THE INFLUENCE OF COSMIC RAYS ON TEMPERATURE IN LOW EARTH'S ATMOSPHERE

N. I. Lozitska[1], **V. V. Lozitsky**[2]

[1] *Astronomical Observatory, Taras Shevchenko National University*
3 Observatorna St., 04053 Kyiv-53, Ukraine
e-mail: lozitsky@aoku.freenet.kiev.ua

[2] *Taras Shevchenko National University*
6 Glushkova St., 03022 Kyiv, Ukraine

The correlation analysis shows the strong connection of the tropospheric temperature with vertical component of the geomagnetic field strength along geographical parallels. The correlation reaches –0.95 in winter on latitudes 65°–75°. The possible physical mechanism of this influence is discussed. Most likely, the falling of the ozone maximum altitude in the areas of the geomagnetic field decreasing leads to air warming near the tropopause followed by further spread of a heat to the sea level.

Until recently the connection between the temperature in the low atmosphere of the Earth and solar activity is not confirmed statistically. However, the 11-years solar cycle has been found in the indirect parameters of the atmosphere, *e.g.*, number of storms, frequency of droughts, *etc.*

We continued the research, initiated earlier by Mustel and co-authors [3], who found that after the penetration into the magnetosphere of solar corpuscular streams the region with strongest tropospheric depression was coincide with the regions of the anomalous geomagnetic field. This result adds to the observation [4] about ruptures in the tropopause by the heated stratospheric air after Forbush decreases caused by solar flares. From these results it follows that possible connection between the temperature and geomagnetic field needs a careful and detailed investigation.

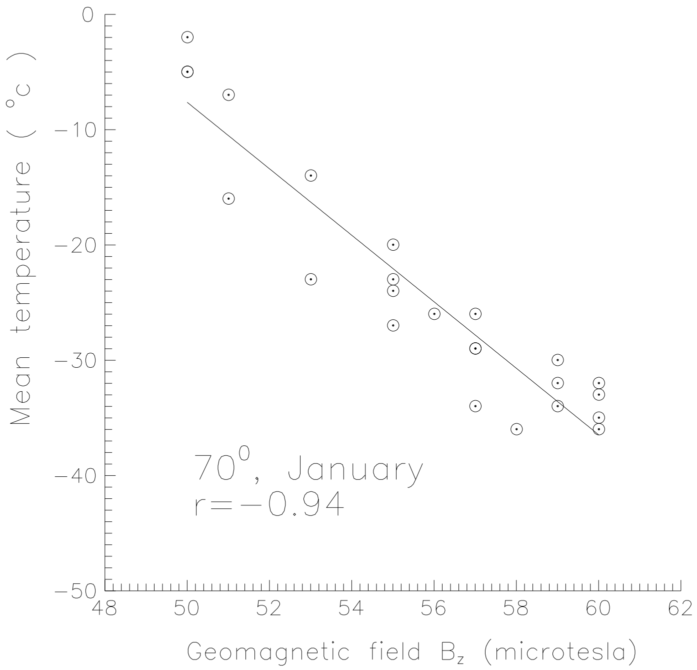

Figure 1: The regression dependence for January temperature versus geomagnetic field along 70° N latitude as an example of very strong dependence of T on B_z ($r = -0.94$)

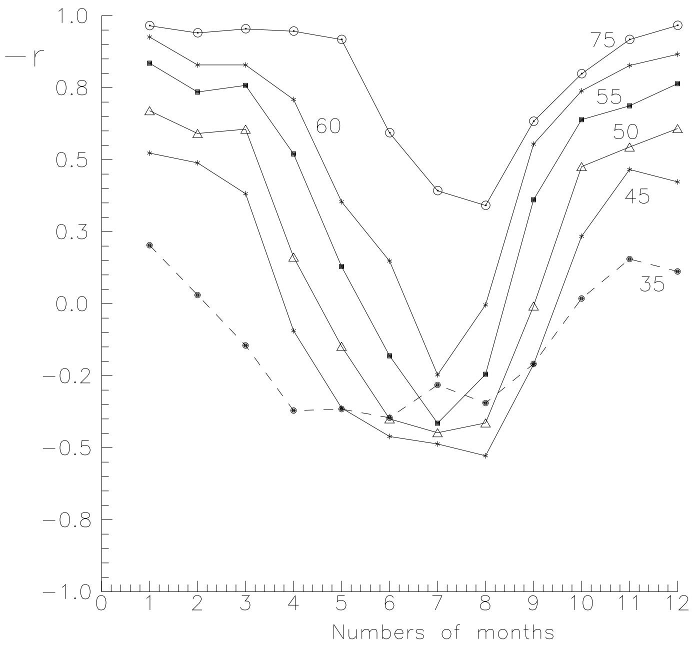

Figure 2: The correlation coefficient $r(T, B_z)$ for different north latitudes and months of a year. One can see the strong negative correlation at latitudes of 50°–75° in winter ($q \leq 0.01$) and reverse one in summer ($q \leq 0.05$)

We used the data [2] on the average monthly temperatures for 1891-1976. The magnetic field strengthes for the same period were used from [1]. Each of the geographical parallels was divided into 24 parts, and annual average values of T and B_z in 15° sections were compared to obtain the regression dependencies (Fig. 1). The same analysis was made for latitudes from 35° to 75° (Fig. 2). It was shown that the maximum of the correlation coefficient reaches –0.95 in winter on latitudes 65°–75°.

Our results confirm the following hypothesis. The solar corpuscular bursts cause the particles flow from radiation belts into the areas of minimum B_z, lowering the maximum ozone height. Stratospheric air near the tropopause is heated by ozone mechanism and heat transfered to the sea level. In summer the near-ground air masses are warmer than those arrived from the tropopause. Therefore, the correlation coefficient changes its sign.

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