

# Unusual Enhancement of Night Airglow Intensity at Low Latitudes on November 13, 1960

Bun-ichi SAITO\*

## 11月13日(1960)第5次船上で観測された低緯度 異常大気光(夜光)増加

齋藤 文 一\*

### 要 旨

11月10日(1960)にはじまるあいつぐ太陽爆発中、とくに注目されるのは、12日13:25 (U.T.) (以下時刻は全て U.T.) に発生した Type IV Radio Burst を伴う Flare である。それは宇宙線強度において、きわめて珍しい型の増加をひきおこし、さらにすでに進行中の大磁気嵐にもいちじるしい影響をあたえた。

東京を出港したばかりの13日、地理緯度 N 32°.7 (磁気緯度 20°) の洋上において、これを大気光(夜光)の異常現象として、光電観測によってとらえることができた。折から天空は非常に快晴であった。観測結果としていちじるしいものは、

i) OI 禁制線 6300 Å, 5577 Å の異常増加。両

者の傾向は非常によい平行性を示し、11:30, 14:30に2つの極大をもつ。増加量はそれぞれ 900, 300 Rayleigh である。

ii) Na-D 線, OH Meinel 帯に何らの増加も見られない。

6300 Å, 5577 Å 2本の輝線の増加は約13日10:00時にはじまっており、これは12日13:25時に太陽面を出発した磁気雲がひきおこしたと思われる。磁気嵐急始と宇宙線 Forbush 減少の時刻とほとんど同時である。また両線の平行した増加は、何らかの粒子衝突励起を予想させ、更にNa-D線とOH Meinel 帯に増加のみられないことは、励起層の高さがかなり高いことを予想させる。

### 1. Introduction

In the period of November 10-15, 1960, many solar flares appeared in succession. In these phenomena, a particular interest has been directed to the flare of Nov. 12, which had importance 3<sup>+</sup>, onset time being 13:25 U.T. and with type IV radio outburst. By this flare, a peculiar double-peak increase occurred in the cosmic ray intensity on the 12th, and furthermore a new magnetic impact occurred on the 13th in addition to the great magnetic storm which was then in progress.

The 5th expedition ship SOYA left Tokyo on November 12 and headed for the Antarctic. Photoelectric measurements of the night airglow including the four colours, 5577 Å, 5893 Å, 6300 Å and near infrared, were commenced from November 13 on the SOYA.

### 2. Observed results and discussions

An unusual enhancement in the intensity of night airglow occurred on November

\* 新潟大学理学部, 第5次南極地域観測隊員, Faculty of Science, The University of Niigata. Member of the Japanese Antarctic Research Expedition, 1960-61.

13, 1960, when the ship was at N 32°.7 in geographic latitude and E 133°.6 in geographic longitude, or N 20° in geomagnetic latitude. The sky was very clear and the transparency of the atmosphere was very high.

The observed airglow intensity at the zenith is illustrated in Figs. 1-4. Remarkable results are as follows.

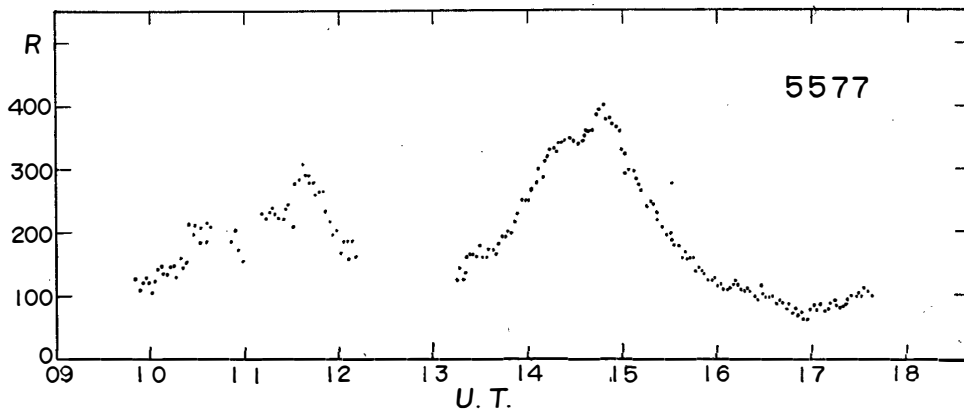


Fig. 1. Airglow intensity on November 13, 1960.

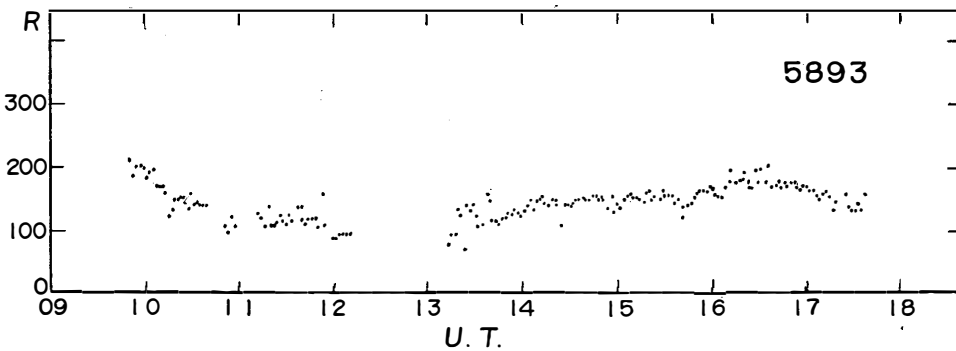


Fig. 2. Airglow intensity on November 13, 1960.

