meets great difficulties. Probably, the most suitable explanation is the one from the point of view of Störmer's theory.

However, one must be careful in the direct identification of Störmer's precipitation line with the observed curves.

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I-2-14. Geographical Distribution of Ionospheric Disturbances in High Latitudes*

R. A. ZEVAKINA**

Disturbance process is considered simultaneously in low and upper ionosphere. With this aim there analysed the synoptical charts Δf_{min}, fE_s and $\Delta foF2$, drawn in polar geomagnetic coordinates by the data of 38 stations of the northern hemisphere (Δf_{min} and $\Delta foF2$ were taken from the medians on quiet days). To present the distribution of the abnormal variations of the ionosphere, depending on season and disturbance intensity, the synoptical charts of Δf_{min}, fEs and $\Delta foF2$ were considered for all the days of July, September and December 1957 for 0, 6, 12, 18 o'clock of the universal time. For the more interesting periods the charts were drawn for each hour. September was very much disturbed, during the month 4 very great disturbances were observed and December was rather quiet–4 small disturbances were observed. 4 disturbances (3 small and 1 very great) were registered in July.

As a characteristic of a disturbed state of ionosphere there adopted: full (B) and increased absorption ($\Delta f_{min} > 40\%$), $fEs > 4$ Mc/s and declination $foF2$ from medians ($\Delta foF2$) more than 20%.

For the period considered 5 very great geomagnetic disturbances with sudden commencement were observed. In all five cases ionospheric disturbances began 1–2 days earlier than magnetic ones.

Figs. 1, 2 and 3 give as an example a number of synoptical charts Δf_{min}, $\Delta foF2$ and fEs during the ionospheric disturbance, observed from 20 to 26 of September, 1957. The magnetic disturbance began at 10^h06^m on Sept. 21, 1957. On the charts the regions of abnormal values of Δf_{min}, $\Delta foF2$ and $foEs$ were contoured. Before the geomagnetic disturbance in the low ionosphere abnormal absorption (Fig. 1a) and the clouds of Es with high fEs (Fig. 3a) were observed. In the region $F2$ a considerable increase of $foF2$ (Fig. 2a and 2b) took place. Before the magnetic disturbance abnormal absorption were observed in small regions. With the beginning and development of geomagnetic disturbance the sizes of the regions with abnormal absorption considerably increase (Fig. 1b). In active periods abnormal absorption spreads along all the space from the pole to the geomagnetic latitudes 50–60°N and sometimes even more to the South. To the end of the disturbance the zone of abnormal absorption gradually reduces (Fig. 1d, 1e, 1f). In this period the regions of abnormal absorption as well as at the first period sometimes resemble spirals (Fig. 1d).

In the $F2$ region with a magnetic disturbance commencement a considerable decrease of $foF2$ takes place, which on the larger part of the territory remains to the disturbance end (Fig. 2 c, d, e). As well as in the low ionosphere, anomalous variations of $foF2$ develop as separate regions, more often they happen to be several (Fig. 2). Its greatest value $\Delta foF2$ reaches in the zone of auroras and somewhat more to the south.

Simultaneously with anomalous variations in absorbing and F regions a considerable increase of fEs is observed on the night side

* This paper was read by N. V. Pushkov.
** U.S.S.R.

