Some researches for human health events based in extremely space weather period

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Abstract

By some experiments' verified, the ELF (extremely low frequency) can influence different levels of the organization of life, such as Biological membranes mast cells, endocrine glands cells and so on. The variation of geomagnetic filed may be a potential endanger factor for human health. In this paper, we will analyze the possibility of pre-alarming the human health events in extremely space weather period. And we will also advance some results of our researches such as the cardiovascular and cerebrovascular events, and Permeability of pleural effusion.

1. Introduction

Human health is influenced by many factors such as temperature, sunshine, atmospheric pressure and so on. There is another important factor electronic magnetic field which we can't feel easily.

The acceptance of the fact that weak electromagnetic fields (EMFs) are ecologically significant factors influencing many biological processes is one of the advances of science in the 20th century. For the geomagnetic flied is a kind of EMF, it may be a potential endanger factor for human health.

In early 1960s, some scientist had noted that the geomagnetic parameters had some relationship with some illnesses morbidity such as psychiatric ward behaviors, heart attacks, mortality and so on[1][2]. Scientists have researched the impact of geomagnetic activity for human health for a long time and got some meaningful results. The space weather is the direct contributor to variations of geomagnetic flied.

Space weather is often defined as the complexity of physical processes on the Sun, in the circum-terrestrial and interplanetary space, in the solar wind, magnetosphere, ionosphere, and thermosphere, which can influence not only performance and reliability of technological systems, but can also endanger different biological and ecological systems including human life and health. And the 'Space weather – Human health events' relations are global implications and hard to perceive easily.

There are two methods for researching the influences of space weather –human health. The first is mainly based on the past solar burst events and analyze clinical data during the space-weather events. Another method for researching 'Space weather – Human health events' is based on the experimental study of the mechanisms of biological activity of EMFs and irradiations in a wide range of frequencies.

In this paper we will also propose also a correlation between Permeability of pleural effusion and variations of geo-magnetic flied. And then we advance a kind of pre-alarm method for these human health events taking advantage of multi bands solar observation data.

2. Permeability of pleural effusion

Through some results of extremely low frequency-health experiment studies, we find that changes of the permeability of biological membranes in the ELF electromagnetic fields. So there may lead some diseases according to these changes during the geomagnetic storms.

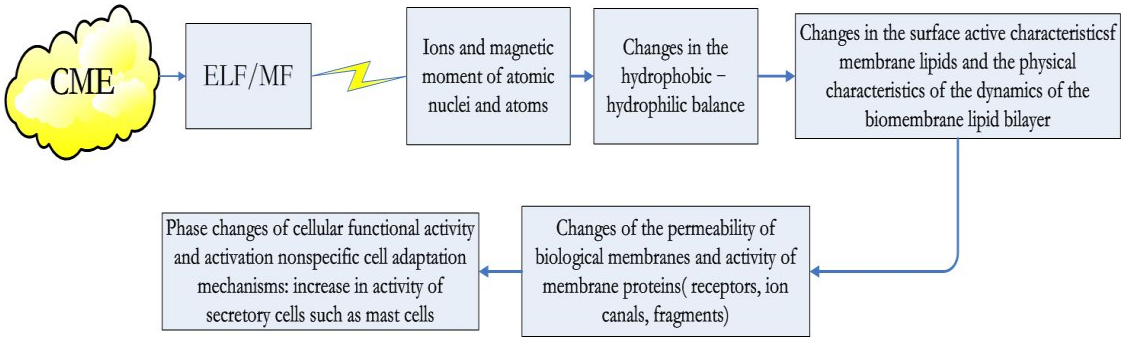

Fig1. Interference of the main mechanisms of influence of ELF MFs and geomagnetic storms during the space weather events[3]

We statistics the total Dst value (from http://www.nsmc.cma.gov.cn/NewSite/NSMC/Channels/) in 5 periods every year from Jan-2009 to Jun-2013 in the 24th solar active period and the total patients number and percentage of permeability of pleural effusion in the same time from the first affiliated hospital of Kunming medical university. And for avoiding interference of other space weather events, there must be not any magnetic storms before 5days of the beginning and the latest day of these periods.

