netic activity maxima on Fig. 4 are given for comparison spirals distribution of magnetic activity Q-indexes (the data for winter and summer are taken from[8] and for equinoxes they are obtained by the authors).

Both the magnetic and ionospheric spirals untwist in a counterclockwise directive. For all seasons the maximum of magnetic disturbance appears earlier than the maximum of blackouts (at the latitude $\varphi=60°$ it appears 2–3 hours earlier) while passing to higher latitudes the blackout delay, compared with magnetic activity, decreases. The results obtained differ from the results[2], which show a good coincidence of the both spirals.

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INTERNATIONAL CONFERENCE ON COSMIC RAYS AND THE EARTH STORM Part I

I-2-16. Abnormal Polar-Cap Absorption Associated with Strong Chromospheric Flares on the Sun for the Period 1938 to 1959*

A. S. BESPROZVANNAYA**

Data on the absorption of the third type (abnormal polar-cap absorption) obtained for the period of the Third International Geophysical Year are supplemented with the results of the analysis of observational materials of the vertical incidence ionospheric sounding obtained at the high-latitude station Tikhaya Bay (80.3°N) for the previous years.

All the cases of the long-duration abnormal absorption at Tikhaya Bay from January 1938 to July 1957 have been selected. Basing on a series of properties of the third type absorption found in the IGY materials, all the selected periods may be referred to the type of " abnormal polar-cap absorption ".

In Table I a list of these periods with the indication of the starting time of absorption, its duration and a number of blackouts (according to hourly data) is given.

The cases of the third type absorption, selected by the author in collaboration with V. M. Driatsky for the IGY period are also given here.

The analysis of the polar-cap absorption periods for the 22-year period of observations has enabled us to obtain a statistically based conclusions on the distribution of the third type absorption in a cycle of solar activity and during a year, as well as the character of connections with magnetic storms and active formations on the Sun.

§ 1. Secular variations.

In the frequency of the polar-cap absorption occurrence a remarkable dependence on the phase of a solar cycle is revealed.

Absorption periods are more frequent in the years of high solar activity and are completely absent in the years of low activity (Fig. 1). In the epochs of the solar-spot

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* This paper was read by N. V. Pushkov.
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Table I. Periods of abnormal polar-cap absorption.

NN	Year	Date	Starting time (*UT*)	Duration (in days)	Duration of black-outs in hours
1	2	3	4	5	6
1	1938	16 January	Indirect data		×
2		5 April	22< × <06*)	3	(53)*)
3		12 April	04	3	(66)
		15 April	09	5	84
4		2 August	22< × <06	3	(50)
5		22 September	×	6	—
		28 September	20	5	47
6		8 December	22< × <06	3	×
7	1939	15 April	03	7	(78)
8		22 April	22< × <06	7	(96)
9		29 April	18	10	(170)
10		10 August	19	4	(62)
11	1940	21 March	22< × <06	5	(96)
		27 March	17	8	169
12		20 June	21	7	112
13	1941	26 February	22< × <06	5	99
14		3 July	22< × <06	3	(42)
15		18 September	Indirect data		
16	1942	28 February	〃	〃	
		7 March	〃	〃	
17	1946	7 February	00	2	(36)
		13 February	14	2	56
18		22 March	09	4	×
		27 March	19	4	(52)
19		25 July	17	10	211
20		21 September	19	3	(52)
21	1947	13 March	18	6	(84)
22		16 June	15	3	13
23		17 July	00	4	48
24		9 November	00	3	60
25	1948	5 May	18	7	120
		14 May	04	3	(24)
26		21 May	12	3	(42)
27		9 August	17	2	24
28	1949	23 January	13	3	(34)
29		10 April	06	8	88
30		8 May	00	3	29
		10 May	22	5	64
31		4 June	15	4	58
32		3 August	11	2	17
		5 August	03	6	82
33		19 November	12	4	58
34	1950	2 February	01	4	52
35		21 February	19	4	×
36		31 May	06	2	24
37	1951	13 June	06	5	111
38	1955	16 January	20	2	39
39	1956	23 February	05	4	70
		10 March	×	7	69
40		27 April	22	2	30

Table I. (Continued)

