Association Milutin Milanković Belgrade

Proceedings of the International Conference

MILANKOVIĆ'S THEORY OF CLIMATE CHANGES - HUNDRED YEARS AFTERWARDS

Belgrade, Serbia
4 - 5 November 2024

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PREFACE ON THE INTERNATIONAL CONFERENCE

"MILANKOVIĆ'S THEORY OF CLIMATE CHANGE - ONE HUNDRED YEARS LATER"

The Milutin Milanković Association continues its activities to affirm the work of the great Serbian and world scientist Milutin Milanković. The main activities in 2024 were devoted to marking the hundredth anniversary of the publication of his Theory of Climate Change and the celebration of International Climate Change Day - November 4.

This significant anniversary was marked by the organization of the International Conference: "Milanković's Theory of Climate Change - One Hundred Years Later". The conference was held from November 4 - 5, 2024 in the Great lecture theatre, named after Milutin Milanković (Amfiteatar 227) at the Faculty of Civil Engineering in Belgrade. The organizers of the conference were the Milutin Milanković Association, the following faculties of the University of Belgrade: The Faculty of Civil Engineering, The Faculty of Mathematics, The Faculty of Geography, The Faculty of Security and the Belgrade Astronomical Observatory.

The conference was officially opened by academician, professor Zoran Knežević, president of the Serbian Academy of Sciences and Arts, , emphasizing the importance of Milanković's theory for the world science and the importance of this event for Serbia and the international scientific community. “This conference represents an important opportunity to recall the greatness of Milanković's scientific thoughts, which significantly contributed to the understanding of climate patterns and their connection with astronomical cycles. Milanković's work is valuable, because it helps us to understand more deeply the processes that shape the climate, which is more important today than ever".

The goals of the Conference were:

a. Use the fundamental contribution of Milanković's Theory of Climate Change in order to understand and predict what could be expected in the next 100 years as a result of climate change, both due to natural long-term processes and anthropogenic factors;

b. Enable understanding of the impact that global changes in nature have on human lives and suggest practical measures that human civilization should take to prevent negative impact on the environment and human civilization, concerning public health and well-being, population migration, land use, food production, soil, water and air pollution and the survival of natural ecosystems.

At the conference some 40 scientific and professional papers were presented by authors from 11 countries: Belgium, Canada, China, Greece, Germany, Hungary, Italy, Poland, Serbia, Sweden, and the UK.

The submitted works are classified into four thematic areas:

1. Quantification of the causes of the impact on climate change and weather extremes

2. Adaptation and resistance (resilience) to climate changes

3. Application of Milanković's Theory of Climate Change to the reconstruction and evolution of the past

4. Climate change and public health and well-being

Based on the presented works, discussions, proposals and recommendations given during the conference, the scientific committee drew up the conclusions of the conference, which were published on the websites of the Milutin Milanković Association (www.milutinmilankovic.rs) and the Faculty of Civil Engineering (www.grf.bg.ac.rs).

At the closing session of the conference, the participants expressed a unique view that Milanković's theory, even after a century of its publishing, is extremely important for understanding today's climate challenges:

"Thanks to the work of a great scientist, we today have a better understanding of planetary processes and opportunities to mitigate climate change. Milanković's vision and scientific contribution remain an inspiration, not only to scientists, but also to the entire society to take responsibility for the preservation of our planet Earth."

"It is the duty of all of us to preserve his legacy and continue to spread the knowledge and contribution of Milutin Milanković for future generations, with the aim of preserving our planet."

"Climate change is no longer a future threat, but a present-day reality, with extreme weather events already significantly affecting human communities and natural ecosystems around the world. All of this represents a clear message that nature is responding / "paying us back" for our relationship with it. Nature is increasingly showing its untamed power, and climate change is warning that we are approaching the dangerous limits of survival."

On behalf of the organizers of the conference "Milanković's theory of climate change - one hundred years later", I express my gratitude to all the participants and authors of this publication - first for their participation in the conference, and then for their outstanding contribution in the respective thematic areas through the presented and published works and their comprehensive discussion. The organizers of the conference would like to especially thank Professor Andre Berger for his exceptional help, support and useful suggestions regarding the organization of the Conference.

Thanks again to everyone

Slavko Maksimović
President of the Milutin Milanković Association

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THEME 1: CLIMATE OF THE PAST, WHAT HAPPENED AND WHY? – KEYNOTE TALKS

The deterministic excitation paradigm can explain the Milanković hypothesis

Stefano Pierini[1]

ABSTRACT: A deterministic excitation (DE) paradigm is formulated, according to which the abrupt late Pleistocene glacial-interglacial transitions correspond to the excitation, by the astronomical forcing, of nonlinear relaxation oscillations internal to the climate system in the absence of any stochastic parameterization (Pierini, 2023). Specific threshold crossing rules parameterizing the activation of internal climate feedbacks are derived according to the DE assumption. Such rules are then applied to the fluctuations of the glacial state simulated by a conceptual model subjected to realistic astronomical forcing. The timing of the glacial terminations thus obtained in a reference simulation is found to be in very good agreement with proxy records; besides, a sensitivity analysis ensures the robustness of the timing. The role of noise in the glacial-interglacial transitions and the problems arising in the implementation of theories in which noise is crucial (such as stochastic resonance) are finally discussed. In conclusion, the DE paradigm may provide a simple and effective dynamical systems characterization of the link between astronomical forcing and glacial terminations implied by the Milanković hypothesis.

20. Pierini S., 2023: The deterministic excitation paradigm and the late Pleistocene glacial terminations. Chaos, 33, 033108, https://doi.org/10.1063/5.0127715.

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