Geophysical Research Abstracts
Vol. 13, EGU2011-10841-1, 2011
EGU General Assembly 2011

The threshold effects of Space and Terrestrial weather influence on human physiological parameters

Tamara Breus (1), Yurii Gurfinkel (2), Vadim Ozheredov (1), and Tatyana Zhenchenko (3)

(1) Spase Research Institute, Planetary Physics, Moscow, Russian Federation (breus36@mail.ru, +7 (495) 331248), (2) Central Clinical Hospital JSC "Russian Railways", Moscow, Russia, yugurf@yandex.ru, (3) Institute of Theoretical and Experimental Biophysics, Moscow District, Russia, zench@mail.ru

The database containing 368 precedents consist of data on atmospheric temperature (T), pressure (P), K-index of geomagnetic activity (predictors) and data of three –years monitoring of healthy volunteer (adapter) by specially developed device TONOCARD were used in this study. This device is intended for noninvasive measurements of arterial blood pressure (BP), pulse wave velocity (PWV) and endothelial function (EF) [Gurfinkel et al., 2009]. It is installed in medical unit of experimental complex of joint RUSSIA – ESA Project MARS-500, and in one of the control groups of healthy volunteers accompanying this experiment. Our studies are trial testing of this device. The objective of out study was to determine the threshold values of individual parameters of terrestrial and space weather, which causes the excess of negative effects associated with a significant increase or decrease of aforementioned physiological parameters in relation to their normal level. Search the threshold value that is the boundary of a half -bounded interval G was carried out by optimizing the target functional, depending on a reference half -bounded interval$\hat{G}$. The target functional is a difference of two mean random values $P\left(\hat{G}\right)\zeta_1$ and$P\left(\sim\hat{G}\right)\zeta_2$, where ζ_1 (ζ_2) is a physiological parameter (adaptor), which predictor is in the region $\hat{G}$ (not in $\hat{G}$), while $P\left(\hat{G}\right)$ ($P\left(\sim\hat{G}\right)$) is a prior probability for predictor to get in $\hat{G}$ (not in $\hat{G}$). Distributions of ζ_1 and ζ_2 values are:

$$p_{\zeta_1}(z)=\frac{\int\limits_{\hat{G}} p_{\theta|\xi}(z|x)\,p_\xi(x)\,dx}{\int\limits_{\hat{G}} p_\xi(x)\,dx} \qquad p_{\zeta_2}(z)=\frac{\int\limits_{\sim\hat{G}} p_{\theta|\xi}(z|x)\,p_\xi(x)\,dx}{\int\limits_{\sim\hat{G}} p_\xi(x)\,dx},$$

where ξ is a predictor, θ is an adaptor, $p_{\theta|\xi}$ is a conditional probability. Proved that in case of a reliable database the target functional $\Psi\left(\hat{G}\right)=P\left(\hat{G}\right)\zeta_1-P\left(\sim\hat{G}\right)\zeta_2$ reaches a maximum only when $\hat{G}\equiv G$. This fact makes it possible to determine the required threshold values of terrestrial and space weather. **Results**: significant increase in the PWV observed when the K-index is larger than 3.5, while all other parameters are not depending on K-index. Lowering SBP begins in excess of atmospheric temperature threshold of $22C^0$, the dependence of SBP from the atmospheric pressure is negligible. PWV begins to exceed its average value after $15C^0$. As shown in [Breus et al., 2010], PWV increases when temperature rises up to $20C^0$, and then ceases to grow.