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TOTAL SOLAR ECLIPSE ON AUGUST 11TH 1999. OBSERVED AT KELEBIJA

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Abstract. The observing results of the total Solar eclipse on 11^{th} August 1999. are presented. The observation has been made by the Astronomical Division of the Research Society "Vladimir Mandic – Manda" from Valjevo at the village Kelebija (Yugoslavia).

The following projects were handled: the photometry of the whole sky, the variability of the magnetic field, atmospheric changes, attendant changes in plants' and animals' behaviour during the eclipse.

During the eclipse the decrease of intensity of the local magnetic field was estimated. The temperature dropped by 5.2 °C, the humidity has increased, while the atmospheric pressure didn't show any tendency of change. All the plants and animals showed some reaction to the eclipse. A rich photo, video and audio documentary material has been collected.

1. INTRODUCTION

The observing results of the total Solar eclipse on August 11th 1999. are presented. The observation has been made by the Astronomical Division of the Research Society "Vladimir Mandić - Manda" from Valjevo at the village Kelebija (λ=46.15095°, (φ=19.57547° E).

The expedition team consisted of 46 members. They were divided into 8 groups. Each of the groups worked on different aspect of the solar eclipse: photometry, magnetic field, meteorology, photography, animal behaviour, plant behaviour, video and audio coverage. Groups had 5 to 10 members.

The team reached Kelebia on August 10th, one day before the eclipse. That day was used for instruments testing and preparation. The eclipse day dawned with rain, but about 8:30 UT it started to clear up, so that during the totality itself the sky was clear.

The project realisation started at 8:00 UT and ended at 13:30 UT. The first contact of the lunar and solar disks in Kelebija was at 9:31:02 UT, the second at 10:53:15 UT, the third at 10:55:05 UT, and fourth contact at 12:16:20 UT. The entire eclipse lasted $2^h46^m18^s$, while the totality itself was on for $00^h01^m50^s$ (110 seconds).

2. RESULTS AND DISCUSSION

2. 1. PHOTOMETRY

Photometric tracking of the Solar eclipse (the whole sky photometry) has been performed with an improvised photometer, composed of solar panel, removed from a solar-powered battery lamp. Measurements of voltage intensity on solar panel have been carried out, and on the basis of assumed voltage-intensity of radiation the linear relation established as, given in graphic presentation.

In the Fig. 1 is seen the expected curve of the light intensity temporal dependence on Earth-surface. The light intensity increase on the left part of the graph is a result of sky clearing. Also as a result of passing cloudiness we have deviation of some of the measurements.

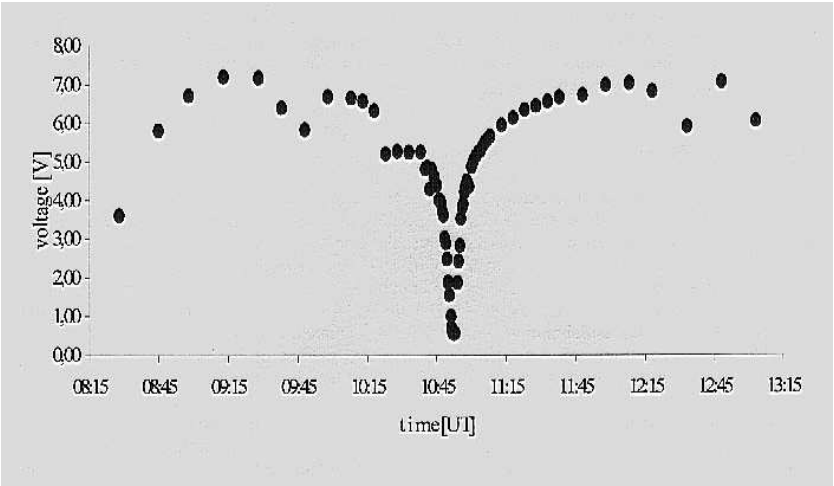

Figure 1:

2. 2. MAGNETIC FIELD

The goal of this experiment was to determine possible changes in the magnetic field as a result of total solar eclipse. The vector of local magnetic field is the sum of vectors of earth-magnetic field and the solar magnetic field in the place of observation.

The equipment consisted of fixed compass with an electromagnet with a nearby switch. Electromagnet was positioned at such distance that it can cause 30 degrees deviation of the needle from its equilibrium position. It was important to secure a constant electrical current supply, so that the magnetic field intensity could be constant, and with it the needle deviation. Once the needle is removed from its to equilibrium position, and it stops moving, the electromagnet is switched off and the time needed for needle to comes back to equilibrium position is measured.