Table1. The correlation between situation of pleural effusion and variations of geomagnetic flied

Period	Correlation between Total number and $\|D_{st}\|$	Correlation between Percentage and $\|D_{st}\|$
3.5-4.10	0.9419 p=0.0167	0.9297 p=0.0207
2.15-3.15	0.8265 p=0.0845	0.6562 p=0.2834
5.1-6.14	0.9613 p=0.0091	0.9190 P=0.0274
9.1-9.25	0.9148 p= 0.0852	0.9998 P= 0.0002
10.30-12.5	0.9781 P=0.0219	0.9836 P=0.0164

The parameter r is the Correlation Score, and p is the confidence coefficient. From the statics results, there are more than 70% results imply the statistical significance ($p<0.05$), and the results 2.15-3.15 may be influenced for the spring festive. So there are high correlation between the percentage of permeability of pleural effusion and absolution value of Dst, it may imply that the pleural effusion can be influenced by the variations of geomagnetic flied in a long time.

3. The cardiovascular and cerebrovascular events

Through some clinic observations, some doctors and scientists find that there exist some correlations between of cardiovascular and cerebrovascular events and geomagnetic activity.

The solar activities such as flares, CMEs (Coronal Mass Ejection) and so on are some direct

drivers for geomagnetic activity. Some researchers find that we can pre-alarm these events by Forbush Decrease (FD); the pre-alarm time is only 16-20hour. Figure 2 shows the correlation between cardiovascular diseases, car accidents and different characteristics of geomagnetic activity[3] (planetary index AA, major geomagnetic storms MGS, sudden commencement of geomagnetic storm SSC, and occurrence of a downward vertical component of the interplanetary magnetic field B_z and also the CR intensity decreasing phase of Forbush decreases(FD))

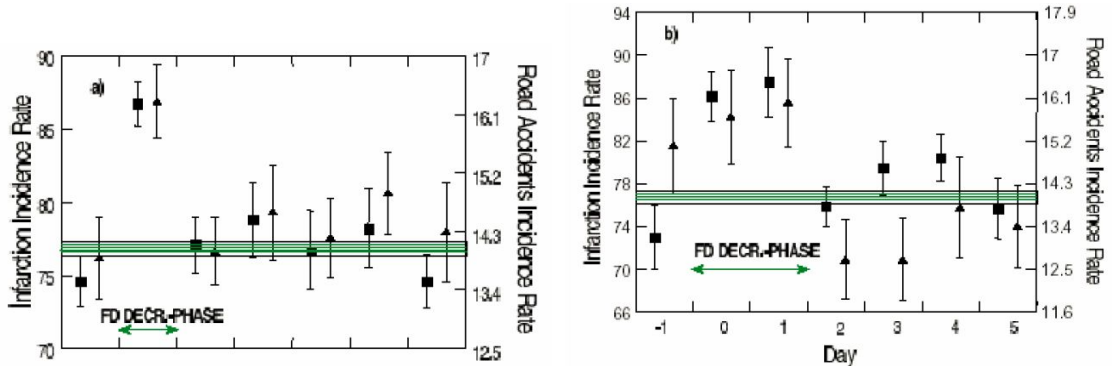

Fig2. Some Infarction (full squares) and road accident (full triangles) incidence during the time development of an FD: **(a)** CR decrease phase T<1 day; **(b)** CR decrease phase 1 day<T<2 days. With horizontal lines are shown average values for days without FD.

The radio solar bursts are always detected by solar radio telescopes ahead of the time that the plasma arrive earth and influence the geomagnetic environments 2-3 days, so we can get the alert information based on solar radio burst observations.

