

SPATIAL VARIATIONS OF THE AIRGLOW IN THE AREA OF λ 5893 Å

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ABSTRACT: Measurements showed the presence of patches in the λ 5893 Å emission, with an intensity of about 100 Rayleighs and dimensions of about 100 x 20 km. The velocities of the patch movements were about 70 km/sec. The predominating directions of the movements were eastern and northern.

In order to study the spatial distribution of brightness in the airglow of the λ 5893 Å region, we used data from the observations conducted at the station in the Vannovskiy district on a five-channel scanning electrophotometer [1, 2]. The analyzed materials were obtained during the nights of May 4-5 and 8-9 in 1962. /10

The absolute intensity of the luminescence in the λ 5893 Å region was calculated according to the following formula:

$$I_{5893} = \frac{4\pi i^* \Delta\lambda}{\omega n^* k p} n - \frac{i^k \Delta\lambda}{k p},$$

where i^* is the energy of the continuous spectrum for the calibration star per 1 Å in the λ 5893 Å section; $\Delta\lambda$ is the equivalent width of the band where there is complete penetration of the interference filter centered on a segment of the λ 5893 Å spectrum; ω is the solid angle of the photometer; n^* is the reading of the photometer from the calibration star; k is the coefficient of penetration for λ 5893 Å; p is the permeability of the atmosphere at the segment of the spectrum being measured; i^k is the intensity of the integral continuum per 1 Å in the λ 5893 Å area; n is the reading of the photometer for the airglow. The value of the integral continuum for the wavelength being measured was determined by interpolation of the data on the continuum obtained by observations for the spectral segments λ 5690 and 6040 Å. The coefficients of permeability and the calibration coefficients were determined by the stars [3, 4].

The average intensity of the airglow per night in the λ 5893 Å region was equal to the following: 50 Rayleighs on May 4-5; 33 Rayleighs on May 8-9. The ratio of the emission intensities at two different points in the sky with equal zenith distances depended substantially on the azimuth of the point of observation, and it reached a value of 1.8. There was noted an increase of the intensity in the western direction during the entire night. A similar picture was also observed for the night of May 8-9, 1962.

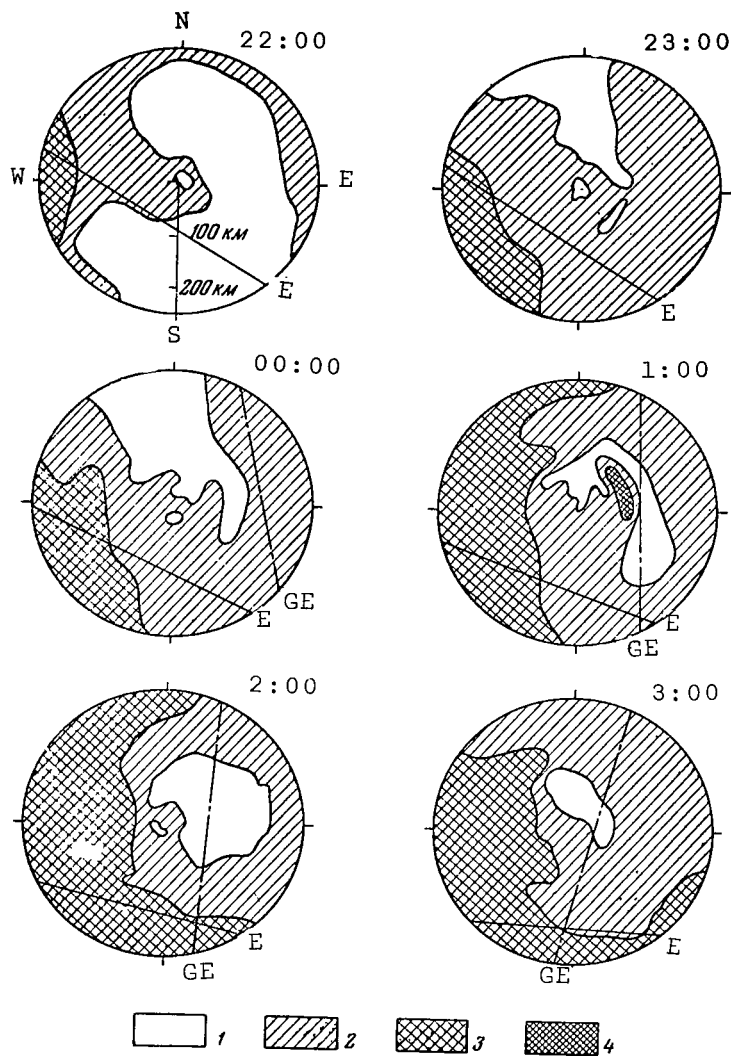


Fig. 1. Circular Isophotic Charts for the Night of May 4-5, 1962. Lines GE and E Correspond to the Galactic Equator and the Ecliptic, Respectively. The Density of the Shading Corresponds to the Relative Intensities of Emission: (1) 0.8; (2) 1.0; (3) 1.2; (4) 1.6.

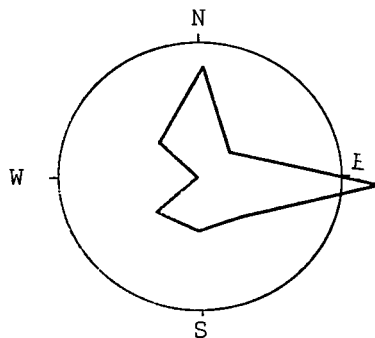


Fig. 2. Histogram of Movement Directions of the Discontinuities in the λ 5893 Å Region.

The results of the observations on the emission in the λ 5893 Å region for the night of May 4-5, 1962 are shown in the form of isophotic charts in Figure 1. Each chart with an hourly interval was constructed as a result of averaging four charts obtained at 15-minute intervals. The intensities observed were divided into ranges whose average values differed from one another by 20%. The densest shading corresponds to the greatest intensity. In constructing the isophotic charts, the height of the emitting layer was taken as equal to 85 km.

An examination of the isophots showed that the shape and size of the discontinuities may be completely different.

The average size of the discontinuities (patches) whose contours did not exceed the dimensions of the region of the sky being examined by the apparatus was equal to 76 km, for 24 measurements. The time for the presence of discontinuities varied from 15 min to 4 hours. /12

On the night of May 4-5, there was recorded a contrasting patch with an intensity of 95 Rayleighs. The length of the patch was equal to 100 km, and the width was equal to 20 km. The azimuth of the patch movement was 150° , and the velocity was about 70 m/sec. An examination of the charts for the nights of May 4-5 and 8-9 of 1962 provided for constructing the histogram for the azimuths of movements shown in Figure 2.

The principal directions of the patch movements, as we can see from the figure, were eastern and northern.

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