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CLIMATE CHANGES INSTEAD OF GLOBAL WARMING

by

Milan M. RADOVANOVIĆ [a]*, Vladan DUCIĆ [b], and Saumitra MUKHERJEE [c]

[a] Geographical Institute "Jovan Cvijić", Serbian Academy of Sciences and Arts, Belgrade, Serbia
[b] Geographical Faculty, University of Belgrade, Belgrade, Serbia
[c] School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India

Short paper
DOI: 10.2298/TSCI140610076R

Air temperature changes on Earth in recent years are the subject of numerous and increasingly interdisciplinary research. In contrast to, conditionally speaking, generally accepted views that these changes are conditioned primarily by anthropogenic activity, more results appear to suggest that it is dominant natural processes about. Whether because of the proven existence of areas in which downtrends are registered or the stagnation of air temperature, as opposed to areas where the increase is determined, in scientific papers, as well as the media, the increasingly present is the use of the term climate changes instead of the global warming. In this paper, we shall try to present arguments for the debate relating to the official view of the Intergovernmental panel on climate change, as well as research indicating the opposite view.

Key words: *climate changes, Intergovernmental panel on climate change, debate, solar activity*

Introduction

Emission of greenhause gases from plants, transportation, individual fire-places, *etc*., has been the problem that modern humanity must resolve as soon as possible. Air pollution is reflected both in living organisms and the thermal properties of the atmosphere, especially in terms of anticyclonic weather conditions. However, what has been the subject of scientific debates for many years is to which extent the temperature changes are the result of the natural processes and how much a man by his actions is the cause of these changes. In this paper, we briefly introduce the newest standpoints of the Intergovernmental panel on climate change (IPCC), as well as the results of the research of the scientists who are classified into the so-called skeptical science.

Regardless of the rapid development of science and technology at the present time, theoretical considerations have not yet reached such a level that would uniquely explain the causes of the formation of the long-period fluctuations and trends of climate fluctuations in the direction of cooling or warming. Even more serious has been the prediction based on quantitative data of future climate change. To provide energy assessment of possible causes of climate

* Corresponding author; e-mail: milan.geograf@gmail.com

changes one must start from the equilibrium balance of the thermodynamic energy, from which it follows that the mean temperature of the atmosphere of the planet is set by the following parameters:

– the size of the received solar radiation,
– the ability of reflecting solar radiation, that is, albedo,
– the losses occurred by long-wave radiation of the Earth's surface, and
– turbulent heat exchange with the surface.

Part of the energy is converted into kinetic energy by the motion of the atmosphere. In addition, the energy circulation of the atmosphere leads to a redistribution of heat energy on the planet. The complex interactions of all these parameters lead to what we observe as fluctuation and climate changes at different time intervals.

The representation of the most important standpoints of the IPCC

The IPCC is a scientific intergovernmental body under the auspices of the United Nations. It was established in 1988 by the World meteorological organization (WMO) and the United Nations environment programme (UNEP). The IPCC produces reports that support the United Nations Framework Convention on Climate Change (UNFCCC), which is the main international treaty on climate change. IPCC reports also contain a "Summary for Policymakers", the concise and most cited IPCC documents.

The ultimate objective of the UNFCCC is "to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" [1]. The IPCC does not carry out its own original research, nor does it do the work of monitoring climate or related phenomena itself. The IPCC bases its assessment on the published literature, which includes dominantly peer-reviewed sources.

Taking on the role of institution in awakening the conscience of mankind, the IPCC in the reports periodically publicly expressed its views on the possible future climate changes caused by, first of all, increase in the concentration of CO_2. Thanks to its work, the terms "global warming" and "greenhouse effect" have become a standard part of scientific vocabulary. However, in the popular literature some positions of the IPCC are often uncritically taken, or "catastrophic" variants and the apocalyptic visions of the future climate are put in the first plan of increasing temperature. On the other hand, there are quite a few authors who consider the IPCC projections oversized, citing strong arguments and scientifically verifiable facts. "This seems to be the case also with studies on the increase in atmospheric carbon dioxide content. Here, many studies have been performed, but many of them are not found by our search string that is concentrated on climatic consequences of increased levels of greenhouse gases and not on the atmospheric chemistry in its background" [2]. In the example of "Summary for Policymakers" from 2001, it can be seen that the standpoint of the IPCC is that anthropogenic influences are dominant in the contemporary climate variations, although in the report itself there are inconsistencies and ambiguities [3].

