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Modelling Climate/Global Change and Assessing Environmental Risks for Siberia

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The state-of-the-art climate models are based on a combined atmosphere–ocean general circulation model. A central direction of their development is associated with an increasingly accurate description of all physical processes participating in climate formation. In modeling global climate, it is necessary to reconstruct seasonal and monthly mean values, seasonal variability (monsoon cycle, parameters of storm-tracks, etc.), climatic variability (its dominating modes, such as El Niño or Arctic Oscillation), etc.

At the same time, it is quite urgent now to use modern mathematical models in studying regional climate and ecological peculiarities, in particular, that of Northern Eurasia. It is related with the fact that, according to modern ideas, natural environment in mid- and high latitudes of the Northern hemisphere is most sensitive to the observed global climate changes. One should consider such tasks of modeling regional climate as detailed reconstruction of its characteristics, investigation of the peculiarities of hydrological cycle, estimation of the possibility of extreme phenomena to occur, and investigation of the consequences of the regional climate changes for the environment and socio-economic relations as its basic tasks.

Changes in nature and climate in Siberia are of special interest in view of the global change in the Earth system. The vast continental territory of Siberia is undoubtedly a ponderable natural territorial region of Eurasian continent, which is characterized by the various combinations of climate-forming factors. Forests, water, and wetland areas are situated on a significant part of Siberia. They play planetary important regulating role due to the processes of emission and accumulation of the main greenhouse gases (carbon dioxide, methane, etc.). Evidence of the enhanced rates of the warming observed in the region and the consequences of such warming for natural environment are undoubtedly important reason for integrated regional investigations in this region of the planet.

Reported is an overview of some risk consequences of Climate/Global Change for Siberia environment as follows from results of current scientific activity in climate monitoring and modelling. At present, the challenge facing the weather and climate scientists is to improve the prediction of interactions between weather/climate and Earth system. Taking into account significantly increased computing capacity, a special attention in the report is paid to perspectives of the Earth system modelling.