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ON SOME RESULTS FROM THE OBSERVBATIONS OF THE TOTAL SOLAR ECLIPSES OF 11/08/1999 AND 29/03/2006

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Abstract

The paper reviews some results from the observations of the last two solar eclipses that took place on 11/08/1999 and 29/03/2006. The methods and means used during the photo sessions have been described. Pictures from different stages have been attached, as follows: partial eclipse, total eclipse, solar corona, Baily's Beads, crescents.

Introduction

The phenomenon of the solar eclipse can be observed when the lunar disk is projected over the visible part of the solar disk, and the lunar shadow moves over the Earth's surface.

The article reviews some of the results from the observations of two solar eclipses from 11/08/1999 and 29/03/2006. The methods and means used during the photo session are described.

The solar eclipses are very important to science. During a solar eclipse, the solar corona, the solar protuberances and the Baily's Beads can be observed. Solar eclipses also have great biological, geophysical, and meteorological influence on the Earth and its inhabitants [1], and they are one of the most attractive phenomena we can observe.

Tasks and objectives

During solar eclipses, photographic observations are the main research method for these phenomena. Our main goal was to take pictures of protuberances on the Sun's limb, solar corona and Baily's Beads; to observe "running shadows" and to take amateur pictures of the Sun with other objects from the landscape.

Solar eclipse – 11/08/1999.

The dark stripe spread over Northeast Bulgaria on 11th August 1999 for comparatively short time, and in its full phase it lasted approximately 2 hours. The solar eclipse of 1999 was comparatively short – 2 hrs and 27 sec. We made the observation from the Town of General Toshevo, district of Dobrich. The main shadow stripe entered Bulgaria at 2:09 pm local time near the Town of Silistra and left the country nearby Cape Shabla at 2:12.3 pm (Fig.1).

Solar eclipse – 29/03/2006.

The total solar eclipse was observed from the eastern most areas of South America, Central Africa, Middle Asia and South Siberia [2]. We observed the eclipse from the Town of Serik, South Turkey. In this latitude, the eclipse started at 12:38.11 pm and finished on 3:13.19 pm (all phases).

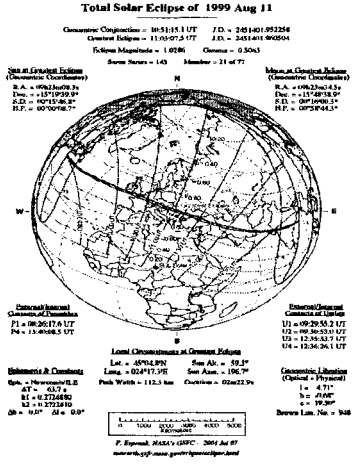

Fig. 1. Line of totality (11/08/1999) [3]

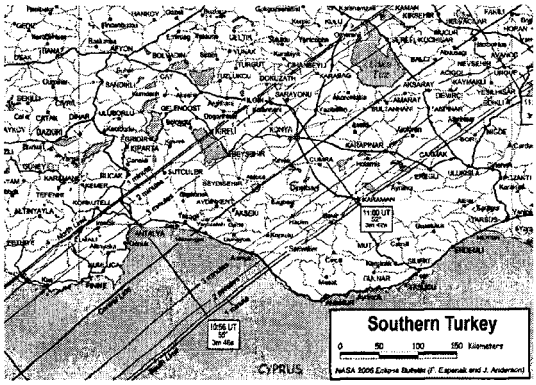

Fig. 2. Line of totality, crossing South Turkey (29/032006) [4]

Means and Methods

Telescope. Model: Konuspace 500, Telescope Newton, Reflector, F= 500 mm, D= 114 mm, f/ 4.3.

Filter. The filter used for the eclipses is Mylar, neutral type. In contrast to saturated SFO-filters, Mylar filters are more transparent and the Sun's color on the picture is not yellow-orange, but bluish [5].

Photographic camera, film and exposure time

36 pictures were shot with *Praktika* photo camera. The camera was attached to the telescope by a converter and installed in the telescope's focal plane. Various speeds were required, so that we could implement different tasks. We used standard Kodak 200 ASA color film, because the Sun is a very bright object and, despite the filters, the light that reached the negative, was sufficient.

The solar eclipses were shot at different speeds in order to receive several pictures or at least one good shot. This was necessary, because during the different phases of the solar eclipse, the solar crescent changes its size continuously.