What can be inferred about it, what is the impact of human activities on fluctuation and climate change in the 20th century? It stands in the "Summary for Policymakers" that it is unlikely that the warming in the last 100 years is solely the consequence of the self-regulation of the climate system. Also, the reconstructed data for the last 1 000 years indicate that it is unlikely that it is caused entirely by natural causes. However, at the end of the same paragraph, it is said: "Nevertheless, the observed warming in the first half of the 20th century could be attributed to the natural factors". The sentence from the previous paragraph merges with the last sentence

where it is stated that "there are new and compelling evidences that most of the warming registered in the last 50 years is attributable to human activities".

Talking about the rise in air temperature in the 20th century in the first paragraph, it is said that "the observations showed a high degree of variability, and that most of the warming during the 20th century occurred during two periods: 1910-1945 and 1976-2000". This means that possible anthropogenic greenhouse effect could dominate only in the last quarter of the 20th century, as the natural factors are the cause of the temperature change in the first half of that century, and significant change in temperature is not observed in the period 1946-1975.

The increase in the average temperature on the surface of the planet in the 20th century was 0.6 ± 0.2 ºC. However, as noted above, this increase was predominantly carried out in two periods: 1910-1945, when there was no anthropogenic impact and 1976-2000, when there was anthropogenic impact according to the IPCC. This means that the growth was taking place not only in the last quarter of the 20th century, when it could possibly be dominated by anthropogenic greenhouse effect, but part of this increase can undoubtedly be attributed to natural factors, up to 1945. Nevertheless, the effect of urban heat island is not excluded. From all of these, it is clearly implied that the increase in planetary temperature of 0.6 ± 0.2 ºC cannot be solely attributed to anthropogenic impact.

In a document of the Report of Working Group I of the Intergovernmental Panel on Climate Change, Summary for Policymakers, from 2013 [4], is the following: "It is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together. The best estimate of the human-induced contribution to warming is similar to the observed warming over this period. Greenhouse gases contributed a global mean surface warming likely to be in the range of 0.5 °C to 1.3 °C over the period 1951 to 2010, with the contributions from other anthropogenic forcings, including the cooling effect of aerosols, likely to be in the range of –0.6 °C to 0.1 °C. The contribution from natural forcings is likely to be in the range of –0.1 °C to 0.1 °C, and from natural internal variability is likely to be in the range of –0.1 °C to 0.1 °C. Together these assessed contributions are consistent with the observed warming of approximately 0.6 °C to 0.7 °C over this period".

Therefore, the contribution to global warming from natural forcings and from natural internal variability is in the range between –0.2 °C to 0.2 °C over the period 1951 to 2010. It is not sure if the natural factors influenced the decrease or increase in temperature, or they had any impact, either individually or in total. The range of estimate of the impact of anthropogenic factors is significantly higher, whereas a sign for the effect of aerosols is not certain. If we take the lower limit of the contribution for greenhouse gases of 0.5 °C and the upper limit for aerosols (–0.6 °C), it turns out that the impact of aerosols on temperature was higher. This combination of impact does not fit the estimated increase value of 0.6 °C to 0.7 °C over this period. However, it is clear that the anthropogenic factors dominate the increasing temperature and the natural ones have the maximum influence of one-third (0.2 °C-0.6 °C).

It is said in the same document that "In addition to robust multi-decadal warming, global mean surface temperature exhibits substantial decadal and interannual variability. Due to natural variability, trends based on short records are very sensitive to the beginning and end dates and do not in general reflect long-term climate trends. As one example, the rate of warming over the past 15 years (1998-2012; 0.05 [–0.05 to 0.15] °C per decade), which begins with a strong El Niño, is smaller than the rate calculated since 1951 (1951-2012; 0.12 [0.08 to 0.14] °C per decade)".