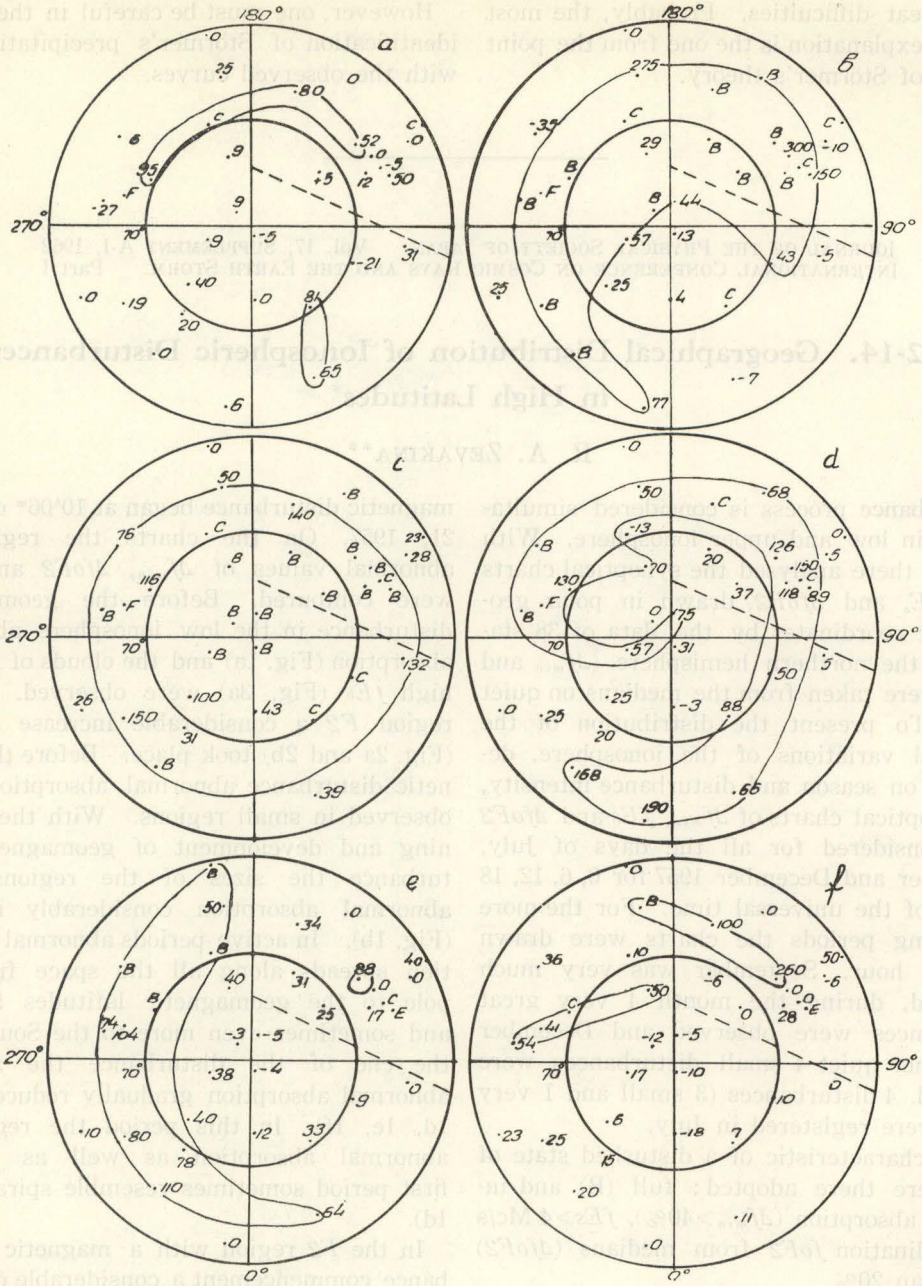

Fig. 1. Synoptical charts of Δf_{min}
a—10hr; *b*—12hr; *c*—14hr. 21st, Sept.
d—12hr; *e*—18hr. 24th, Sept.
f—0hr. 26th, Sept. 1957.

in the limited region (Fig. 3).

During disturbances a location of anomalous regions in lower and upper ionosphere changes. However, their regular displacement with the time of a day, but *Es* has not been found out.