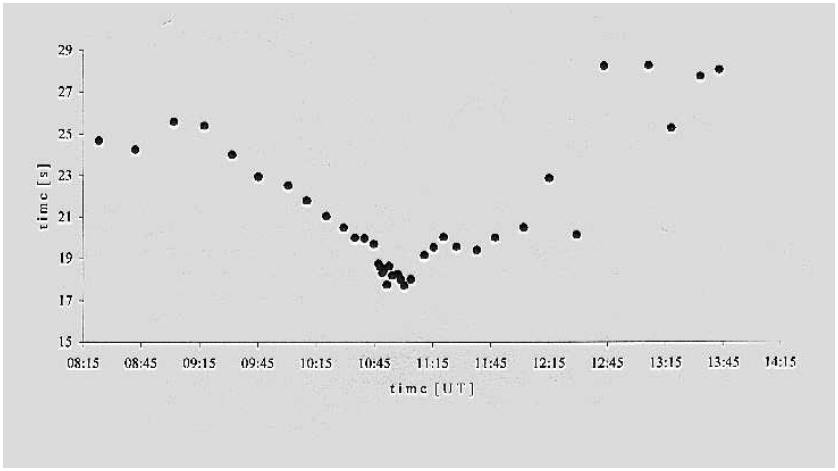

Figure 2:

The deviation from the expected curve in the right part of the graph is a result of bad power supply. The minimum time needed for the needle to get back to its equilibrium position (curve minimum) was at 11:00 UT, which is 00:06:45 after the beginning of totality. Relative variation of needle oscillation period is 30.3%.

2. 3. METEOROLGY

Three types of meteorological investigations have been conducted: temperature variations, pressure variations and humidity variations during the eclipse.

Temperature

Data on temperature are presented in Fig. 3.

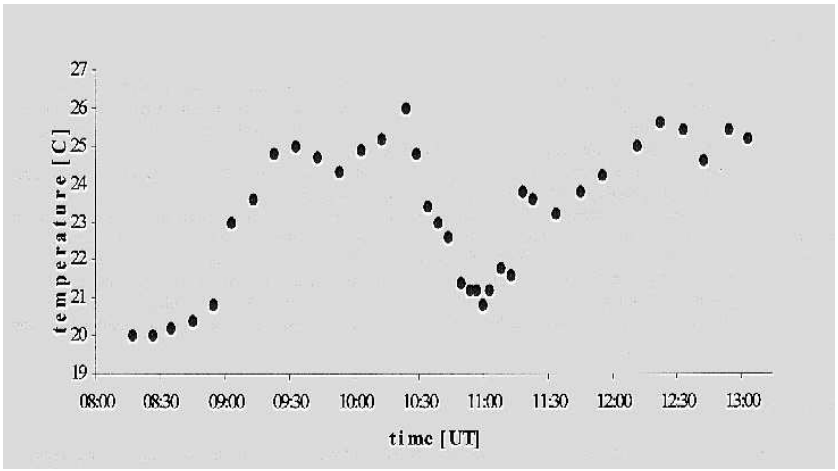

Figure 3:

The left part of the graph (beginning of measurements) is such owing to the sky having cleared and causing the temperature to rise. The central part of the graph

points to the temperature drop as a result of the solar eclipse. The minimum temperature is recorded at $00^h06^m45^s$ after the totality begun (11:00 UT). This can be explained by low capability of the atmosphere to adapt to new conditions. The maximum temperature deviation recorded is 5.2°C, which is in accordance with expectations.

Pressure

Data on pressure are given in Fig. 4. The pressure was measured with a barograph.

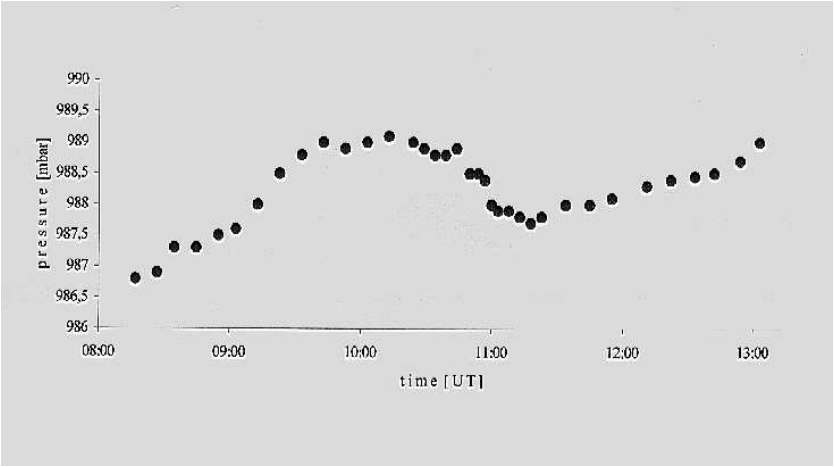

Figure 4:

