



Relationship between space weather effects and failures of electrical grids in South Poland

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Nowadays, when human kind is so addicted from various electrical and electronic equipment, it is of a special interest to understand the possible origins of the interruptions in electricity supply. Failures in ground-based electrical and electronic systems, or disturbances of satellites operation (e.g. Global Positioning System) caused by influential magnetic storms caused by the changeable Sun can have a high economic impact. These strong magnetic storms are triggered by solar-driven disturbances in interplanetary space. Studies of these phenomena have gained a special pace since the incident that had occurred in northern Canada in March 1989. During this event the work of the hydroelectric plant in the region of Quebec was blocked for long, winter hours and many citizens of this region of Canada suffered from a blackout. Analysis performed in the Oak Ridge National Laboratory showed that if that blackout had taken place in the USA then costs generated only by a not supplied electricity could even reach 6 billion USD.

In our paper we apply time series and statistical analysis tools, i.e. summation and Wilcoxon Matched Pairs Test, for a large set of data, among them: 4625 failures of electrical grids in southern Poland in 2010 (from the total number of 25616) and 10656 in the first seven months of 2014 (from the total number of 30155), which might be connected with the above described effects. We analyze data of breakdowns with unidentified reasons, as well as failures connected to the aging and electronic devices, which occurred during the periods of an increased geomagnetic activity. Based on the data from The Institute of Meteorology and Water Management-National Research Institute we eliminate from the consideration those failures which had meteorological grounds. Our analysis show the usefulness of these tools in such a vital for a modern societies issue, as well that powerful phenomena of solar origin, somewhat disturbed in 2010 and January-July 2014 the electrical grids productivity in southern Poland.