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Uncertainty In Climate Variability Modeling: The Role Of Various Physical Mechanisms

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Abstract

Human-induced climate change is one of the defining issues facing society nowadays. The main tool for studying the response of climate system to combined anthropogenic and natural forcing and projecting climate change is represented by climate (Earth's system) models with various levels of complexity. These models rather successfully project a tendency to increase the temperature of the troposphere and the ocean, sea level rise, the melting of the Arctic and Antarctic sea ice, snow cover and internal glaciers, etc. However, it is very important to project not only the spatiotemporal patterns of changes in the mean values of climate variables, but also their fluctuations over a wide range of timescales, since knowledge both climate trends and variability is highly important for managing complex socio-economic systems in the climate risk environment. Although different climate models consistently project the future climate change trends, the specific indices that characterise these projections vary significantly from model to model. Most of this uncertainty arises from inter-model differences is the strength of radiative feedbacks. It is highly important that projections of climate fluctuations (variability) with time scales of years to decades and centuries are even more uncertain than for trends of mean values of climate variables. For example, the decadal variance of global and hemispheric temperatures in CMIP5 models deviate from each other by a factor of more than four. The reasons of that are not entirely clear and obvious. In this study, we apply a simplified computational instrument, developed on the bases of two-layer energy balance model, to assess the effects of different physical mechanisms in climate system on the inter-annual, decadal and multi-decadal fluctuations (variability) in the global mean surface temperature taken as an indicator for climate variability. The influence of uncertainties in parameters that characterise feedbacks, thermal inertia, deep ocean heat uptake and strength of stochastic radiative forcing on the surface temperature variance and its power spectrum are discussed

Biography:

S. A. Soldatenko has completed his PhD in 1983 from Military Aerospace Engineering Academy, and Doctor of Sciences (Math & Physics) in 1992 from St. Petersburg State University. For many years he was a Department Chairman at several universities and research organizations. For about 20 years we worked in Canada and Australia. Currently he is a Senior Fellow at St. Petersburg Institute for Computer Sciences of the Russian Academy of Sciences (SPIIRAS). He has published more than 250 papers in reputed journals and has been serving as an editorial board member of repute.

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5th World Summit Climate Change and Global Warming; Amsterdam, Netherlands- February17-18, 2020.

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