Ionosphere variation considered is typical for great disturbances. During moderate and small disturbances the regions with abnormal variations Δf_{min}, $\Delta foF2$ and fEs have much less sizes, besides they exist not so long. In the periods of small disturbances abnormal

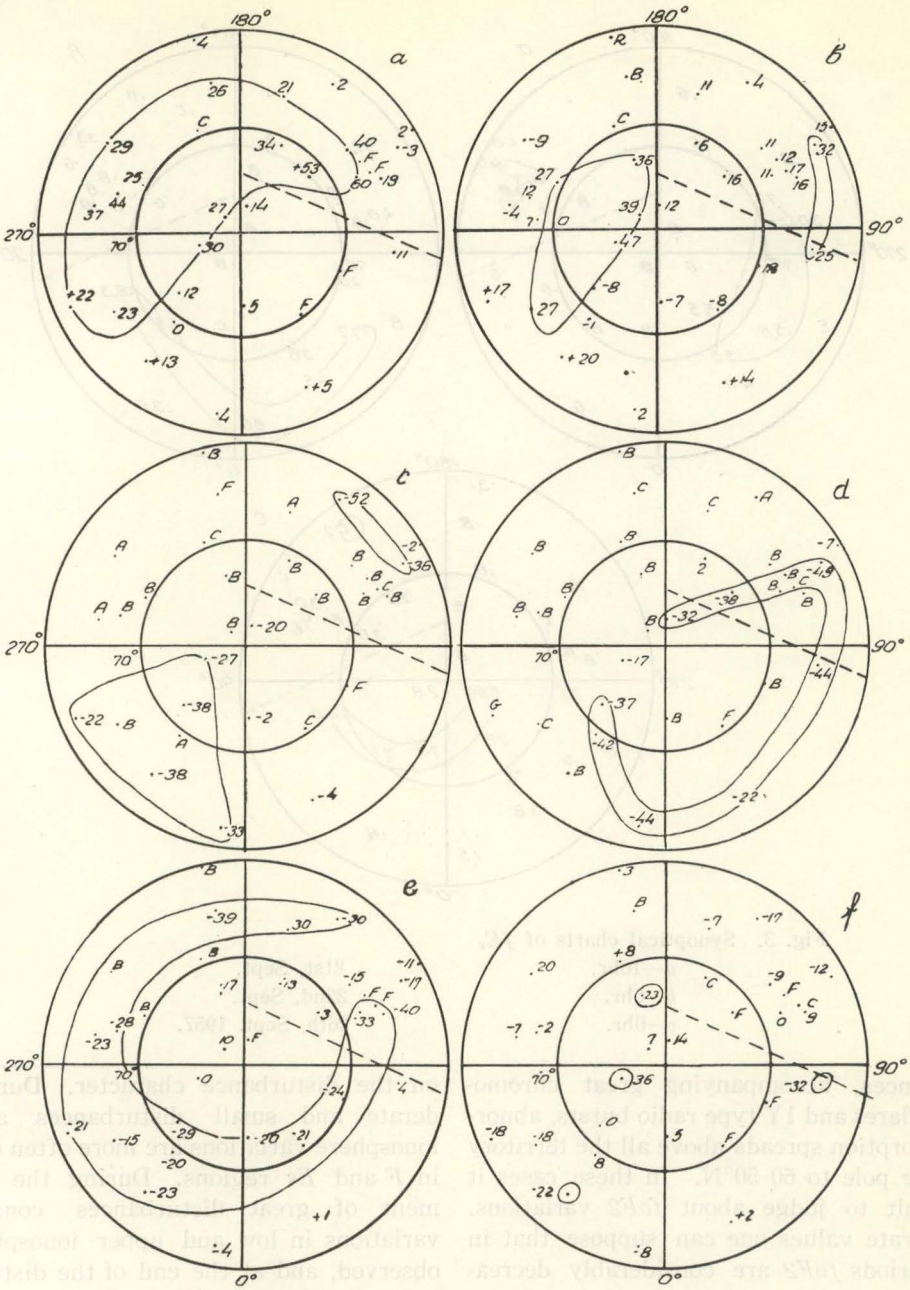

Fig. 2. Synoptical charts of Δf_0F2

a—0hr; *b*—10hr; *c*—16hr· 21st, Sept.
d—18hr. 23rd, Sept.
e—18hr. 24th, Sep.
f—10hr. 26th, Sept. 1957.

ionosphere variations are observed only at individual stations (Fig. 2f.)

