

THE UV RADIATION AND THE OZONE CONTENT DURING THE SOLAR ECLIPSE ON 11 AUGUST 1999.

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Abstract. The UV radiation and the total ozone content (TOC) during the solar eclipse (96% maximum coverage) were measured by an ultraviolet spectrophotometer. The device measures the direct solar irradiation in the range 300-343 nm at 1 nm spectral resolution. It was calibrated by comparison with the Brewer spectrophotometer. The direct solar irradiance decreased approximately 25-40 times in maximum obscuration of the solar disk. Approximately 15 min. after the first contact, the ozone content began to decrease till the maximum phase. 8 min. before the maximum obscuration TOC was 14% less than the value of the control day (10th Aug). After the maximum phase the ozone content sharply increased and 35 min. later it became 10% more than that on the control day. During the next 50 min. TOC reached the normal level.

The solar eclipse gives an opportunity to investigate how the photochemical processes



Fig 1 Location of the observation station. The path of the total eclipse is shown.

react to the comparatively fast solar radiation changes. It is known that the solar radiation, especially the UV band, has an important role for small atmospheric components formation and destruction. On the other hand, these ingredients affect the climate. That is why the investigation of the small components behaviour during an eclipse would complete our notions for the processes determining and supporting them which is very important for the existence of the biosphere.

Many investigators have observed the total ozone during

an eclipse [1,2,3]. But the results obtained so far are too different. Some observers found small changes of the ozone amount and others – significant ones. There even have been reports that very few changes of the ozone have been observed [4].

During the solar eclipse on 11th August 1999 the penetrating solar radiation was observed in Stara Zagora, Bulgaria, using the scanning ultraviolet spectrophotometer Photon-2 [5]. The instrument was calibrated in 1997 by comparison with the standard Brewer#086 spectrophotometer which is situated in Thesaloniki. During the eclipse Photon-2 measured the penetrating solar radiation in 300+343 nm region with 1 nm resolution. The evaluation of the total ozone amount was made by the method, presented in [6].

At the observation point (Fig.1), the solar eclipse on 11th August was with maximum coverage of 96% [7]. The first contact occurred at 12:41 local time and the fourth - at 15:31. The maximum obscuration was at 14:08 [7].

Fig.2 shows some spectra registered by the instrument during the day of the eclipse. The changes of some wavelength intensities during the solar eclipse are presented in Fig.3. It is seen that the radiation decrease began immediately after the first contact and the increase –

immediately after the maximum coverage. The irradiance decreased approximately 25-40 times during the maximum obscuration of the solar disk.

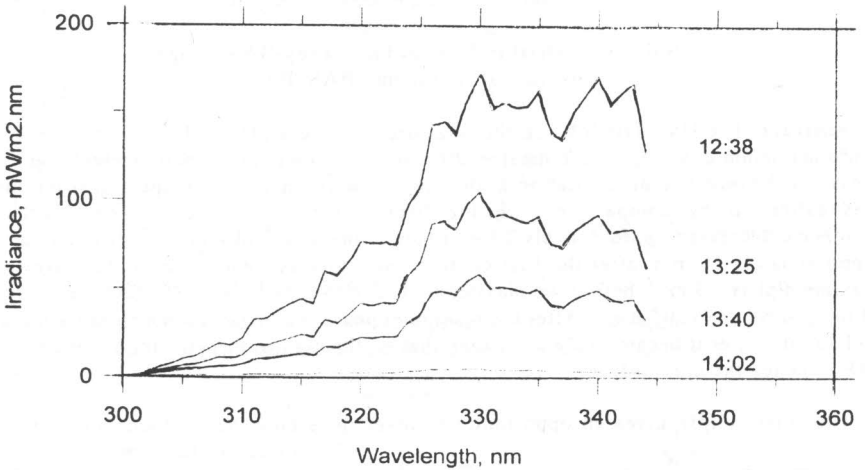


Fig.2 Spectra, registered by the Photon-2 during the day of the eclipse at different moments

The behaviour of the ozone amount during the eclipse is presented in Fig.4. The data on 10th August are presented as control ones. After the beginning of the eclipse the ozone slightly increased and ~15 min after the first contact the ozone was nearly 5% more than the value before the eclipse. At the moment of the maximum obscuration the ozone amount was about 14% less than the value of 10th August. After the maximum phase the ozone content sharply increased and 35 min. later it became 10% more than that on the control day. During the next 50 min. the ozone reached the normal level. A similar result after the maximum obscuration was reported in [3].

