

Global Warming – A Solar-Terrestrial Phenomenon without Connection with Greenhouse Gases in Earth’s Atmosphere

Nikolay Takuchev*

Trakia University, Stara Zagora, Bulgaria

*Corresponding author Email: nnppptt@gmail.com

Received 9 December 2024

Abstract. The paper presents arguments in support of the hypothesis that the global warming of the Earth, which we have witnessed over the past few decades, is due to solar influence on the Earth. The proposed hypothesis does not require the hypothesis of human intervention in this phenomenon.

KEY WORDS: Global warming, Solar positive particles, Temperature, Sun Spot Numbers, GOES satellites.

1 Introduction

The author presents arguments supporting the hypothesis that global warming of the last 70 years is probably a consequence of streams of high-energy, positive solar particles. These particles are emitted predominantly at the “rise” phase of the 11-year solar activity cycle, and associated with them is a weak pulsation of cloudiness in the Earth’s atmosphere with a positive correlation with the Sun Spot Number (SSN) at the “rise” phase of the solar activity cycle. Penetrating deep into the Earth’s atmosphere, these particles increase air ionization at the level of cloud formation. The additional ions serve as condensation nuclei around which water droplets form, i.e., additional cloudiness is formed. Electromagnetic radiation is the energy carrier that heats the Earth’s surface. The additional clouds reflect a part of electromagnetic radiation back into space. Less solar electromagnetic energy reaches the Earth’s surface, which lowers the surface air temperature (a negative correlation with the SSN).

When solar activity decreases, as observed in the last 70 years, the reverse process occurs – cloud cover decreases, more solar electromagnetic radiation reaches the Earth’s surface, and the temperature increases, the phenomenon known as global warming.

An additional argument for the presence of high-energy radiation that penetrates deeply into the Earth’s atmosphere and even reaches the Earth’s surface is the

observable fact – high statistically significant correlations between the fluxes of such radiation recorded by GOES series satellites in a geostationary orbit (36000 km above the Earth’s surface) and the human mortality from deadliest diseases.

2 Objective

Below are examples from a study of the effect of solar activity on the Earth’s temperature. The consequences of the penetration of streams of high-energy, positively charged solar particles through the Earth’s atmosphere to the surface are also discussed.

3 Material and Methods

In connection with the described study, four types of data were collected and processed, obtained from reliable sources – recognized databases of NOAA, NASA, EUROSTAT, and US National Center for Health Statistics – 1. Data for the surface temperature [1, 2], 2. Data for solar activity cycles [3, 4], 3. Data for the solar corpuscular radiation with high energy, reaching the Earth’s orbit [5], and 4. Data for mortality in the human population from causes, mostly diseases, supposedly dependent on said solar radiation [6, 7]. The joint study of the three

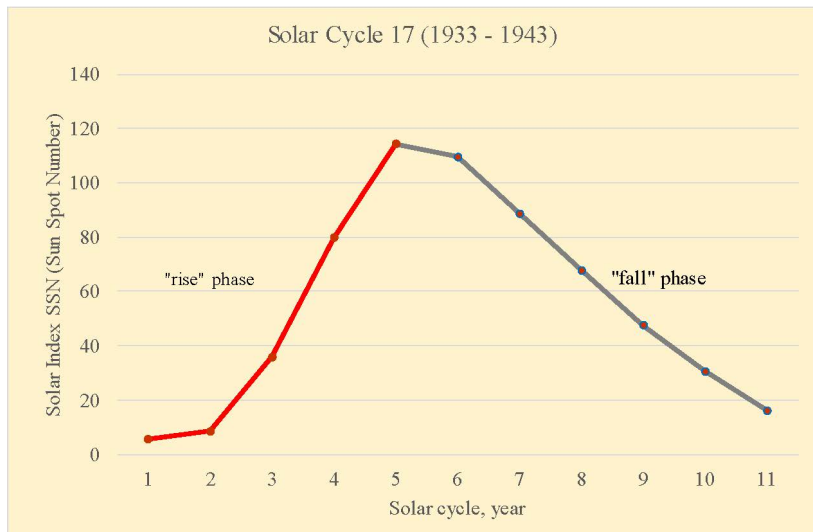


Figure 1. A cycle of solar activity in the example of solar cycle 17. During the first phase of the cycle (phase “rise”), solar activity increases and reaches a maximum (the largest SSN), and then during the second phase (phase “fall”), the activity decreases to a minimum before the start of the next cycle.