Table 1. Speeds used to shoot the phases of the solar eclipses

Speed	Phase
1/500	First contact
1/250	1/2 of the Sun
1/125	1/4 of the Sun
1/60	1/10 of the Sun
1/30	Before totality
1/1000	Totality phase
1/500	Totality phase
1/250	Totality phase
1/125	Totality phase
1/60	Totality phase
1/30	Totality phase

Results

Gradually, the dark side increased and the Sun started to look more and more like a thinning crescent. The day light weakened. The temperature decreased by 6 °C.

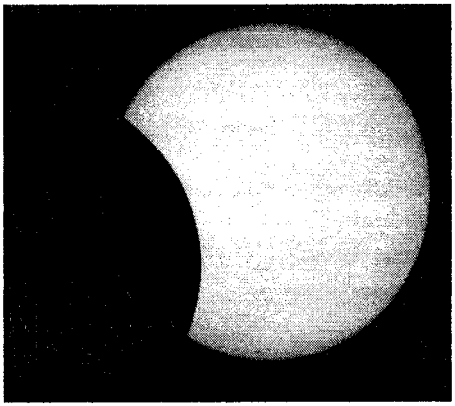

Fig. 3. Thinning solar crescent (11/08/1999).

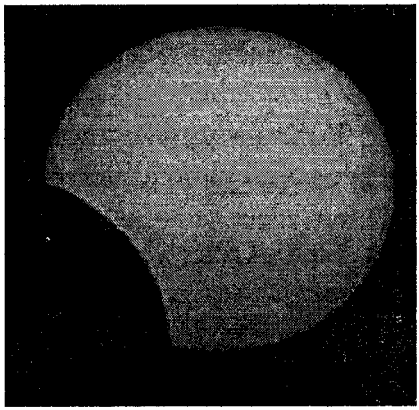

Fig. 4. Thinning solar crescent (29/03/2006).

Unlike the solar eclipse of 11/08/1999, when the Sun was in the maximum of its activity, now it was in its minimum and it was difficult to extract from the pictures areas where protuberances could be observed.

Solar corona. The solar corona is almost circular, due to the solar minimum, and is silver-white. When the Sun is in its maximum, the corona is greatly stretched-out along the solar equator and a separate ray can be viewed.

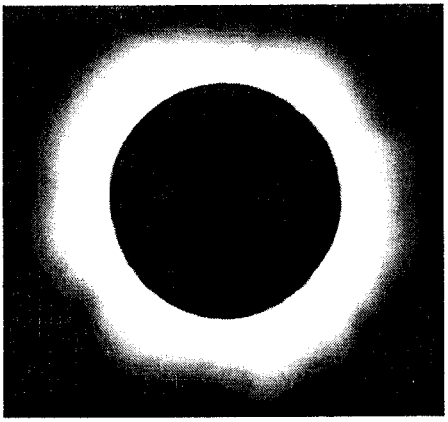

Fig. 5. The solar corona (11/08/1999).

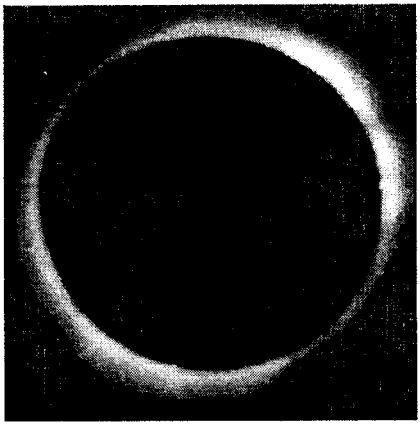

Fig. 6. The solar corona (29/03/2006)

Running shadows. Running shadows can be observed right before and immediately after the totality phase. They are considered to be an effect of the turbulent flows of the solidity in the Earth's atmosphere, which leads to focusing and unfocusing of the sun rays. It is extremely difficult to shoot the rays, but it was very easy to observe them.

Baily's Beads. They occurred before and after the totality phase. They appear because of the craters on the lunar limb.

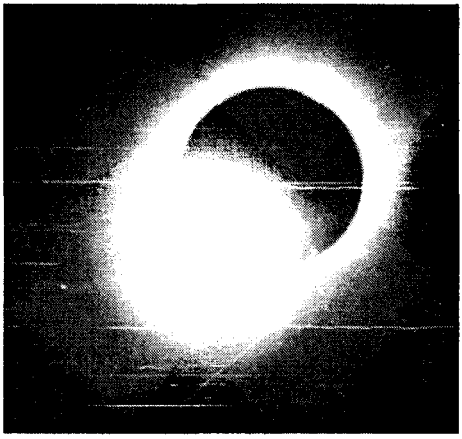

Fig. 7. Baily's Beads (11/08/1999)

