{\circ} 44'.$$

Its height above sea level was about 800 m. Our site of observation was partly surrounded by mountains which attenuated the speed of the wind, prevalent in the plains during the day.

According to visual observations the duration of the total eclipse was 6 min and 42 sec (beginning at 11 42 55 UT; end at 11 49 37 UT).

Our own power generator was used to provide power (220 V A. C., 50 c/sec), for all the telescopes.

## Observational Programme of the Expedition

The observations carried out during the eclipse, are supplemental to the research of the Solar Department and Department of Interplanetary Matter of the Astronomical Institute.

a) Photographing of the K-corona with a radial filter and polarizing filters.

The purpose of the experiment was to obtain pictures of the solar corona upto a distance of about  $5 R_{\odot}$  of approximately the same darkening (the purpose of the radial filter) in three positions of the polaroids, differing by  $120^{\circ}$ . A total of 9 pictures was obtained. Their exposure times are as follows: polarizing filter No. 1—10, 15, 20 sec; polarizing filter No. 2—15, 30, 40 sec; polarizing filter No. 3—20, 30, 50 sec.

The 179/1000 mm telescopic objective, part of a Pentacon Six TL camera (which was used for photography) was mounted separately with a Kometensucher telescope, manufactured by Karl Zeiss of Jena. Fomapan 30 photographic material

was used. The polarizing filters were manufactured by Meopta Bratislava.

The experiments, designed by M. Rybanský, were prepared in the workshop at Skalnaté Pleso by P. Zimmermann.

The radial filter, designed by M. Rybanský, was manufactured by exposing a photographic plate on a lathe. The intensity of the light and the frequency of revolutions was varied, so that the darkening from the centre of the filter to its edge would roughly correspond to the decrease of the intensity of the corona.

During the eclipse the pictures were taken by L. Scheirich and the time was recorded by Š. Babič.

As a result of the unstable frequency of the electric current and of a failure of the sine manual control of the telescope (caused by sand) which could not be repaired, the Sun is displaced with respect to the centre of the radial filter on the average by 0.7 mm. Because of this the eastern limb of the Sun is underexposed.

The obtained results will serve to determine the structure of the corona, the intensity and degree of polarization of various coronal structures.

#### b) Photographing the coronal spectrum

The purpose of this experiment was to obtain pictures of the spectrum of the solar corona in the interval of 4000—6000 Å. Three exposures were made: 180 sec (spectral interval of 5000—6000 Å), 120 and 60 sec (spectral interval of 4000—5000 Å). In spite of exposures extended as compared to the originally planned exposures the pictures are underexposed as a result of the sand and dust in the atmosphere due to the sand storm of June 27, 1973. Only the 5303 Å emission line and the continuous spectrum in its immediate vicinity were recorded. Fomapan 30 photographic material, closed in cassettes was used. The observations were executed by means of a 130/1950 mm refractor which was mounted on a German paralactic assembly.

The spectrograph was manufactured according to M. Rybanský's design in the workshop by P. Zimmermann. The grating has 1300 lines/mm with a light concentration of the first order in the region of 3500 Å. The dispersion of the spectrograph is 14 Å/mm and the  $f$ -number 1 : 15.

During the eclipse the width of the aperture was 0.03 mm. The aperture was positioned tangentially with respect to the eastern limb of the Sun.

The spectrum of the solar corona was photographed during the eclipse by P. Zimmermann.

The obtained results will serve to determine the

half-width of the 5303 Å emission line and the associated applications for this region of the corona where this emission was observed.

#### c) Photographing the K-corona

The purpose of this experiment was to obtain pictures of the K-corona (Fig. 2) at different exposure times. 7 pictures of good quality were obtained. Their exposure times are: 1/2, 60, 30, 15, 4, 2, and 1 sec. Exposures of 1/4, 1/8, 1/30, 1/60 and 1/120 sec were also made during the eclipse, however, they were not on the film, because a failure occurred in the Pentacon Six TL camera. The regular spaces between individual frames of 4 mm gradually increased up to as much as 80 mm. The photographic material used was Fomapan 30. The pictures were taken during the eclipse by V. Rušin.

The obtained results will serve to determine the density of free electrons up to distances of about  $2 R_{\odot}$  and of the structure of the solar corona.

After the partial eclipse terminated, the Sun was already in a heavy dust haze. As a result of this the comparative scales were photographed between 09 00 and 12 20 UT on July 1, 1973. Two exposures of comparative scales were made for each exposure during the solar eclipse.

As a result of the increased amount of dust in the atmosphere the light of the stars in the evening before the eclipse was decreased by 2 to 3 stellar magnitudes. The weather did not improve substantially by the time of the eclipse. This is proved by the results obtained from the observations carried out by E. Pittich (Pittich, 1973). The light gain from the stars is 2—3 stellar magnitudes smaller than one would obtain with instruments, used for this experiment.