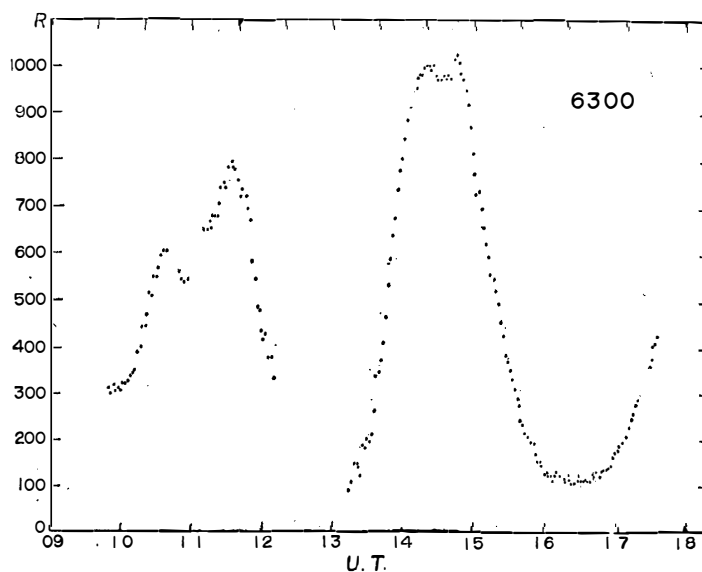


Fig. 3. Airglow intensity on November 13, 1960.

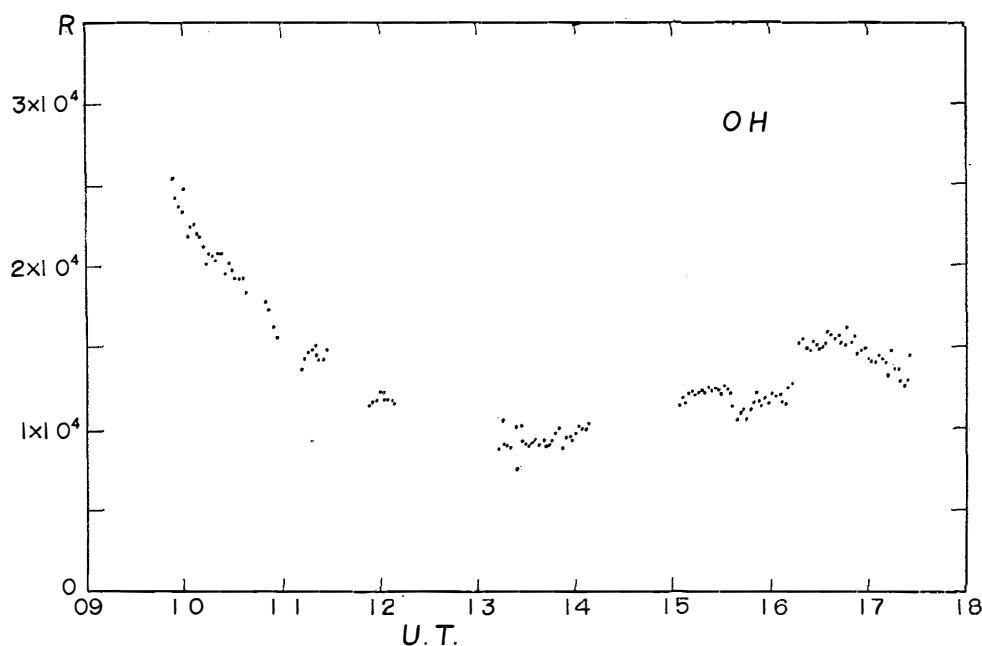


Fig. 4. Airglow intensity on November 13, 1960.

1) Unusual enhancement in  $6300 \text{ \AA}$  and  $5577 \text{ \AA}$  lines by oxygen atom, which had remarkable parallel behavior with two peaks at about 11:30 and 14:30 U.T. The peak intensities were 1000 Rayleigh in  $6300 \text{ \AA}$  and 400 Rayleigh in  $5577 \text{ \AA}$  emissions respectively.

2) No enhancement in the  $5893 \text{ \AA}$  by sodium atom and the near infrared band by OH molecule.

It should be noticed that the starting time, about 10:00 U.T. in  $6300 \text{ \AA}$  and  $5577 \text{ \AA}$ , almost coincided with the start of the new sudden commencement of magnetic storm and Forbush decrease in the cosmic ray intensity generated by the arrival of the magnetic cloud started at 13:25 U.T. from the sun on November 12 (references 1) and 2)).

The remarkable parallelism in the intensification of the two lines by oxygen atom will represent a possibility of excitation by the collision of incoming particles into the upper atmosphere. Furthermore, the fact that no enhancement is recognized in the sodium D-line and the OH molecular band suggests that such excitation is generated at the altitude as high as the ionospheric F2 layer.

**Note added in proof:** In Fig. 2, the readings of ordinate should be multiplied by the factor 0.7.

### References

- 1) Steljes, J. F., Carmichael, H. and McCracken, K. G.: Jour. Geophys. Res., 66, 1363 (1961).
- 2) Roederer, J. G., Manzano, J. R., Santochi, O. R., Nerurkar, N., Troncoso, O., Palmeira, R. A. R. and Schwachheim, G.: Jour. Geophys. Res., 66, 1603 (1961).

(Received Sept. 6, 1961)