NN	Year	Data	Starting time (UT)	Duration (in days)	Duration of black-outs in hours
1	2	3	4	5	6
42		31 August	18	4	76
42		14 November	16	2	36
43	1957	20 January	18	2	28
44		22 February	16	3	24
45		2 April	23	7	10
46		11 April	13	6	93
47		19 April	3	4	25
48		9 May	5	2	14
49		19 June	23	8	174
50		28 June 3 July	× 9	5 3	65 66
51		9 August	20	3	30
52		28 August	14	9	166
53		12 September	04	1	8
54		18 September	20	6	48
55		26 September	21	3	24
56		20 October	19	3	35
57		4 November	23	2	2
58	1958	10 February	06	2	18
59		11 March	×	2	20
60		14 March	16	3	27
61		17 March	×	8	61
62		25 March	10	8	139
63		10 April	08	3	16
64		4 June	23	3	5
65		7 July	03	6	104
66		29 July	04	2	4
67		16 August	06	3	50
68		21 August	14	8	165
69		22 September	16	4	32
70	1959	13 February	09	3	×
71		11 May	03	11	45
72		13 June	08	4	×
73		9 July	20	13	240
74		18 August	11	3	12

*) Before November 1950 observations had been made not each hour.

Note: Periods of absorption are given under a single ordinal number, if they are associated with one eruptive area on the Sun.

maximum of 1937–1939 and 1947–1949 a total number of the days in a year with the third type absorption amounted to 35 that is twice less than the days noted in the years of abnormally high solar activity (1957–1959).

2. Seasonal variations.

A certain asymmetry in the distribution of cases of the third type absorption during a year is revealed. In October–December a number of the periods of this type of absorption is remarkably smaller than in the rest months.

For the 22-year period of ionospheric observations only two cases were noted in December and October, and four cases of

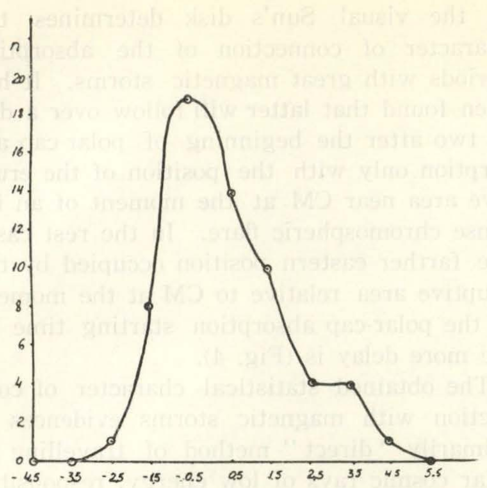

Fig. 1. Mean annual number of the polar-cap absorption periods depending on the position of a year relative to the epoch of the solar activity maximum.

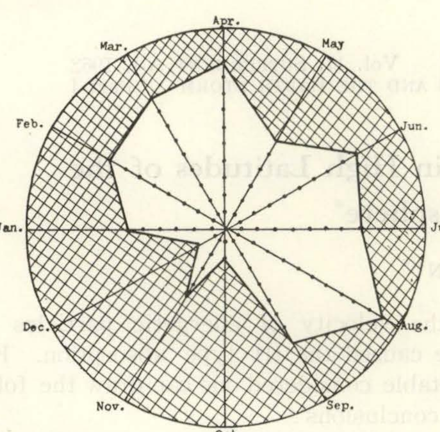

Fig. 2. Circular diagram of the distribution of the total number of absorption periods from 1938 to 1959 by months.

abnormal polar-cap absorption were noted in November (Fig. 2).

The obtained seasonal distribution cannot be explained by a more favorable orientation, in illuminated months, of the northern polar cap relative to the Sun as far as the same tendency was revealed in the data of Antarctic high-latitude stations, where the periods of polar-cap absorption completely coincided with the periods noted in the IGY materials in the northern polar-cap.

§ 3. Association with the eruptive areas on the Sun and magnetic storms.

Except for rare cases, all the selected periods of abnormal polar-cap absorption coincided with the existence of the high eruptive and active area on the Sun (with a great number of chromospheric flares with intensity from 1 ball and more).

It has been revealed that the position of the eruptive area on a visual Sun's disk relative to the Central Meridian affects in a certain way on the character of the absorption period associated with it.