The description of two other experiments, conducted in observing the solar corona during the eclipse, can be found in (Sýkora, 1974).

## Conclusion

The author would like to thank his collaborator M. Rybanský for his suggestions and assistance in preparing the instruments, Dr. L. Pajdušáková, Director of the Astronomical Institute of the Slovak Academy of Sciences for her care in setting up the expedition and many other employees of the Astronomical Institute of the Slovak Academy of Sciences, various firms and institutions, who have made the expedition possible and who took part in preparing it and fitting it out materially.

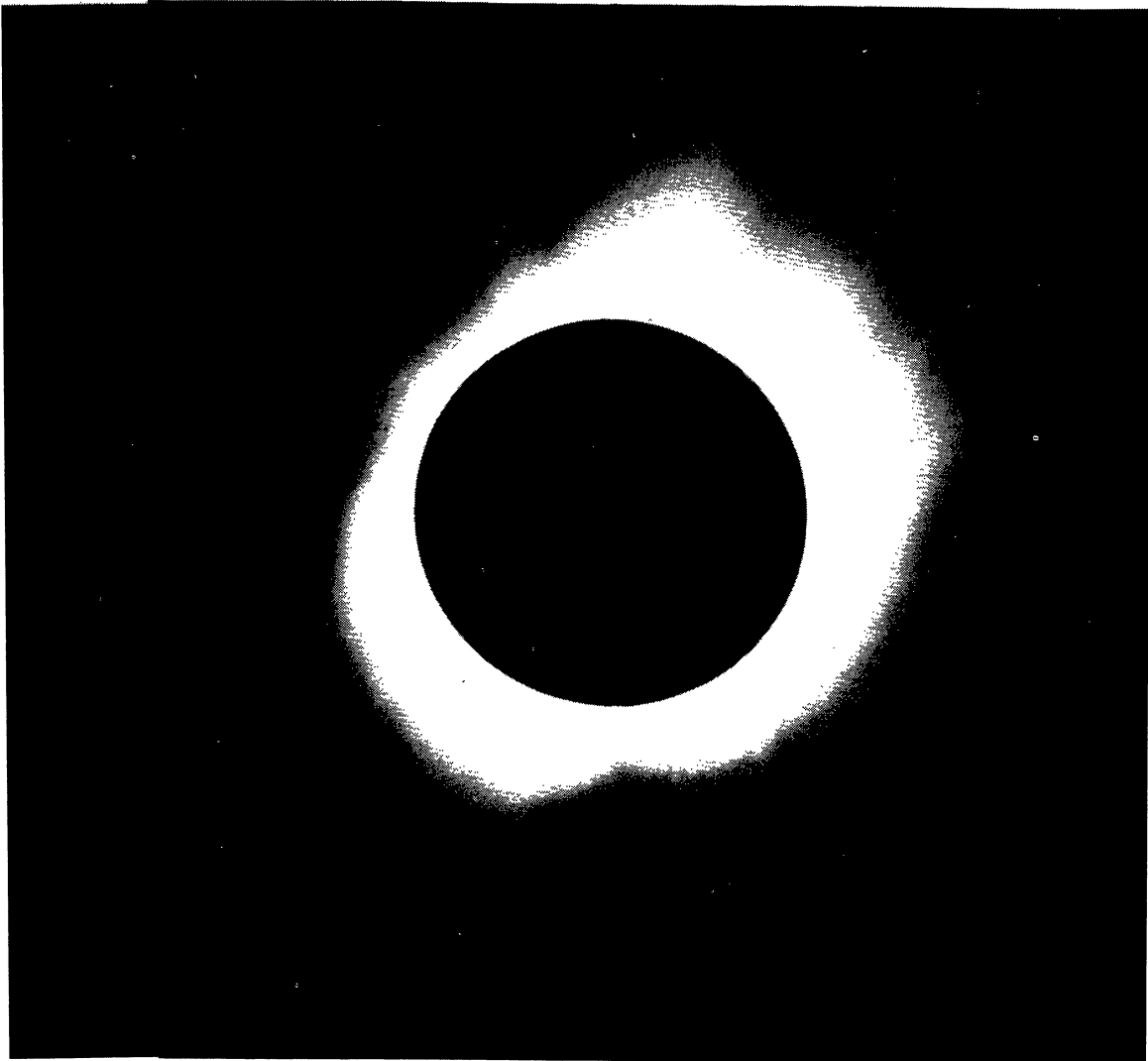


Fig. 2. K-corona. The telescope 130/1950 mm; exp. 1 sec; photographic material Fomapan 30.

## References

PITTICH, E. (1973): Personal communication.

SÝKORA, J. (1976): This volume.