This would mean that in the period 1998-2012 there was no statistically significant increase in temperature. During the same period, the concentration of CO_2 has increased by 7%, which did not substantially have an impact on global temperature. It is also noted that the natural variability is present, which in this period is obviously of greater significance in relation to the anthropogenic factors. Although in the footnote it is said that "Trends for 15-year periods starting in 1995, 1996, and 1997 are 0.13 [0.02 to 0.24] °C per decade, 0.14 [0.03 to 0.24] °C per decade, and, 0.07 [–0.02 to 0.18] °C per decade, respectively", however, a delay in the rise of temperature is not consistent with the models used by the IPCC. "However, for the 15-year trend interval corresponding to the latest observation period 1998-2012, only 2% of the 62 CMIP5 and less than 1% of the 189 CMIP3 trend computations are as low as or lower than the observed trend" [5].

Moreover, the set of satellite data Remote Sensing System (RSS) of temperature measurements in the first 8 km of the troposphere (latitude range 70.0 S to 82.5 N) showed a statistically insignificant cooling of –0.05 °C per decade (fig. 1). The RSS satellite dataset shows no global warming at all for 213 months from September 1996 to May 2014. That is more than half the entire 425-month satellite record. On the same satellite data, there has been no statistically significant global warming for more than 26 years [6]. The results of a number of studies indicate that as a consequence of greenhouse forcing general circulation models predict a greater positive temperature trend for the troposphere than the surface [7-9]. According to previous references, it is very likely that the 1998 has been the warmest year in the instrumental record, since 1861. This means that the negative trend has much more been pronounced since 1999 onwards.

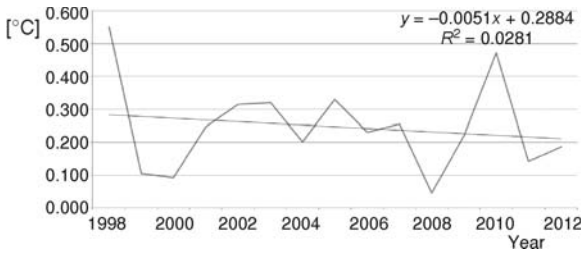

Figure 1. Remote Sensing System (RSS) lower troposphere anomaly temperature trend

Arguments in contradiction to the view of global warming

Bearing in mind the restriction of the scope of this paper, we decided to give a brief representation of the results in the last 4-5 years. Analyzing the evolution of the scientific consensus on anthropogenic global warming in the peer-reviewed scientific literature, examining 11 944 climate abstracts from 1991-2011 were examined, matching the topics "global climate change" or "global warming". They found [10] that 66.4% of abstracts expressed no position on anthropogenic global warming. In a second phase of this study, they invited authors to rate their own papers. Compared to abstract ratings, self-rated papers expressed no position on anthropogenic global warming in 35%. With reference to the papers, these authors concluded that the narrative presented by some dissenters is that the scientific consensus is on the point of collapse while the number of scientific heretics is growing with each passing year. Contrary to this analysis Lockwood [11] argued that the popular idea (at least on the Internet and in some parts of the media) that solar changes are some kind of alternative to GHG forcing in explaining the rise in surface temperatures has no credibility with almost all climate scientists.

The impression is that during the last few years more and more articles appear in which the current temperature changes are tried to be explained by the Sun-Earth connection. The first

sentence in Steinhilber's *et al.* [12] paper in the Introduction is: "The Sun is the main driver of the Earth's climate". Lockwood *et al.* [13] have recently re-evaluated the derivation of open solar flux and mean solar wind speed from geomagnetic activity data, using a better correction for the processing of the interplanetary field by longitudinal solar wind structure between the surface of the Sun and the Earth. The results are very similar to those of Rouillard *et al*. [14], who used an averaging procedure to effectively make the same correction. The implications of the derived changes in open solar flux have been reviewed by several authors [15, 16]. Mentioned authors [12] argue that the current low solar cycle minimum is part of the fall from the grand solar maximum (similar like [17]) that has persisted during the space age. From the linear extrapolations (over short intervals) these authors predicted that the Sun will fall out of the maximum (defined by the mean level exceeded in 1920) within the interval 2011-2027. This agrees with the independent predictions for a consistent threshold by Abreu *et al.* [18], based on the distribution of durations of past grand solar maxima in cosmogenic isotope data.