data types allowed a conclusion to be drawn as to the cause of an invisible chain of interconnected phenomena, to which, in the author's opinion, global warming is also connected. Data for annual surface air temperatures were retrieved from the Global Historical Climatology Network daily (GHCNd) database, the National Climatic Data Center, NOAA website. The database includes thousands of climate stations, but temperature data were retrieved only for stations whose range of continuous annual temperatures is at least five solar cycles long back in time, starting from the last completed (24th) solar cycle – a total of 872 stations.

4 Results

Of the stations included in the study, those with a negative correlation between temperature and SSN during the “rise” phase (Figure 1) of the studied series of several recent solar cycles were 812, i.e., 93% of the surveyed stations. Of these, 321 stations had statistically significant correlations (significance level at least 0.05). Of these, 163 stations had statistically significant correlations less than -0.900 (significance level at least 0.05). Most often, maximum statistically significant negative correlations were obtained in six continuous cycles (171 cases). They quickly decrease with the increase in the length of the series of cycles, reaching 1 case for a length of 9 cycles.

The phenomenon is observable worldwide (Figure 2), but sufficiently long temperature data are available mainly for Europe (Figure 3). There are also stations for which this phenomenon is barely noticeable or not observed.

The following considerations are for a weather station in Stara Zagora, Bulgaria, with temperature data for 126 years. Figure 4 shows the high negative correlation between the average temperature measured at the station during the years with a “rise” phase and the SSN for the same phase. There is no analogous

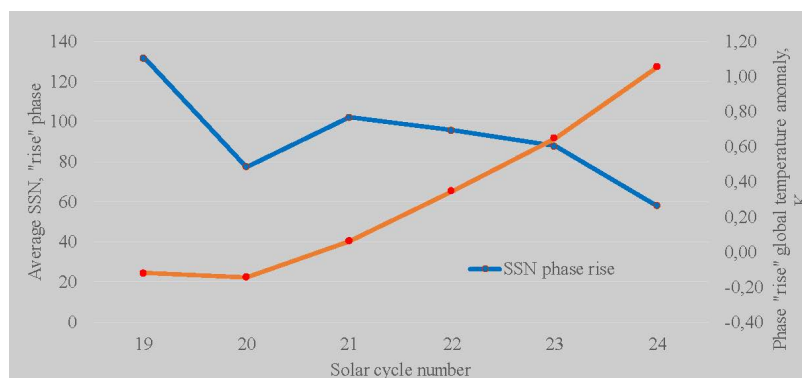


Figure 2. SSN for “rise” phase and global temperature anomaly, correlation coefficient -0.583, statistically insignificant.

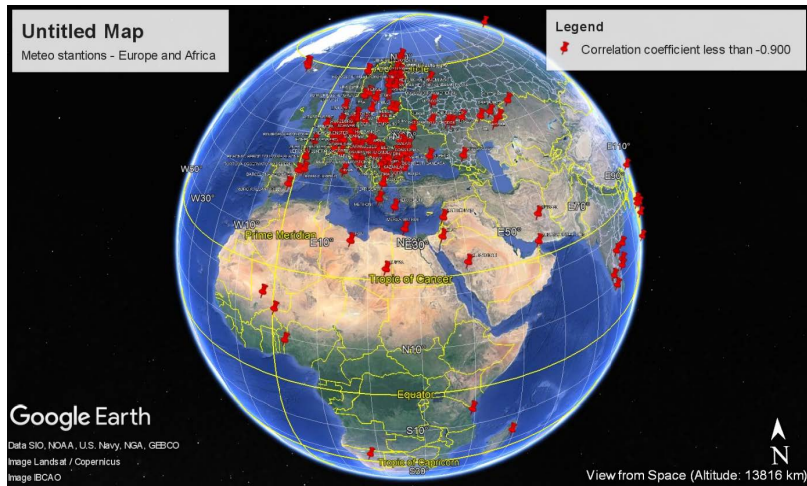


Figure 3. The stations with correlation coefficients below -0.900 between surface air temperature and SSN for the phase “rise” of the solar cycles.