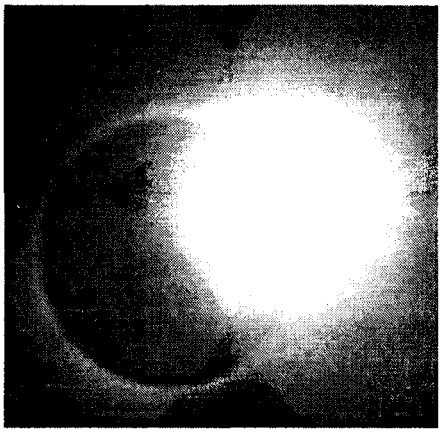

Fig. 8. Baily's Beads (29/03/2006)

Shadow of the earth objects. Since the luminous crescent gradually decreases, the shadows become sharp (without penumbras). The objects parallel to the solar crescent have extremely sharp shadows, while in other spatial dispositions, the shadow is asymmetric. This is due to the smaller angular sizes of the revealed parts of the Sun.

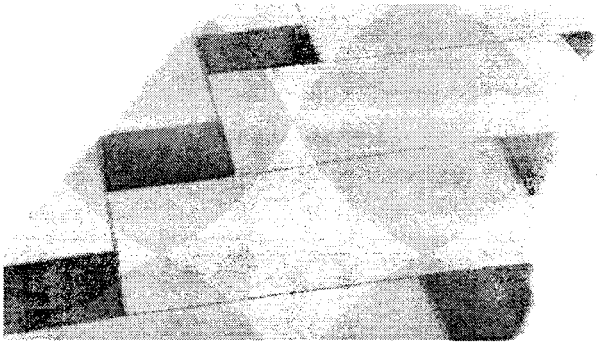

Fig. 9. Shadow of an Earth object (29/03/2006)

Crescents. Thousands of small crescents can be observed due to the small holes along and between the sheets, used as camera obscura.

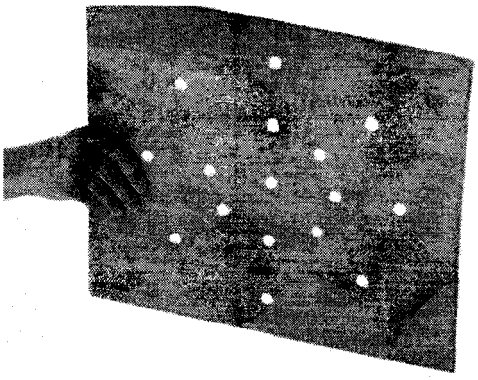

Fig. 10. A board with circular holes, allowing the sunlight during the partial phase (29/03/2006).

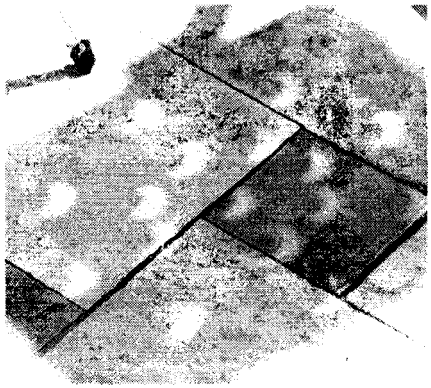

Fig. 11. The crescents observed from the board with circular holes, letting the sunlight (29/03/2006).

Celestial bodies. During the totality of the solar eclipse, the observed celestial bodies were Venus and Mercury.

Results

The pictures of the solar eclipses of 11/08/1999 and 29/03/2006 show that, due to the solar minimum, the solar corona from 29/03/2006 is almost circular and silver-white (Fig. 6). On 11/08/1999, the Sun was in its maximum and the solar corona was greatly stretched-out along the solar equator, so separate rays can be seen (Fig. 5).

Conclusion

We made 72 pictures with exposure time varying from 1/30 to 1/1000 seconds, shooting the phases of the two solar eclipses, the Baily's Beads and crescents, the running shadows and the planets visible during the totality phase of the solar eclipse and lots of amateur pictures.

References

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3. http://sunearth.gsfc.nasa.gov/eclipse/SEplot/SEplot1951/SE1999Aug11T.GIF
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ОТНОСНО НЯКОИ РЕЗУЛТАТИ ОТ ПЪЛНИТЕ СЛЪНЧЕВИ ЗАТЪМНЕНИЯ НА 11/08/1999 И 29/03/2006

М. Замфиров, П. Гецов

Резюме

В статията се разглеждат някои резултати, свързани с двете слънчеви затъмнения на 11.08.1999 г. и 29.03.2006 г. Описани са методите и средствата при провеждането на снимките. Показани са снимки на частичната фаза на затъмнението, пълната фаза, слънчевата корона, броеница на Бейли, сърпчета.