LATITUDE DEPENDENCY OF AIRGLOW EMISSIONS

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夜光輝線の緯度効果

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In addition to the observations of 5577A emission in the night airglow, made in the 1st, 2nd, and 3rd expeditions, the observations of three other emissions were carried out in the 4th expedition along the same course of voyage of the Soya between Tokyo and the Antarctic.

Two units of photoelectric photometer were used in the observation, one sensitive to visual region and the other to infrared region, both compiled in one mounting which enables always measuring zenith intensity in spite of the big rolling and pitching of the ship. The emissions were isolated by the interference filters which were put in front of an objective lens automatically exchanged by a small motor.

The final calibration of the observed values is not yet finished, and the present report is based on the preliminary values of observation. The final values and detailed discussions will be published later in other publications.

The latitude dependency of the 5577A emission of oxygen atoms was almost definitely determined in the past three expeditions by J. NAKA-

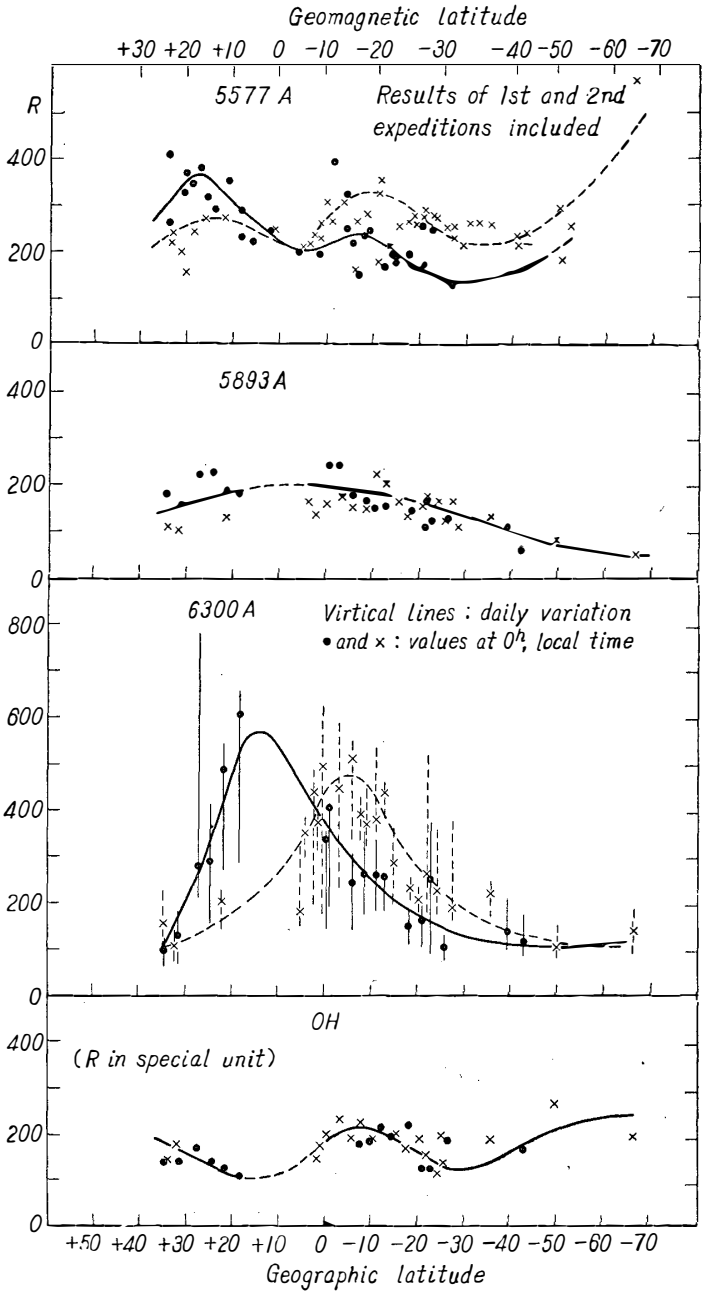

Fig. 1. Observed intensity of Airglow.
● outward voyage × homeward voyage

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MURA, though the daily variation caused by the intense solar activity was not small enough for the analysis. The result of the 4th expedition, made in less active stage of the sun, clarified the existence of seasonal effect superposed on the latitude effect which had generally been analysed by J. NAKAMURA. The reduction of these effects are subject mainly to the general circulation of the upper atmosphere about 100 km from the surface of the earth.

The result of measurements of the D line of sodium atoms is shown in the second portion of Fig. 1. The mean intensity of each night is shown in this figure, beause the daily variation and the seasonal variation of this emission seems not to be so big. The general tendency of the latitude dependency of this emission is that it is stronger around the equator and weaker in higher latitude.

The intensity of 6300A emission of oxygen atoms has a very remarkable dependency on latitude as shown in the third portion of Fig. 1. Daily variation of this emission becomes very big in lower latitudes compared with that in higher latitudes. The intensity itself has remarkable maximum around the equator, and the peak seems to move to both sides of the equator. As our observations are made in limited period of the year (Nov.-Dec., and Feb.-Apr.), the detailed tendency is not yet clear, but it seems very probable that this is due to the solar movement, considering the facts that the height of this emission is as high as that of ionospheric F2 layer, and the intensity of the emission has close correlation with the electron density of F2 layer.

It will be noteworthy that the maximum intensity of 6300A emission comes generally in midnight at around the equator, and the intensity correlates very well inversely with the virtual height of F2 layer, all in good accordance with the ionospheric peculiarities around the equator. Fig. 2 shows the relation between the intensity of 6300A line and the virtual height of F2 layer which was also observed on the Soya.

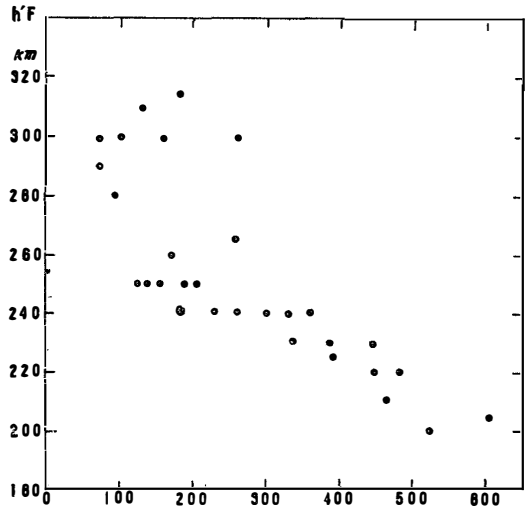

Fig. 2. Correlation between the intensity of 6300A and virtual height of F2 layer.

The OH band in the near infrared region was measured with the photomultiplier tube Du-Mont K1613 combined with the dark red filter. The intensity was caliburated by a continuous light source with a small lamp and compared with the IGY photometer at Maruyama Airglow Station. The latitude dependency of this emission is somewhat similar to that of 5577A line, having the primary minimum at around the equator and seems to have secondary minimum at around 30°. Seasonal effect of this band seems to be very small, and this is in agreement with the small seasonal variation observed at IGY stations. The observation of this emission, however, was not enough to draw further conclusions about this emission.

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