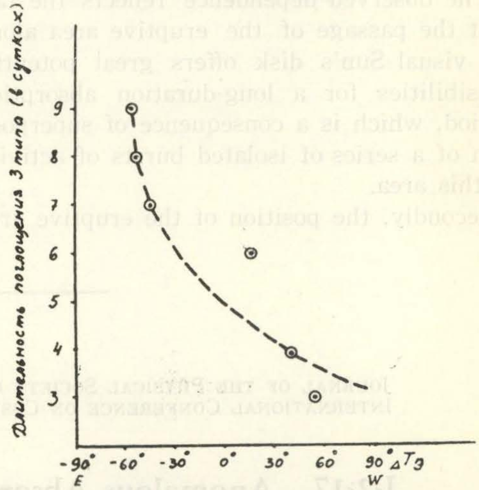

Fig. 3. Dependence of the absorption period duration upon the position of the active area relative to CM at the Starting moment of absorption (ΔTe).

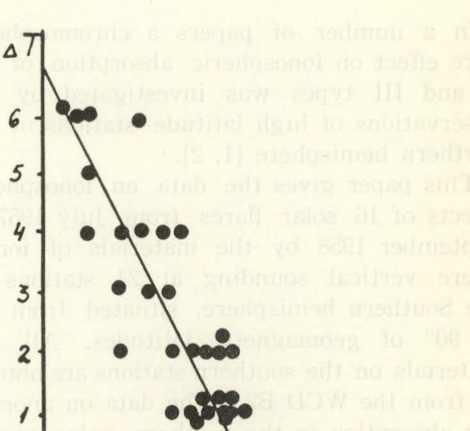

Fig. 4. Distribution of the difference of the starting time of the third type absorption and of great magnetic storm (ΔT) depending on the position of the eruptive area relative to CM at the starting moment of absorption (Te).

Firstly, the farther the eastern position relative to CM occupied by the eruptive area at the moment of the intense chromospheric flare after which polar-cap absorption had begun, the more its duration is.

In Fig. 3 a middle position of the eruptive area relative to CM at the starting time of absorption for the duration periods more than 8 days; 8; 7; 6; 5; 4 and 3 days is given.

The observed dependence reflects the fact that the passage of the eruptive area along the visual Sun's disk offers great potential possibilities for a long-duration absorption period, which is a consequence of superposition of a series of isolated bursts of activity of this area.

Secondly, the position of the eruptive area on the visual Sun's disk determines the character of connection of the absorption periods with great magnetic storms. It has been found that latter will follow over a day or two after the beginning of polar-cap absorption only with the position of the eruptive area near CM at the moment of an intense chromospheric flare. In the rest cases the farther eastern position occupied by the eruptive area relative to CM at the moment of the polar-cap absorption starting time is, the more delay is (Fig. 4).

The obtained statistical character of connection with magnetic storms evidences of primarily "direct" method of travelling of solar cosmic rays of low energy, responsible for polar cap absorption.

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I-2-17. Anomalous Absorption in High Latitudes of the Southern Hemisphere*

G. V. BOOKIN**

In a number of papers a chromospheric flare effect on ionospheric absorption of the II and III types was investigated by the observations of high latitude stations of the northern hemisphere [1, 2].

This paper gives the data on ionospheric effects of 16 solar flares from July 1957 to September 1958 by the materials of ionosphere vertical sounding at 24 stations of the Southern hemisphere, situated from 40° to 90° of geomagnetic latitudes. All the materials on the southern stations are obtained from the WCD B2. The data on anomalous absorption in the northern polar region and magnetic disturbances given for comparison are taken from paper (2). The data on chromospheric flares, radioemission of the Sun and absorption in the northern and southern hemisphere are presented in table 1. ϕ_0 means low latitudinal limit of the region of absorption, VIII the lowest range of the velocity of energetic particles that have caused the III type absorption. From the table considered one can draw the following conclusions:

1. Dellinger effect was found only in two cases. Perhaps the usage of hourly value graphs, presented by a number of stations in the W.C.D. did not allow to find out this shorttime effect in the other cases.

2. The moment of the III type absorption commencement for the northern and southern hemisphere differs essentially.

3. In the northern hemisphere the lowest boundary of anomalous absorption is 58.5°N, in the southern one—54°S. For one and the some flare the distribution (in geomagnetic coordinates) of anomalous III type absorption has an assymetry vividly expressed for the northern and southern hemispheres.

4. The duration of blackouts, caused by one and the same flare, may be essentially different in the northern hemispheres.

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* This paper was by N. V. Pushkov.
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