I-4-6. Geographical Distribution of Aurorae in the Southern Hemisphere*

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The IGY investigations have made a valuable contribution to the study of the geographical distribution of aurorae in the Southern hemisphere, especially in the Antarctic. The papers^{1),2)} give the location of the auroral zone in the Southern hemisphere during the IGY period, on the basis of visual observations. Bond and Jacka have also determined the location of the auroral zone in the region of Mawson and Macquarie stations³⁾. A map with isolines of the frequency of aurora appearance at the zenith, is obtained in the Southern hemisphere by the observations on all days during the IGY.4) Fig. 1a and b show correspondingly maps of isoaurora for the Southern hemisphere during magnetically quiet and magnetically disturbed days. The observation period and methods used in selecting days with various intensity of magnetic disturbance are similar to those used in (4) for the Northern hemisphere. In the auroral zone (heavy line) the frequency of aurora appearance at the zenith increases from 55 per-cent during magnetically quiet days to 90 per-cent during magnetically disturbed days that coincides with corresponding values for the Northern hemisphere.

During magnetically quiet days auroral zone is shifted to the South from the auroral zone of magnetically disturbed days in average by 5-6 degrees. However, at the stations situated at the latitudes of auroral zone for magnetically quiet days, the frequency of aurora appearance at the zenith somewhat increases during transition from quiet to disturbed days.

Therefore, simultaneously with moving off the pole with increase of magnetic activity the auroral zone expands in the direction to higher latitudes. To the North of the auroral zone, during disturbed days, aurorae are observed at the zenith at the distance of 25 degrees from the auroral zone, and during





Fig. 1. Isolines of the frequency of aurora appearance at the zenith in the Southern hemisphere.

a-during magnetically quiet days.

b-during magnetically disturbed days.

^{*} This paper was combined with I-4-7 and presented by A. I. Lebedinsky.

magnetically quiet days at the distance of 10 degrees from the zone, aurorae at the zenith are quite seldom observed.

The analysis of auroral distribution at the stations of the region near the pole such as Vostok, Vostok I, Pionerskaya, and Mirny, indicates that both in the Southern and in the Northern hemispheres there exists a second zone of primary appearance of aurorae at the zenith. This zone surrounds the geomagnetic pole like a ring at the geomagnetic latitudes of 81 degrees. However, because of the rather rare network of stations at such high latitudes the second zone is not so distinctly developed as in the Northern hemi-



- Fig. 2. Dependence of the time of morning and night extremums in the diurnal variation of aurora appearance frequency at the zenith on the corrected geomagnetic latitude.
 - 1-the night maximum.
 - 2-the morning maximum.

sphere.

Fig. 2 shows the dependence of the time of morning and night extremums in the diurnal variation of auroral appearance frequency at the zenith in polar co-ordinates. The polar co-ordinates are served by the corrected geomagnetic latitude and the local geomagnetic time. It was assumed that the auroral zone was a circle with the geomagnetic latitude of 71 degrees. Then the corrected geomagnetic latitude of the station is $\phi'=71^{\circ}\pm \Delta$, where Δ is the distance from the station to the auroral zone. The times of maximum activity are shown by crosses.

The figure obtained consists of two cuts of the spiral, each of them corresponding to a certain maximum in a diurnal variation. The figure reminds one of an oval with a minimum distance from the geomagnetic pole in the day-time and a maximum distance at night. The night branch of the oval was drawn for the first time by Malville on the basis of the observations at the Ellsworth and Amundsen-Scott stations. The part of the oval corresponding to the night-maximum (Fig. 2) is identical with that obtained by Malville.

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