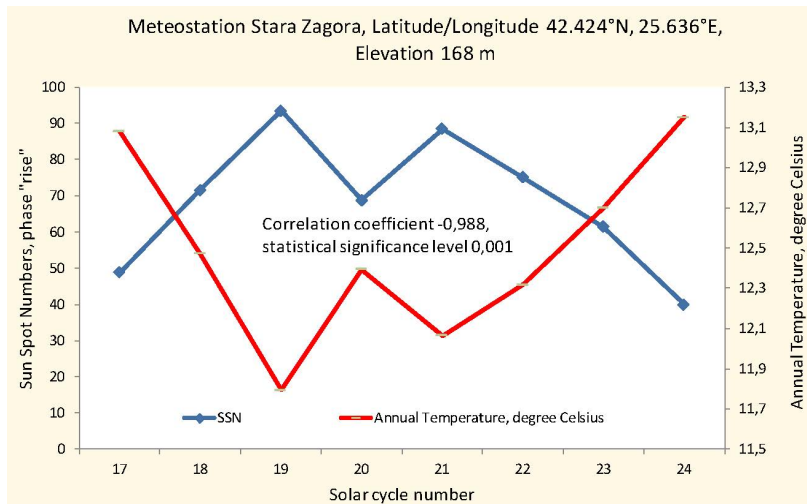


Figure 4. There is a high statistically significant negative correlation between the mean surface air temperature for the weather station STARA ZAGORA, BULGARIA, and the mean value of the number of sunspots during the phases “rise” of the last eight solar activity cycles.

relationship for the “fall” phases (Figure 5).

Between the average temperature measured at the station during the years with a “rise” phase and the SSN for the same phase, there is a strong linear relationship

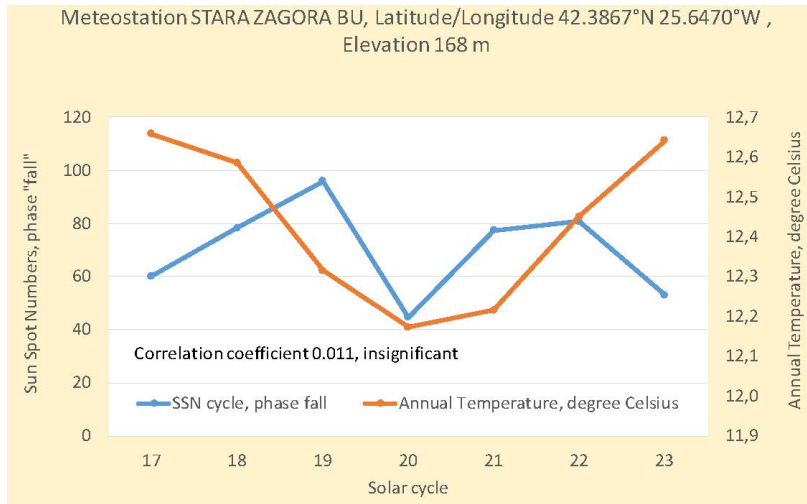


Figure 5. No statistically significant correlation exists between the mean surface air temperature for the weather station STARA ZAGORA, BULGARIA, and the mean number of sunspots during the phase “fall” of the last seven solar activity cycles.

