Shape and structure of the corona during the November 3, 1994 eclipse

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Abstract. A brief description of the scientific goals and preliminary results related to the 3 November 1994 eclipse at Putre is given. The white-light corona was of minimum type with two large helmet streamers seen up to 7 – 8 $R_\odot$, and located around the solar equator in the E- and W-limbs. Coronal holes and plumes are located around the solar poles.

Key words: Sun-corona-eclipses

1. Introduction

Several instruments were used to observe the white-light corona during the 3 November 1994 eclipse at Putre, Chile (observations of the emission corona and prominences were also made at the Lomnický Štít coronal station in Slovakia). The scientific goal of the Astronomical Institute, Slovak Academy of Sciences Expedition (AISASE) from Tatranská Lomnica, was to make both photographic and video records, and to use these observations to obtain a better understanding of the conditions in the solar corona, especially in its photometry, structure and dynamics. The purpose of the observations was to help in solving the following problems of the solar corona: (1) The heating of the solar corona; (2) The connection of coronal structures with the underlying layers, and their temporal changes or development (in the totality path if any), etc.; (3) Physical conditions (temperature, density and velocities) at different coronal structures or around them, and their variability over the solar cycle; (4) To obtain information about the structure of the magnetic field (global) in the solar corona; (5) To find a connection between coronal structures, their physical properties, and the solar wind or interplanetary space properties.

The solar corona shape, its structures and physical properties are the result of solar activity. Despite all the work that has been done so far in order to understand the solar activity phenomenon,it is still not properes understood. Therefore, in our opinion, if any progress is to be made in this field, we should abandon the idea of the 'exclusive' role of MHD in solar physics and also consider alternative approaches such as that recently proposed by Saniga and Klačka (1993).

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2. Eclipse experiments

(1) A 1100-mm focal length f/10 MTO mirror lens, a 300-mm focal length f/4 lens (with an occulting disk in front of the lens and/or in the standard mode) and a 130-mm focal length f/5.6 lens were used to obtain a series of white-light coronal slides (KODAK 100 ASA and 200 ASA in the first ones; FUJI 100 ASA in the last one). A JVC camcorder was also used to record the white-light corona over the full phase of totality. All experiments were successful as planned and 15 high-quality slides (exposures of 1/150 to 2 s) were obtained, through the thin layer of cirrus that occurred during the eclipse.

3. Preliminary results

The white-light corona was of minimum type with a lot of short plumes at the poles and two long helmet streamers around the equatorial regions (Fig. 1). The base of the E-limb streamer is located at P.A. (positional angle) 29° – 127°. Its base is interrupted at P.A. 75° –79° where a small prominence was observed. The W-limb streamer is at P.A. 213° – 257°. Both streamers are seen up to the height of 7-8 $R_\odot$. There are two streamers more at the W-limb at P.A. 259° – 303° and at 293° – 337°. The boundary between the two latter streamers at the edge of the Moon is difficult to detect and their brightness disappears at the height of 4 $R_\odot$ in the background. There are several small prominences (the apparent height did not exceed 5×10^4 km) visible at the following P. A.: 78°, 97°, 117°, 229°, 270°, 310° and 319°, and practically all of them lie at the base of individual streamers. Coronal holes occurred at both poles at P.A. 338° – 31° (the northern) and 150° – 213° (the southern).

The inner corona displays a very faint, but more complicated structure (thin dark loop, dark cavities, voids, etc.). No remarkable coronal mass ejection was observed, at least over the one-hour interval, in the totality path from Chile to Brazil via Bolivia and Paraguay, according to information supplied by Dr. O. Matsuura (1994), Chairman of the Brazil National 1994 Eclipse Committee. A detailed analysis will be published elsewhere.

Location: Putre (Army Base), Chile
Longitude: 69°33′55″
Latitude: −18°11′37″
Altitude: 3479 m above sea level
Time of observations: 9:18:17 - 9:21:19 local time or 13:18:17 - 13:21:19 UT
Participants: Lubomír Klocok and Vojtech Rušin (chief of the Expedition).

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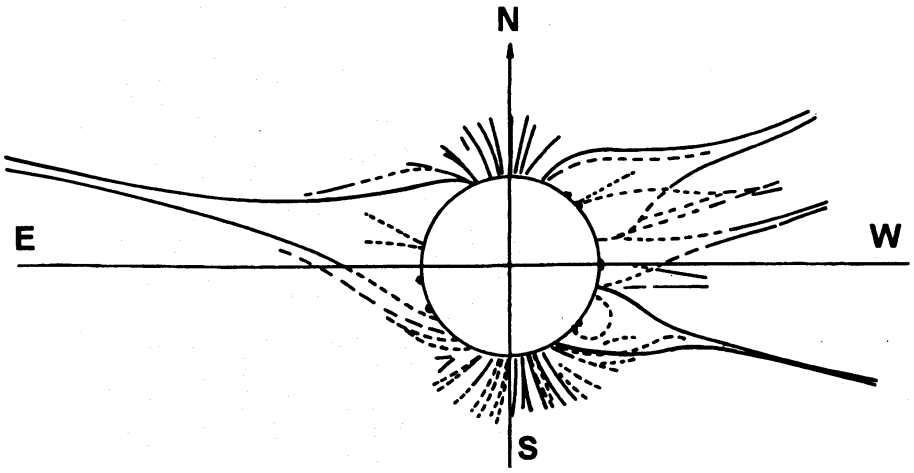

Figure 1. Large-scale structure of the white-light corona. Two remarkable helmet streamers up to 7-8 $R_\odot$ are seen in the equatorial regions, polar plumes at the poles. Prominences are denoted by black areas at the Moon's limb.

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References

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