Cerebral Pathology and Solar Activity and Meteorology

(Project: Medico-biological Problems Related to Solar Activity
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Summary

Acute cerebro-vascular disease put significant pressure on society, medical systems and family budgets. This has led to the study of a broad range of possible environmental links in the hope of finding and developing better prevention measures against the disease. The interest and research of the possible links between cerebral accidents and solar activity and/or meteorology dates back in 1934 when Dull and Dull described the health effects of sudden solar flares. In recent years, this phenomenon has been studies by few groups in the United States, Japan, France, Czech Republic and Israel.

The aim of the poster is to outline a just starting project (2011-2015) focusing on cerebral pathology and its potential correlation with geomagnetic activity and/or meteorology factors.

Over 6200 cases diagnosed with cerebro-vascular pathology (ischemic cerebral stroke, cerebral hemorrhages, transient cerebral cardiovascular conditions and dizziness) in First Municipality Hospital, Sofia, Bulgaria from 2001 till end of 2009 are the subjects in the study so far. Supposed relationships between monthly averages for Wolf numbers, solar flares index and Ap index on one hand, and the occurrence of cerebral pathology on the other will be carefully examined during the project lifetime. Preliminary analysis of data collected allows us to assume the existence of correlation between the geomagnetic activity and cerebral pathology.

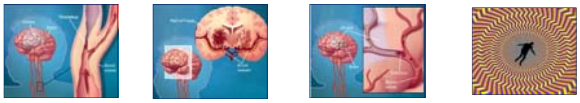
Project Duration: *2011 - 2015*

Partners:

- Space and Solar-Terrestrial Research Institute, Bulgarian Academy of Sciences, Sofia, Bulgaria
- First Municipality Hospital, Sofia, Bulgaria
- Space research Institute, Russian Academy of Sciences, Moscow, Russia
- Institute for Population and Human Studies, Bulgarian Academy of Sciences, Bulgaria
- University Hospital for Active Treatment "St. Anna", Sofia, Bulgaria
- Central Clinical Hospital GSC Russian Railways Moscow, Russia

Collected data so far: Out of >60000 patients treated in the Department of neurology, FMH-Sofia from 1.1.2001 till 31.12.2009, patients diagnosed for ischemic or hemorrhagic cerebral infarction, transient cerebral ischemia and dizziness were 6277. The distribution of the diagnoses is presented on the table below

Data for 2010, 2011 and … still to be collected



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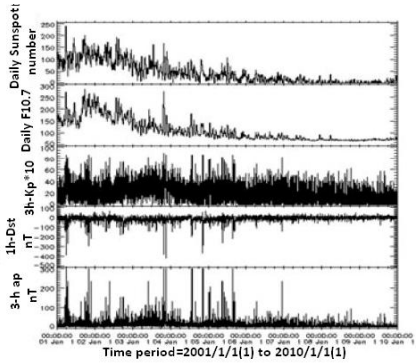
	Ischemic Cerebral Infarction		Hemorrhagic Cerebral Infarction		Transient Cerebral Ischemia		Dizziness	
	Men	Women	Men	Women	Men	Women	Men	Women
2001	242	232	61	65	18	18	1	7
2002	193	195	45	46	37	38	12	10
2003	231	246	26	23	19	16	11	18
2004	246	301	26	17	6	14	16	19
2005	201	236	32	20	11	16	3	7
2006	249	367	33	35	1	5	2	2
2007	295	379	29	35	7	2	28	57
2008	301	360	41	39	2	3	41	87
2009	295	399	26	38	3	7	29	77



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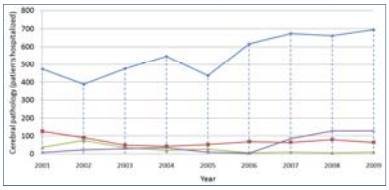

The project aims to study:

- The putative relationships between some solar activity indexes (Wolf numbers, solar flares, Ap index, etc) and meteorology factors on the one hand, and the occurrence of cerebral pathology on the other.

- The lag between the time of the cerebrovascular accidents and geomagnetic indexes as available data revealed that there may be a such lag;

- The relation between the cerebral accident (ischemic or hemorrhagic cerebral infarction) and the stages of magnetic storms as there are data that during geomagnetic disturbances the microcirculation parameters undergo rapid changes from increased coagulation (i.e. increased probability of thromboses) to decreased viscosity (i.e. increased probability of hemorrhages) [1];

- The authors plan to following the changes based on daily changes of solar activity and will have in mind the meteorology data at the time of analyses.

The project reflects the intense interest towards the influence of solar activity and meteorology on human brain. A number of publications reveal that such link may exist although we still do not know the exact mechanisms of these relationships. In sum:

- *It is accepted that geomagnetic effects are more pronounced at higher magnetic latitudes;*
- *Extremely high as well as extremely low values of geomagnetic activity seem to have adverse health effects;*
- *A subset of the population (10-15%) is predisposed to adverse health due to geomagnetic variations [2].*

When human brain functions are concerned, longitudinal studies support the hypothesis for a correlation between mental health and solar activity, just to mention some:

- Significantly negative correlation between the monthly means of the Wolf numbers, solar flares and Ap index on the one hand and monthly numbers of new cases of cerebral infractions were found by [3-4] . The authors reported that the increased intensity of the geomagnetic parameters appeared to be significantly connected with decreased occurrence of cerebral infarctions, and vice versa. This effect seems to last up to 17 months;
- A correlation between peaks in suicide numbers and geomagnetic activity (Ap index) was found in an Australian study. The correlation was gender dependant [5] ;
- A review of 13 years suicide rates in South African also suggested a link between suicides and magnetic storms [6];
- A 36.2% increase in the number of men admitted into hospital for depression in the second week after geomagnetic storms was revealed in another study [7]

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