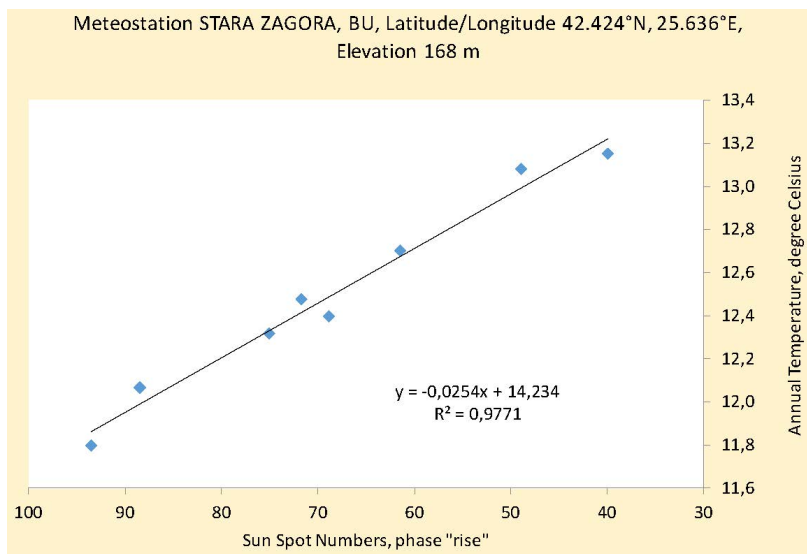


Figure 6. There is a linear relationship with a very high coefficient of determination $R^2 = 0.9771$ between surface air temperature in the region of STARA ZAGORA, BULGARIA, and the number of sunspots, both calculated for the phase “rise” of the solar cycles included in the study.

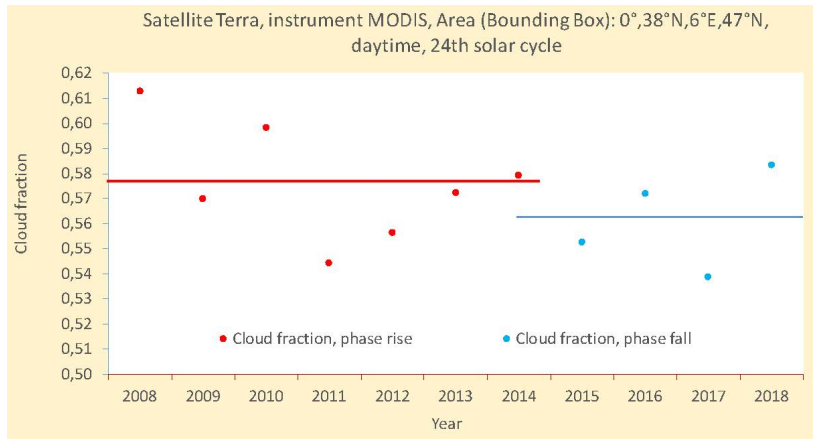


Figure 7. Daytime cloudiness over the western Mediterranean is about 1.5% more during the phase “rise” of the solar cycle than during the phase “fall”.

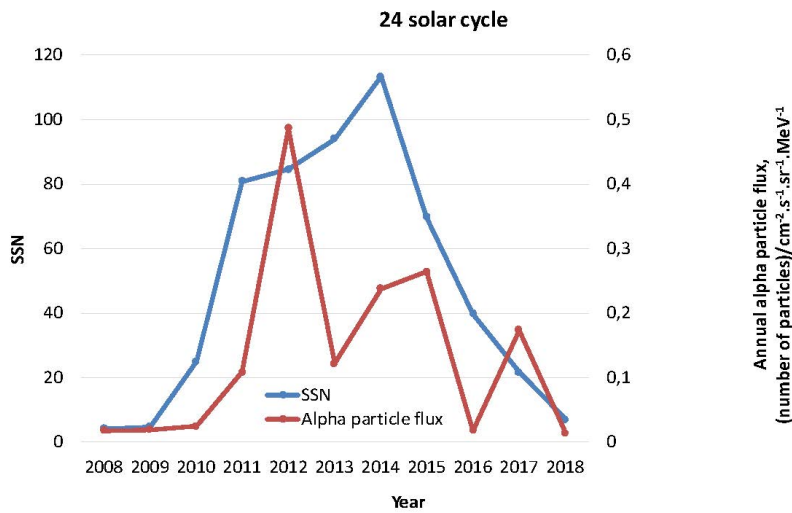


Figure 8. Annual alpha particle flux is about 20% higher magnitude during the phase “rise” than the phase “fall” of the last full (24th) cycle of solar activity.

