SEMINAR IN PHYSICS

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REFRESHMENTS

Self-organization of the Earth's Climate System versus Milankovitch-Berger Astronomical Cycles

Professor Lev Maslov
Department of Physics & Astronomy, University of Northern Colorado

The Late Pleistocene Antarctic temperature variation curve is decomposed into two parts: "cyclic" and "stochastic". Two mathematical models are created and studied. It is shown that the "cyclic" and "stochastic" temperature variations represent two different but tightly interconnected processes with two different types of self-organization. The first one is the sequence of auto-oscillating temperature cycles, with periods gradually increasing from 100,000 years in the first cycle to approximately 140,000 years in the last glacial cycle. The second process is the stochastic fluctuation of temperature in each cycle.

The self-organization in the auto-oscillation process is the non-linear reaction of the Earth's climate system, as a whole, to the input of solar radiation. The self-organization in the stochastic part is the self-organized nonlinear critical process taking energy from, and fluctuating around, the auto-oscillating part of the temperature variations. It is shown mathematically that the Earth's climate is the open, complex, self-organized dynamical system with nonlinear reaction to the input of solar radiation. Physical interpretation of mathematical models and scenario of future climate development are given.