International Conference

GLOBAL AND REGIONAL CLIMATE CHANGES

16-19 November 2010
Kyiv, Ukraine

CONFERENCE ABSTRACTS

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abnormal displays, for example, is abnormal hot years and winters. But there is an unsettled very important question concerning an estimation of results of integration of global climatic model.

The general results of check of monthly average air temperature for Ukraine are possible to consider satisfactory as the correlation factor basically exceeds 0.9. It reaches the greatest values in the southern Ukraine and equals 0.94.

As a rule distribution isolines of correlation is that, the minimum coefficient correlations is observed in the northwest, and a maximum – in the south and the southeast. Root mean square deviations of the forecast for monthly average temperature of air reached the minimum values in the south and equaled 0.3°C regardless of the scenario of emissions.

Under scenario A2 are observed the most reasonable results of modeling from the point of view verification. It is noticed that under the given scenario the global temperature should increase till 2100 almost on 3°C. But it does not course essential changes of a temperature conditions to considerably warming in the last 15 years in Ukraine. And even on the contrary in the south of Ukraine the insignificant cold snap will be observed.

The influence of climatic changes on Ukrainian water resources (modeling and prediction)

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Rivers, according to famous geographer and climatologist A.I. Voyyekov, are a product of climate. Changes of climatic conditions cause changes in water requirement and, thus, determine strategy for further development of water management in the Ukraine. The investigations of climatic factors and appropriate water resources changes on meteorological and hydrological observation time more then 100 years revealed the tendencies to changes of heat resources and humidification. Precipitation of warm and cold periods increases with the exception of Eastern Ukraine, where long time annual mean of precipitation doesn't change. There exists an upward tendency for average air temperatures of annual, warm and cold periods. The air cold period temperature increase is more pronounced then for warm period. Growth in temperatures of the cold period takes place in the area of negative values. In certain years, from the late nineties on, the average temperature of the cold period takes on positive values. The analysis of annual runoff data made it possible to determine that there has been a low-water phase of annual runoff fluctuation since the early 80s in the Western Ukraine (on such rivers as the Prut, the Tisa, the Dniester, the Pripyat', the Western Bug and the Southern Bug). In the north-eastern Ukraine runoff fluctuations have been registered in the high-water phase since 70s of the previous century. The tren of transition to low-water phase was revealed only at the beginning of XXI century for the rivers in the forest-steppe zone. At the same time there has been decrease in peak flow of the spring floods and increase in runoff during low water since 80s of the previous century. Such changes in water regime are explained by a rise in air temperatures in winter season (XII-II), shallow frost penetration in soil, increase in number and length of thaws and intensive meltwater penetration into water-bearing horizon.

Thus influence of climate change on water regime of the rivers has increased dramatically over the latest two decades. The water resources forecast in further climatic changes is possible by the use of the mathematical modeling. In order to find a solution to the problem of forecasting water resources under changing global climate a model termed 'climate-runoff' has been designed at Odessa State Environmental University. The input of the model are meteorological data, and the output is the calculated runoff. This circumstance makes it possible to use meteorological data climate scenarios to evaluate the potential of water resources in Ukraine on conditions of global climate changes.

The theoretical basis of the model is water-heat balance equation of the catchments and water management balance equation of the catchments presented in probabilistic form. The basis stochastic simulation is the model of Markov type. Model "climate - runoff" can solve the following problems: the assessment of natural water resources in the absence of observational data or it's insufficient; the assessment of water resources in the presence of water in the catchment's area change (artificial ponds, irrigation, drainage, water for municipal needs); the assessment of changes in water resources in the climatic conditions specified by scenarios. "Response functions" of water resources on water

management transformation (so-called functions anthropogenic influence) were obtained on the basis of simulation stochastic modeling and were used to optimize the water management systems work. The implementation and adaptation of the model has been performed on the basis of previous years (prior to significant changes in climate) for the watersheds of different geographical zones (forest, forest-steppe, steppe, the Carpathians and the Crimean Mountains). On the base of the model "climate-runoff" possible changes of Ukrainian water resources in the scenarios conditions (the scenarios of 'sudden' doubling of CO_2 concentration in the atmosphere CCCM, GFDL, UKMO, and nonstationary model GFDL) were evaluated. New scenarios (a1b, b1, a2) for global warming have been presently developed.

The research results were published in two monographs and scientific publications in leading journals (materials of conference "Climate and Water", (Finland, 1998); Hydrobiological Journal, 2000; Atmospheric Research, 2004; Journal of Hydrology, 2006).

The Turkish Straits as an important element of the climatic regulation of the Black Sea

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The Turkish Straits system is comprised of the straits of the Bosphorus and Dardanelles linked by the Marmara Sea. Since the opening of the connection between the Mediterranean and Black Seas about 8000-9000 years ago the Black Sea has been converted from almost a fresh-water lake to a brackish land-locked sea (Lane-Serff et al., 1997, Maderich, 1999). Contemporary state and future evolution of the Black Sea and North-Aegean Sea essentially depend on the exchange flow between these basins. Whereas dense Mediterranean water inflow form deep waters of the Black Sea proper, the Black Sea outflow of brackish waters affect Eastern Mediterranean overturning circulation. In turn, the straits dynamics is governed by strait geometry and the water budget and the difference in water-mass properties in adjacent sea basins. This work addresses the seasonal, interannual and decadal variability of the Black Sea-Bosphorus-Marmara Sea-Dardanelles system. The modelling approach is based on the early works of Maderich (1998; 1999), where system of Mediterranean seas was studied using the coupled one-and-half dimensional models. In such models the conservation of mass, heat and salt are considered only in vertical direction ("one dimension") whereas inflow and outflows through straits act as forcing terms for the vertical circulation and feedback for the system ("half dimension"). Here, this approach was extended using for the Bosphorus and Dardanelles two-layer hydraulic model (Maderich and Konstantinov, 2002), that simulates exchange in terms of level difference along the strait. The strait models were tuned and verified using observation data and detailed three-dimensional modelling (Kanarska, Maderich, 2008). An evolution of system in 1970-2000 was simulated to study seasonal behavior of system and impact of climate change on the Black Sea and water exchange through the Turkish straits.

Current and expected climate changes in Russia and adjacent countries in the 21st century: an assessment from multi-model ensemble

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Available observation has shown that substantial warming on global and regional scales have occurred at last decades of the 20th century and beginning of the 21st century. There are convincing evidences that major cause of such warming is human activity resulted in increase of emission of greenhouse gases to the atmosphere. This explanation is supported by majority of scientific community all over the world. Meanwhile there are also claims from some scientists that warming might be associated with natural long-term climate variability and alternative hypotheses are suggested explaining the observed phenomenon. On the basis of climate simulation with coupled climate models

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