

THE INFLUENCE OF THE SOLAR ECLIPSE ON THE ATMOSPHERIC ELECTRICITY

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We investigated the changes of the potential gradient of the atmospheric electricity and those of atmospheric conductivity at the time of solar eclipse of May 9, 1948 at Wakkanai, Hokkaido ($\lambda=141^{\circ}40' E$, $\varphi=45^{\circ}25' N$). The potential gradient was recorded photographically by using the quadrant electrometer and water-collector. The value of the atmospheric conductivity was observed by the instrument of Gerdien type.

The condition of the eclipse is as follows.

Beginning of the eclipse	10 ^h 25 ^m 30 ^s .0 (J.C.S.T.)
Greatest phase of the eclipse	11 ^h 51 ^m 43 ^s .1
Ending of the eclipse	13 ^h 18 ^m 51 ^s .0
Degree of obscuration	99.4%

The observed result is shown in Fig. 1. Fig. 1 A is the result of the calm day of May 8, 1948 and Fig. 1 B is the result of the solar eclipse of May 9, 1948.*)

As the figure shows, on the calm day both values of the potential gradient and conductivity become maximum at morning or night and minimum at noon.

Now, the meteorological conditions at the day of solar eclipse was as follows. It began to rain at about 2^h and stopped raining at about 5^h and was gradually restored. At the beginning of the eclipse it cleared up and we could not recognize any cloud such that makes the potential gradient or conductivity change in the interval from the beginning to the end of the eclipse.

In the interval from 2^h to 5^h, the condition of the weather was sometimes very wild as if it were storm, so the meteorological con-

dition was too worse to observe the atmospheric electricity. But fortunately it was good condition at the time of solar eclipse as above mentioned.

As Fig. 1 B shows, the conductivity became maximum at the time of maximum phase of eclipse, while the potential gradient became minimum. This change is very remarkable by comparing to the tendency of the calm day as shown in Fig. 1 A.

This influence of the solar eclipse to the atmospheric electricity is illustrated qualitatively as follows.

The large number of the ions, produced by the ionization in the upper atmosphere will be transported by the descending air current which is produced due to cooling of air at the time of solar eclipse, so the conductivity becomes maximum and the potential gradient becomes minimum at the maximum phase of eclipse.

The above mentioned result coincides strictly to the result, obtained by the one of the authors at the time of solar eclipse of Sep. 21, 1941 at Yonakunishima, Ryukyu Is. 1)

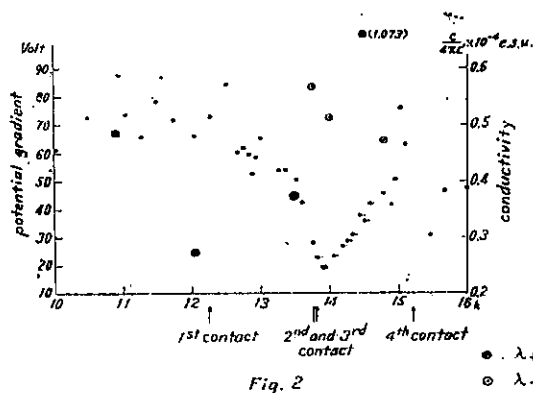


Fig. 2

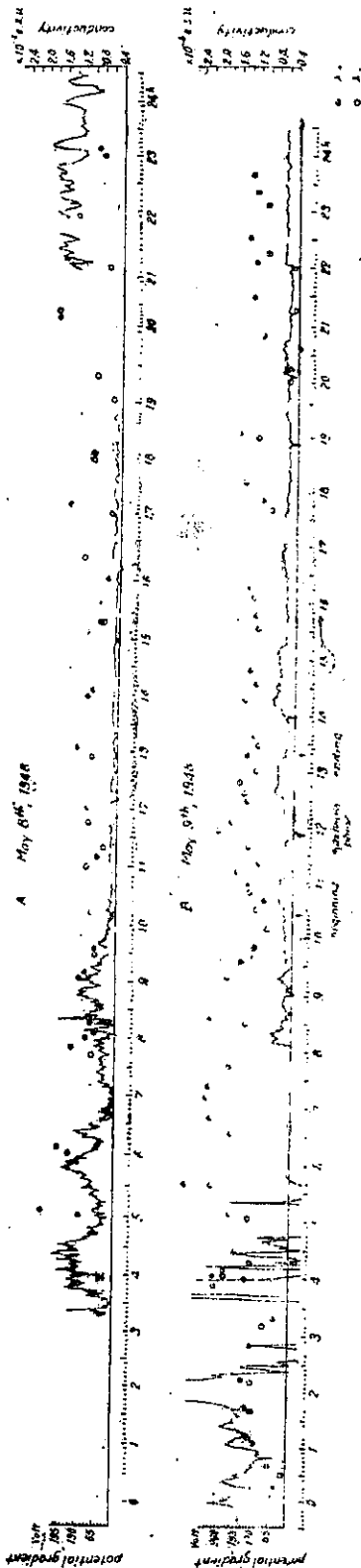


Fig. 2 shows this record. In this case, also the conductivity became maximum and potential-gradient became minimum at the time of the maximum phase of eclipse. On this time the atmospheric pressure was distinctly increased about 0.3 mm Hg at the time of little after the maximum phase.²⁾ This increase of the atmospheric pressure is no doubt the effect of the eclipse on the atmospheric pressure and it is due to the descending current in the atmosphere which is produced by the cooling of the air at the time of the eclipse.

Also the influence of the solar eclipse on the atmospheric electricity will be caused by such descending air current, but the change of the atmospheric electricity is depend upon the charge, mobility and density of ions, and other meteorological conditions, so it needs further study on this problem.

References

- 1) Yoshio Kato : The Report of the Solar Eclipse of Sep. 21, 1941 (in Japanese), Japanese Journal of National Council of Japan, 1943.
- 2) Yoshio Kato : Effects of the Solar Eclipse on Pressure Change of the Atmospheric Pressure, Proc. Imp. Acad., Tokyo, Vol. XIX, 1943.
- *) The observed values are shown in the "Report of the Geophysical Party of the Solar Eclipse Expedition of Tohoku University, on Observation at Wakkanai, Hokkaido and Onagawa near Sendai". This issue p. 53~57.