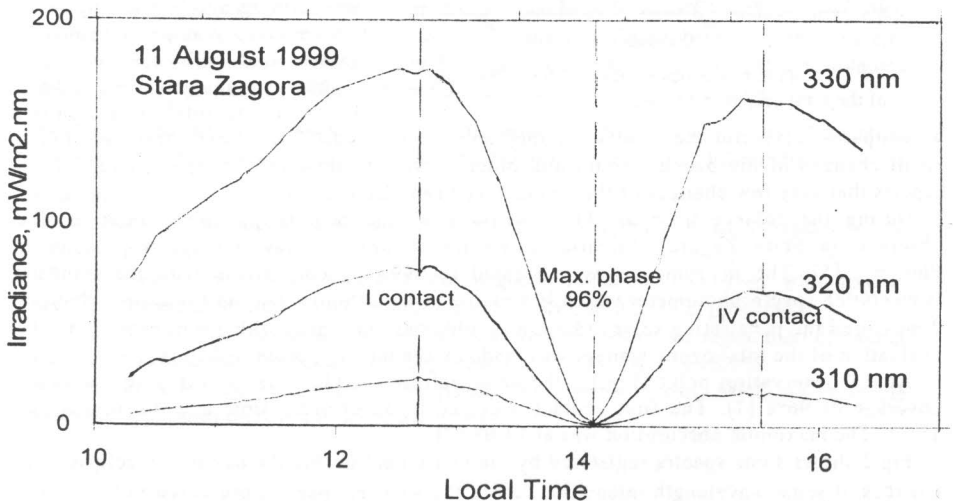


Fig.3 Behaviour of some wavelength intensities during the solar eclipse.

So far there has been no explanation of the ozone amount behaviour during the eclipse. It is possible that the ozone changes are caused by atmospheric dynamic effects during the eclipse.

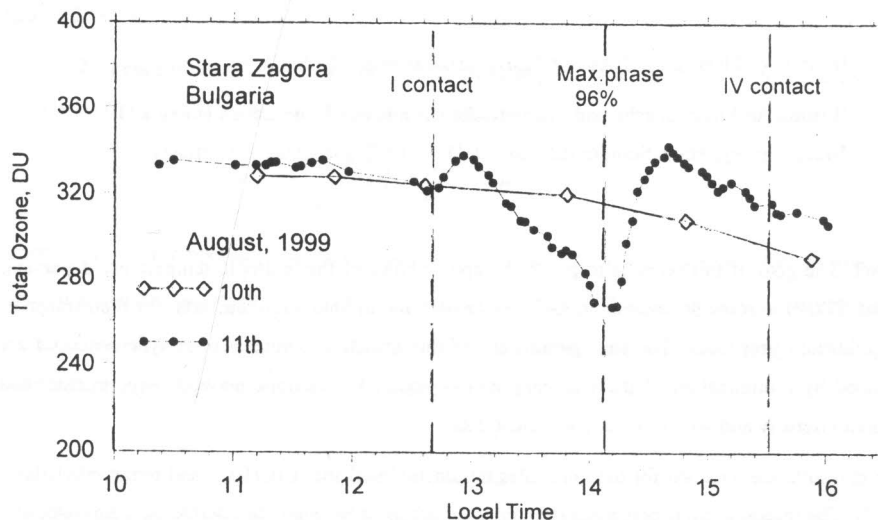


Fig.4 Ozone amount during the solar eclipse. For comparison the data of 10th August are shown.

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