with a coefficient of determination $R^2 = 0.9771$ (Figure 6). The deterministic linear dependence has a determination coefficient of 1.000 and only one independent variable. In this case, the temperature depends linearly only on one cause – the solar activity characterized by SSN for the “rise” phase. The obtained result rejects the hypothesis of dependence of the rising temperature on the concentration of greenhouse gases, at least for the region of Stara Zagora.

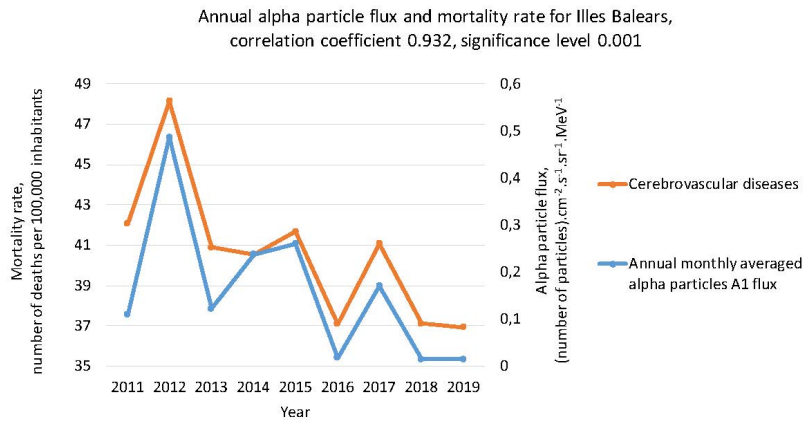


Figure 9. There is a high statistically significant correlation between the annual flux of high-energy solar alpha particles and cerebrovascular disease mortality in the Western Mediterranean, indicating that there is very likely a causal relationship between the two phenomena.

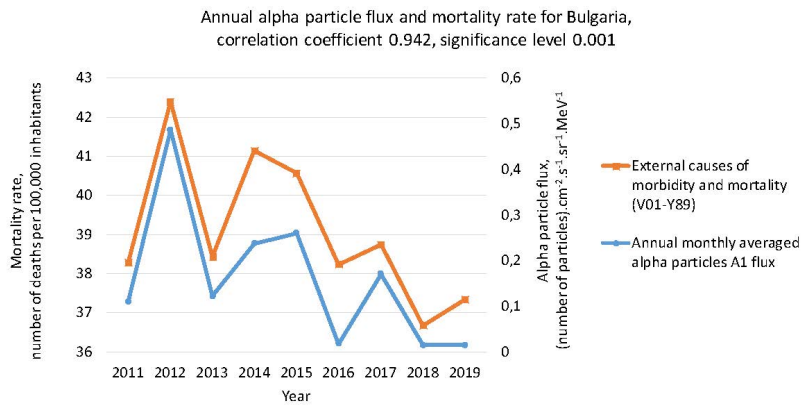


Figure 10. There is a high statistically significant correlation between the annual flux of solar alpha particles with high energy and the mortality from external causes of death in Bulgaria, i.e., it is very likely that there is a causal relationship between the two phenomena.

This conclusion is particularly impressive, as it was made for the Stara Zagora region, the air above which should contain an increased amount of carbon dioxide released from the burning coal in the powerful energy complex with thermal power plants located in the area (total power 3 GW). Since in a source region of greenhouse gases, their influence on the rising air temperature is negligible, the conclusion is that solar activity is the dominant, if not the only, cause of the global increase in air temperature in the last few decades.