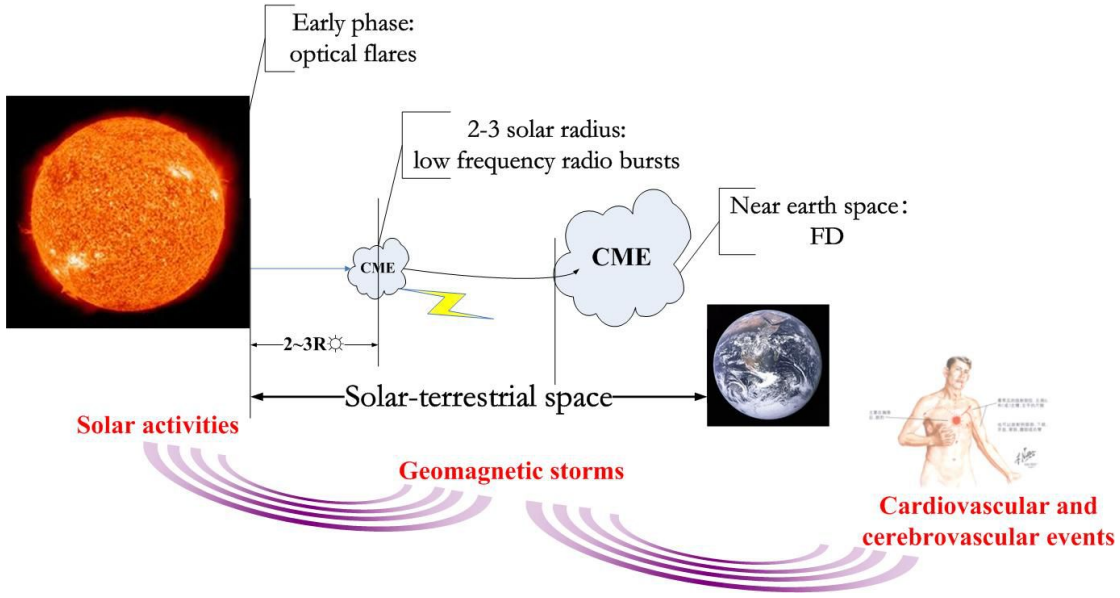

Fig3. The sequence of "solar burst—cardiovascular and cerebrovascular events"

In our work, we analyzed the total number of of cardiovascular and cerebrovascular patients which are supplied by the First affiliated hospital of Kunming medical university in solar radio burst period during 2012 March and May. We find that the total number of of cardiovascular and cerebrovascular events increased after the radio solar burst events 2-3 days.

We statistics the total number of cardiovascular and cerebrovascular patients during the subsequent half-month of two radio bursts and find there are a obviously increasing in the 2-3 days.

The total number of cardiovascular and cerebrovascular patients after radio bursts events in March and May 2012

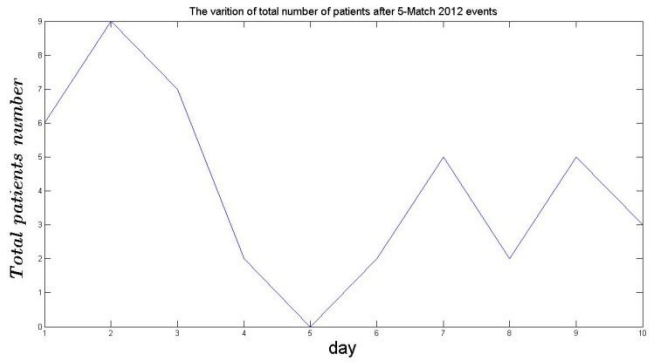

Fig4. The variation of total number of patients after 5th –Match 2012 events

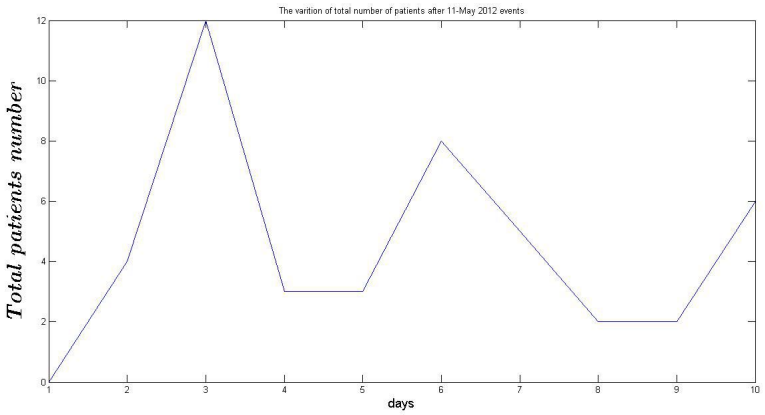

Fig5. The variation of total number of patients after 11th –May2012 events

In these two events, the total numbers of the patients after 2-3days obviously increased ($P(X \geqslant 9)=0.0033<0.05$ and $P(X \geq 12)=0.00012<0.05$) . So we can get a conclusion that we can get the early pre-alarm information taking advantage of some solar observation data such as radio bursts.

4. Acknowledgments

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5. References

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