

Eruptive events on the Sun have an impact on immediate cosmic surroundings of the Earth. Through induction of electric current also affect Earthbound structures such as the electric power distribution networks. Inspired by recent studies we investigate the correlation between the disturbances recorded by the Czech electric-power distributors with the geomagnetic activity represented by the K index.

We found that in the case of the datasets recording the disturbances on the power lines with the high and very high voltage levels and disturbances on electrical substations, there was a statistically significant increase of failure rates in the periods of maxima of geomagnetic activity compared to the adjacent minima of activity. There are hints that the disturbances are more pronounced shortly after the maxima than shortly before the maxima of activity.

Our results provide hints that the geomagnetically induced currents may affect the power-grid equipment even in the mid-latitude country in the middle of Europe. A follow-up study that includes the modelling of geomagnetically induced currents is needed to confirm our findings.

The second part of our research includes modelling of geoelectric field using one-minute geomagnetic measurements from Intermagnet database. We applied this model to the long-term measurements of the geomagnetic field during the period of increased solar activity (for example in days when aurora was observed) and considered possible destructive effects on the distribution network infrastructures. Using geoelectric field we computed currents that are induced in these infrastructures. Their values varied in order of tens of amperes. Thus we got a strong hint for effects of geomagnetic activity even in the mid-latitude country such as the Czech Republic.