International Conference

GLOBAL AND REGIONAL CLIMATE CHANGES

16-19 November 2010
Kyiv, Ukraine

CONFERENCE ABSTRACTS

НАЦІОНАЛЬНА АКАДЕМІЯ НАУК УКРАЇНИ 1918

УкрНДГМІ

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In result by us it was established that at incising global temperature on 1°C there is a displacement of position of a zone minimum of atmospheric sedimentation on 2° latitudes in a direction of middle latitudes.

At global warming on 3-4°C the basic zone of a subtropical minimum of a zone climatic field of an atmospheric precipitation in Northern hemisphere will be displaced in a direction of middle latitudes to 34±5° of north latitude, and it means that northern periphery of a zone of subtropical anticyclones will cover all southern territory of Ukraine.

On the basis of worked out semi-empirical models of displacement of a subtropical minimum of a zone climatic field of an atmospheric precipitation at different levels of global warming are received estimations of its position in the future. Displacement of northern periphery of a zone of subtropical anticyclones represents potential danger of desertification of southern and southeast regions of Ukraine, since second half of 21 century if modern tendency of global warming will be kept (especially if global warming will exceed 2-4°C).

Conditions of ice and thermal regimes of the river Dniester in the context of global climate change

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Thermal and ice regime of rivers is a reflection of climatic conditions. Climate change now causes the transformation of the state of water bodies, including the thermal and ice regime of the rivers. The most pronounced global climate changes in the ice regime of rivers. Ice phenomena on rivers are an indicator of transitional climate seasons. In the past decade abnormally warm winters has seen, which are characterized by frequent thaws, the lack of ice, in some winters there is no formation of stable ice, reduced ice cover. Increased air temperature during the winter months causes the decrease in the amount of negative air temperatures, which affects the timing of the ice appearance, the intensity of the ice cover knots during winter and periods of the river ice purification.

Comparative analysis of ice and thermal regime monitoring data of the upper river Dniester for 1981-2006 years with data for the period 1965-1980 years showed that there are significant changes. In recent decades, compared with previous years, the water temperature in the river Dniester increased by 2,4 ° C (range Mogilev - Podolsky). Changing the thermal regime of rivers associated with annual and monthly mean air temperature data and timing of transition temperatures of air through the critical values in autumn and spring.

In the period from 1981 to 2000 time of ice appearance moved from mid-November - December to the beginning of the year - January, February. At the present stage there is great amplitude of the timing of the first ice appearance and the establishment of ice. It is found, that the number of days from the transition temperature through 0°C until the ice phenomena in recent years has increased: from 2 - 5 days in the period 1965-1980 years. up to 25 - 35 days in period 1981-2006 years.

Changes in the dates of the ice establishment affect their duration, which is particularly noticeable after 1986. The most significant changes relate to the length of ice cover, which fell to 1-2 decades. In addition, after 1981, the Dniester sustained freezing is not observed at all. It is worth emphasizing the fragility of the ice cover on the river Dniester.

Changes in the dates of the establishment of ice affect their duration, which is particularly noticeable after 1986. The most significant changes relate to the length of ice cover, which fell to 1-2 decades. In addition, after 1981, on the river. Dniester sustained freezing is not observed at all. It is worth emphasizing the fragility of the ice cover on the river Dniester.

These changes of the ice regime of the river Dniester affect the hydrological regime of the river as a whole. Similar changes can also be found on other rivers in Ukraine, which certainly affects the economic activities of the country: increasing the navigation period, reduced instances of jams phenomena, reduced costs of spring flood, etc.

Conversion of the ice regime mostly due to a change of the atmosphere dynamics. To establish the influence of large-scale atmospheric circulation on the climate in Ukraine can use the indices of the North - Atlantic Oscillation (NAO). Increased attention to studying the NAO is associated with the transition of its indices in the positive phase of the oscillations, which occurred in the early 80-s of XX century. For the territory of Europe positive phase is characterized by the formation of stronger than average westerly winds, which are directed from the middle latitudes of the Atlantic to Europe, increasing the flow of relatively warm (and wet) sea air during the winter across the northern Atlantic to Europe. Also during the high NAO index observed abnormally low rainfall over much of central and southern Europe.

Research has shown that there is a significant relationship between annual index NAO and annual air temperature of Ukraine. Also, the influence of signals NAO found in the temperature regime of the rivers, that causes changes in terms of ice occurrence and transmission. These circumstances indicate the need to further study the influence of global atmospheric circulation on the thermal regime of air and water.

Sensitivity of the regional climate model CCLM to regional land use changes in Eastern Europe

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In the Framework of the BMBF research project "International Water Research Alliance Saxony" (IWAS) the most pressing water problems in five regions of the world should be solved via an "Integrated Water Resource Management" (IWRM) approach. Because land use, water availability, and the quality of natural water resources are closely connected, land use scenarios, together with regional climate projections, are essential components for quantifying future fluvial discharge and matter input from rural and urban areas. The regional climate projections for the IWAS target region Western Bug river basin / Ukraine are based on the non-hydrostatic climate model COSMO Climate Local Model "CCLM".

Global climate projections are downscaled to the target region in a one-way double nesting approach from 200 km to 50 km and 7 km, respectively. To check the model performance for this region and resolution, one model run, forced with atmospheric reanalysis ERA40 data from 1960 to 1990 and with constant soil and vegetation parameters, serves as control run.

For consistency with the underlying IPCC-SRES scenario, appropriate regional land use scenarios should be taken into account and included in the model. Building such land use scenarios is a resource-consuming process and should be justified by the model's climatologic sensitivity to land use changes. For evaluation, basic land use changes were applied to the model by altering the external surface parameter settings on the 7 km scale.

As the control run, six model runs from 1960 to 1961 are forced with identical atmospheric ERA40 data, but with different constant parameter settings at the surface. The model output for air temperature, wind speed, and total precipitation are evaluated. Their deviations from the control run are compared to the deviations of additional sensitivity experiments with slightly changed initial conditions.

First results suggest that the 2m temperature is sensitive to land use changes, and the deviations are limited to the test area. However, the total precipitation shows differences over the whole domain, but no sensitivity related to the test area.

Earth climate system model

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Earth climate system model of INM RAS consists of two main blocks: atmospheric general circulation model and oceanic general circulation model. Atmospheric block is finite-difference, with resolution from 5x4 degrees up to 1.25x1 degrees in longitude and latitude. In vertical 21 – 80 levels are used with the uppermost level at 30 or 90 km.

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