

THE HUMAN HEALTH DEPENDENCE ON THE GEOMAGNETIC ACTIVITY

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It is shown and statistically confirmed the growth of daily trauma occurrence during global geomagnetic storm periods. The daily data do not permit to reveal the effects of short-time geomagnetic disturbances of natural or technogenic character on the acute mental and cardiovascular pathologies

1. INTRODUCTION

One of the important factors of outer space origin having impact on biosystems is the variations of geomagnetic field. The complexity of the problem is connected, particularly, with the fact that the objects under study have their biophysical individuality changing during the object life under action of endogenic and exogenic factors. That's why the probability techniques are used to estimate the biotropic effects of the geophysical processes. It was shown in [1] the statistically confident with confidential probability $P=0.95$ the effect of the geomagnetic storms in the form of growth of daily number of heavy mental and cardiovascular diseases by factor 1.5-2 during the storm period in comparison with undisturbed periods.

2. THE SERIOUS TRAUMAS DURING GEOMAGNETIC STORM PERIOD

The present paper deals with the effect of planetary geomagnetic storms [2] on the daily occurrence of serious trauma fixed by Moscow ambulance with subsequent hospitalization (period of March 1983 – September 1984, 225 thousands cases totally). Accomplishment of random event criterion permits to estimate the event probability with the help of confidential interval, which was selected as 0.95. As well as in [1,3], the 7-day variation with maximum on Friday-Saturday, connected probably with the social causes, was excluded from the raw data. The amplitude of this variation was ~ 100 hospitalizations per day. The background of seasonal (yearly) variations was not excluded because it does not exceed the standard

mean deviation. On the Fig. 1 are presented the

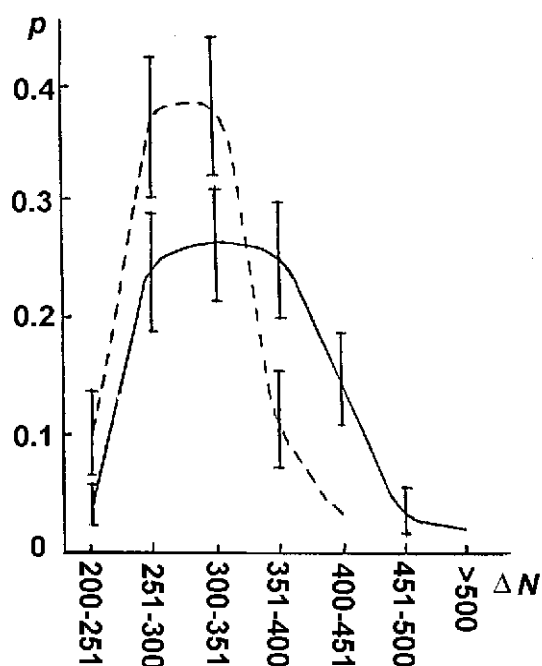


Fig.1 Distributions of daily occurrence of serious trauma for quiet conditions (dashed line) and for magnetic storm periods (solid line)

trauma (p) for quiet geomagnetic conditions and during geomagnetic storms. One can see that distribution for the geomagnetic storm period is shifted to the large number of hospitalizations. The confidential intervals are shown on the picture by vertical lines and they do not intersect for the quiet and disturbed conditions what means that the trauma occurrence growth is connected with the geomagnetic storms. It could be the attention weakness, de-coordination of movements and other malfunctions of human organism. The present analysis permits to make the quantitative estimation of the biotropic effect. The sum of hospitalizations for ranges which do not exceed the average daily occurrence ($\overline{\Delta N} = 330$) during geomagnetic storms is 0.55 while for the quiet periods it equals 0.86. For the ranges higher than daily mean occurrence these numbers are 0.45 and 0.14 respectively. It means that low number of

hospitalizations happens 1.5 times (0.86:0.55) more during quiet periods than during the geomagnetic storms, and contrary, the high number of hospitalizations happens 3 times more frequently (0.45:0.14) during geomagnetic storm period. The seasonal variations of the biotropic effects for trauma events were not revealed.

3. ACUTE MENTAL AND CARDIOVASCULAR PATHOLOGIES DURING SORT-TIME GEOMAGNETIC DISTURBANCES

It was shown in [3] that biotropic effect in acute mental and cardiovascular pathologies does not depend on the intensity of the planetary geomagnetic storm. It is of interest to regard the dependence of the short-time geomagnetic disturbances representing the substorms effects or the local technogenic effects. The same database (March 1983 – October 1984) was used for the analysis. The periods without the magnetic storms analyzed in [1] were divided for the quiet intervals when during the whole day the K-index did not exceed 3, and intervals of the short-time geomagnetic disturbances with the duration no less than 12 hours when the K-index exceeded 3 at least for one 30-hour interval. The total number of days under analysis was 352, from then there were 200 quiet and 152 with short-time disturbances. The IZMIRAN magnetic observatory data [2] were used for the K-index. The hospitalization occurrence data of Moscow ambulance for the suicide (2-23 cases per day), mental diseases (10-60 cases per day), myocardial infarction (5-70 cases per day) and brain vessels defeat (16-80 cases per day) were used. As in the previous analysis [1,3] the data were "cleaned" from the week variation. The background of seasonal (yearly) variations was not excluded because it does not exceed the standard mean deviation. The similar to Fig.1 distributions were built for every of pathologies for quiet and disturbed periods. The examples of distributions for suicides and myocardial infarction are shown in Fig.2. One can see that the curves practically coincide (the same effect is for other kinds of regarded pathologies). The absence of obvious effect does not mean the absence of the effect of sort-time geomagnetic disturbances. The biologic response probably exists but is within adaptation possibilities of organism [4] or the analysis needs more detail time scale, shorter than one day.

4. CONCLUSIONS

The statistical analysis of daily occurrence of hospitalization by Moscow ambulance for different diseases gave the following results:

1. with confidential probability $P=0.95$ the effect of the planetary geomagnetic storms on the heavy trauma occurrence is demonstrated. The trauma occurrence exceeding the mean daily number for the

whole regarded period growth by 3 times during geomagnetic storms in comparison with the quiet period.

2. daily sampling does not permit to reveal the effect of the short-time geomagnetic disturbances of natural and technogenic nature on the occurrence of acute mental and cardiovascular diseases

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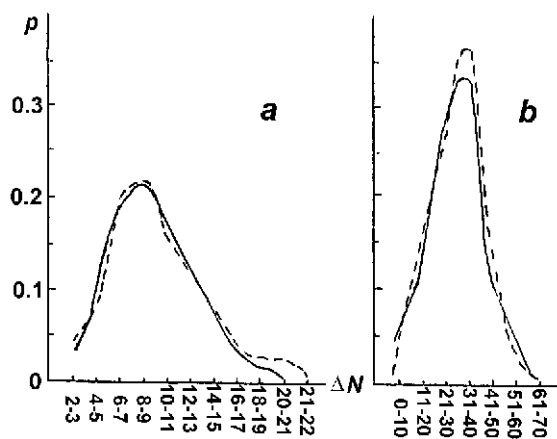


Fig.2 Daily occurrence distributions for suicides (a) and myocardial infarction (b) for quiet (dashed line) and disturbed (solid line) conditions

5. REFERENCES

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BIOGRAPHICAL NOTES

Valentina P. Kuleshova, graduated from Physical Faculty of the Leningrad State University. Is working at IZMIRAN more than 35 years. Main interests are: solar-terrestrial relations, development of forecast for planetary magnetosphere-ionosphere disturbances. Recently studied the biotropic effects of geomagnetic activity. Results are published in more than 60 papers.

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