8 *Global Warming – A Solar-Terrestrial Phenomenon without ...*

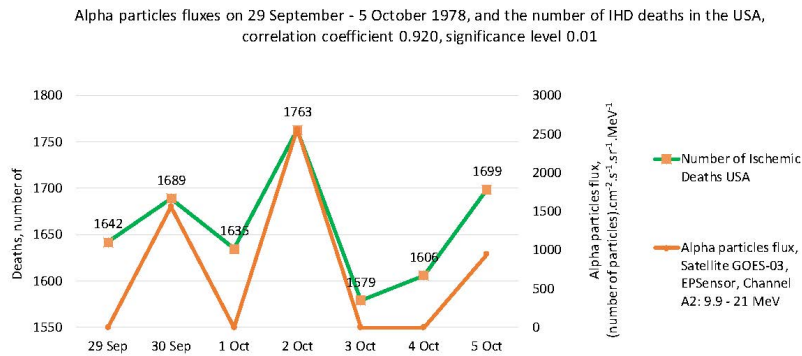


Figure 11. There is a high statistically significant correlation between alpha particle fluxes on September 29th and October 2nd, 1978, and the daily number of ischemic heart disease deaths in the USA.

Increasing cloud shading during the daytime during the “rise” phase reasonably explains this phase’s decrease in surface temperature. The increased cloudiness may be due to the increased number of condensation nuclei in the atmosphere at the condensation level where the cloudiness forms. Condensation and, as a result, the formation of clouds depends on the presence of ions, which at a height of several kilometers are the only type of condensation nuclei around which water vapor forms droplets and, as a result, clouds. Daytime cloudiness during the “rise” phase of the solar activity cycle is higher than during the phase “fall” (Figure 7).

A likely source of ionizing radiation, increasing the number of condensation nuclei in the atmosphere, is explosive processes on the Sun, which become more frequent during the “rise” phase compared to the “fall” phase of the solar activity cycle (Figure 8).

The high-energy solar protons and alpha particles were detected in the Earth’s orbit by GOES satellites in the geostationary orbit (36000 km above the Earth’s Equator). Evidence that they penetrate Earth’s atmosphere is the observable fact that they evoke increased human mortality from many causes – mostly diseases (Figures 9, 10, and 11).

As solar activity has decreased over the last 70 years – the last few solar cycles up to the 24th number have had a monotonically decreasing number of sunspots – their negative correlation with temperature results in a rising surface air temperature. According to the hypothesis presented above, this increase is related to processes in the Sun and has nothing to do with the increasing concentration of greenhouse gases in the surface atmosphere.

The electromagnetic component of solar radiation supplies the energy for global warming, regardless of the immediate cause of its occurrence – streams of solar

positively charged particles or greenhouse gases. To mitigate the consequences of global warming, regardless of its cause, efforts must be redirected from combating greenhouse gas emissions to increasing the planet's reflectivity of solar electromagnetic radiation.

Bibliography

- [1] NOAA National Climatic Data Center <https://www.ncdc.noaa.gov/cdo-web/data-tools/selectlocation>.
- [2] NOAA National Centers for Environmental Information (2024) Climate at a Glance: Global Time Series, <https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/global/time-series>.
- [3] SSN, Royal Observatory of Belgium, Brussels <http://www.sidc.be/silso/datafiles#total>.
- [4] SSN, NOAA <https://ngdc.noaa.gov/stp/space-weather/solar-data/solar-indices/sunspot-numbers/american/>.
- [5] Data from GOES satellites. Available: <https://www.ncei.noaa.gov/data/goes-space-environment-monitor/access/avg/>.
- [6] EUROSTAT, European short list of deaths by cause, death rate by NUTS 2 region of residence Statistics, Eurostat (europa.eu) 10/10/2023.
- [7] Centers for Diseases Control and Prevention (CDC), USA, National Center for Health Statistics (NCHS), Scientific Data Documentation, Detailed Mortality File, 1962-1992 https://wonder.cdc.gov/wonder/sci_data/mort/detailed/type_txt/DetailedMortality1962-1992.asp, last visited on 20. III.2023.