Data at the beginning could be accounted for the change of atmospheric conditions just before the eclipse. A pressure drop is noted as the eclipse phase progressed, and its increase after the totality. The minimum pressure is recorded at 11:18:00 UT, i.e. 25 minutes after the beginning of totality. Because relative pressure change amounts to 0.15%, are concludes that no pressure change in associated with the solar eclipse.

Humidity

Data gathered on humidity are given in Fig. 5.

It is noticeable in the graph that the air humidity exhibited general tendency to decrease. Prior to the eclipse there has been a rainfall (left part of the graph) so humidity increased. As the wheather got clearer humidity dropped. There is a 13% increase of humidity in the period approximately. 40 min. before to 40 min after the totality, which makes a relative change of 17.8%. Maximum humidity of the air took place 7 minutes after the beginning of the totality, same time as did temperature minimum.

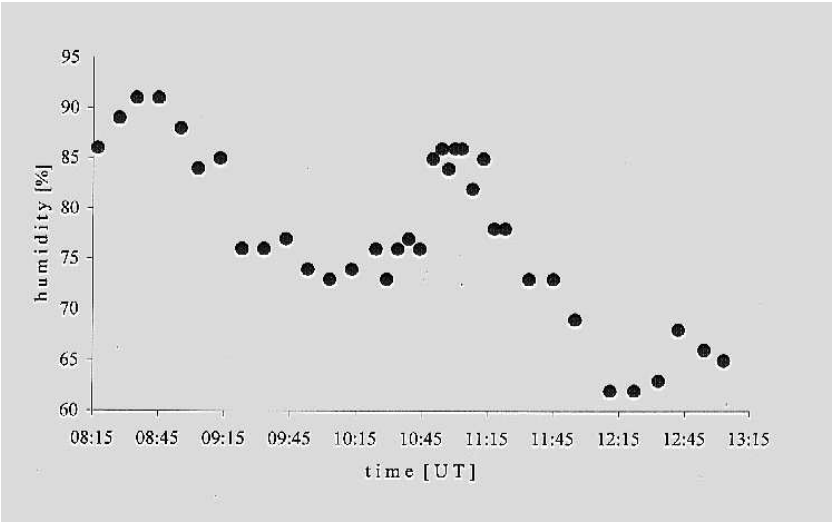

Figure 5:

2. 4. ANIMAL BEHAVIOUR

To determine if animals react on the eclipse of the Sun, 45 horses, 5 does (captive), 3 dogs, hens, swallows and pigeons have been observed. Horses, does and dogs have been observed at a horse farm in Kelebija, while hens, swallows and pigeons in the camp itself. So that the animal mood changes could be easier to detect it had been arranged with the employees at the horse farm, the observers being biologists.

An hour before the totality horses started showing first signs of nervousness. They got agitated, started to sweating noticeably, even pawing the ground. During the totality some horses calmed down, some even lied down. A few minutes after the totality horses were in the same shape still, but soon their behaviour started to normalizing.

During the totality observed dogs retreated into their doghouses and lied down, while does were quiet all the time.

Hens acted normally with twenty minutes before the totality, but then they started moving slower, pecking and looking around. A rooster crowed for the first time 10 minutes before the totality. During the totality all of hens stood in one place and havenm̂oved. After the totality they continued to act normally.

Swallows acted normally, throughout, while pigeons were agitated and aggressive.

2. 5. PLANT BEHAVIOUR

The reaction of the following plants was observed during the totality: black locust (Robinia pseudoacacia) and pine tree (Pinus nigra).

The black locust reacted only to the totality and only by retracting leave. Ten minutes after the total eclipse leaves regained their position as it was prior to the totality.

Black pine reacted hardly noticeably and only to the totality. A needle retracting has been noticed then. Ten minutes after the totality all returned to its normal position.