A significant number of studies show that some meteorological parameters, such as storms and droughts show a good correlation with the 22-year Hale magnetic cycle. But by far the more familiar cycle of solar activity is the 11-year cycle and it is this cycle that is mostly used for correlative analyses with meteorological parameters [19]. Lockwood *et al.* [20] claimed that models predict that perturbations can descend from stratosphere to the surface by altering the propagation of planetary waves, an effect that has been reported in observations. Explaining "top-down" model these authors suggest that solar effect on temperature in the lower equatorial stratosphere can influence the jet streams in the underlying troposphere. Propagation of the charged particles to the surface is also studied in many other papers, with conclusion that influence on environment of these processes could be much more intensive than previously was impression [21-23].

Quite contrary to IPCC prognosis, results of this research [24, 25] indicate annual average temperature drop of 0.9 °C in the Northern Hemisphere during solar cycle 24. For the measuring stations south of 75N, the temperature decline is of the order 1.0-1.8 °C and may already have started. For Svalbard a temperature decline of 3.5 °C is forecasted in solar cycle 24 for the yearly average temperature. An even higher temperature drop is forecasted in the winter months. An Arctic cooling may relate to a global cooling in the same way, resulting in a smaller global cooling, about 0.3-0.5 °C in SC 24. From correlation studies of 7 (not all global) temperature series for the period 1610-1970, a solar contribution of 41% to the secular temperature increase is found. Analyzing global temperature curves for periodic oscillations Scafetta [26] concludes that the climate is forced by astronomical oscillations related to the Sun, and at least 60% of the warming since 1970 can be related to astronomical oscillations. According to this author our planet will experience Little Ice Age with maximum cooling around the middle of this century.

The indications that the solar-climatic coupling is non-linear were already obtained in several works. Specifically, this can be confirmed by the experimental fact that the temperature response of the atmosphere to the solar radiation variability during the Schwabe cycle is a factor of 2-3 as large as such are responses following from thermodynamic considerations. Numerous evidences of the effect of solar cosmic ray fluxes, related to powerful flares, on the processes in the Earth's lower ionosphere were obtained in many works. It is interesting to note that the quasi-thirty-year climatic periodicity is often observed in different climatic processes and is called the Bruckner periodicity. If the climatic system is strongly non-linear, even low energy SA manifestations in the Earth's lower troposphere can actually cause substantial variations in the global climatic system [27].

Conclusions

Based on the above material we have seen that there are conflicting views on the interpretation of results of temperature changes at the global level. The possibility of applying these findings is further complicated if we try to put down the projections to the local or regional level. Researchers hope that by improving how they simulate climate variables such as cloud coverage and sea surface temperatures, they will further reduce the uncertainties in regional forecasts, making them even more useful for policy-makers [28]. In any case, we hope that this work will encourage scientists to state their opinions on the basis of verifiable arguments, especially if we take into account the opposing viewpoints in terms of temperature changes in the near future [29].

The scientific debate, which eventually follows this paper, would certainly contribute to better understanding of the arguments for and against the so-called global warming, that is, climate changes. Reduction of toxic gases in the atmosphere is something that should not represent the subject of the debate, but the duty of all who may affect it.

Acknowledgment

The results are a part of the project III47007, funded by the Ministry for Education Science, and Technological Development of the Republic of Serbia.

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Paper submitted: June 10, 2014
Paper revised: June 12, 2014
Paper accepted: June 13, 2014

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Tromesečno
ISSN 0354-9836 = Thermal science
COBISS.SR-ID 150995207