Thus, the sizes and distribution of regions with abnormal ionosphere variations greatly change depending on disturbance activity.

During great and small disturbances anomalous variations occur in both low and high ionosphere. However, the regions with abnormal absorption, *Es* and with abnormal $\Delta foF2$ in high latitudes are often situated not above each other, but on different territories. Only during active periods of great

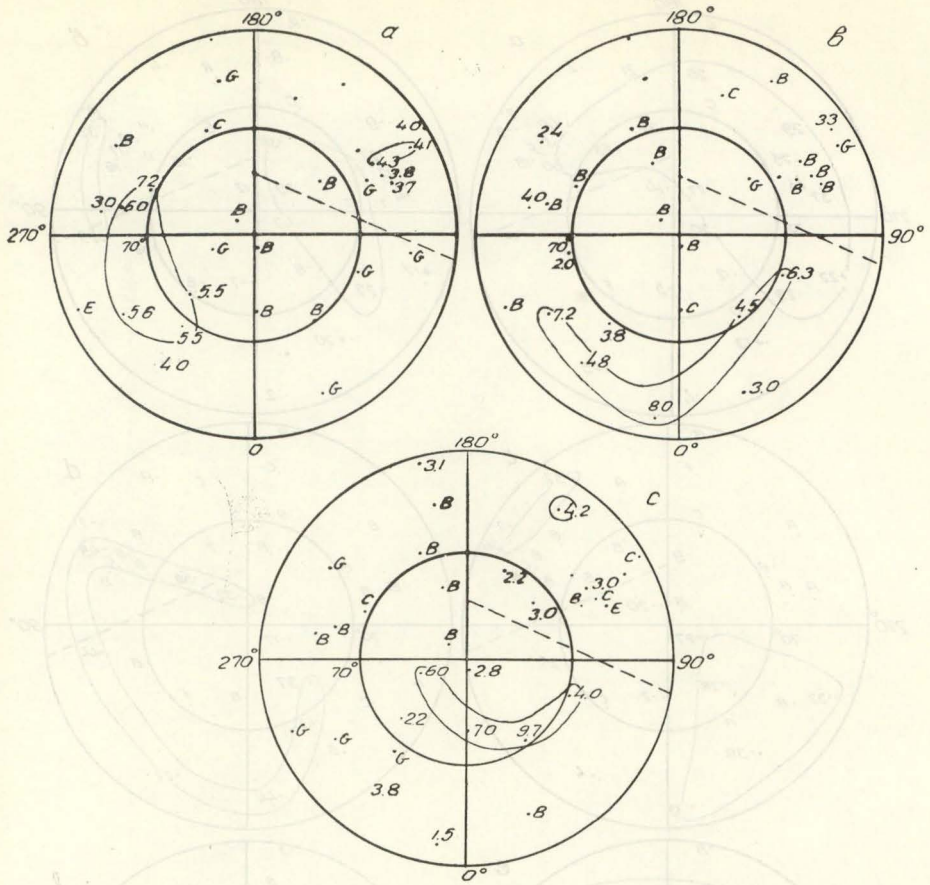

Fig. 3. Synoptical charts of fE_s
a—10hr. 21st, Sept.
b—6hr. 22nd, Sept.
c—0hr. 26th, Sept. 1957.

disturbances, accompanying great chromospheric flares and 1Y type radio bursts, abnormal absorption spreads above all the territory from the pole to 60–50°N. In these cases it is difficult to judge about *foF2* variations. By separate values one can suppose that in these periods *foF2* are considerably decreased. The height distribution of activity changes with the storm time and depends on the disturbance character. During moderate and small disturbances abnormal ionosphere variations are more often observed in *F* and *Es* regions. During the development of great disturbances considerable variations in low and upper ionosphere are observed, and at the end of the disturbances the most considerable variations occur in *F2*–region.