

Possible influence of solar extreme events and related geomagnetic disturbances on human cardio-vascular state: Results of collaborative Bulgarian–Azerbaijani studies

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Abstract

This collaborative study is based on the analysis and comparison of results of coordinated experimental investigations conducted in Bulgaria and Azerbaijan for revealing a possible influence of solar activity changes and related geomagnetic activity variations on the human cardio-vascular state. Arterial blood pressure and heart rate of 86 healthy volunteers were measured on working days during a period of comparatively high solar and geomagnetic activity (2799 measurements in autumn 2001 and spring 2002) in Sofia. Daily experimental investigations of parameters of cardio-vascular health state were performed in Azerbaijan with a permanent group of examined persons. Heart rate and electrocardiograms were digitally registered (in total 1532 records) for seven functionally healthy persons on working days and Saturdays, in the Laboratory of Heliobiology at the Medical Center INAM in Baku, from 15.07.2006 to 13.11.2007. Obtained digital recordings were subjected to medical, statistical and spectral analyses. Special attention was paid to effects of solar extreme events, particularly those of November 2001 and December 2006. The statistical method of the analysis of variance (ANOVA) and post hoc analysis were applied to check the significance of the influence of geomagnetic activity on the cardio-vascular parameters under consideration. Results revealed statistically significant increments for the mean systolic and diastolic blood pressure values of the group with geomagnetic activity increase. Arterial blood pressure values started increasing two days prior to geomagnetic storms and kept their high values up to two days after the storms. Heart rate reaction was ambiguous and not significant for healthy persons examined (for both groups) under conditions with geomagnetic activity changes. It is concluded that heart rate for healthy persons at middle latitudes can be considered as a more stable physiological parameter which is not so sensitive to environmental changes while the dynamics of arterial blood pressure reveals a compensatory reaction of the human organism for adaptation.