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Statistical assessment of the water resources on meteorological evidence. Forecast of annual runoff for different climatic scenario

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The water-management transformation of runoff and prospective change of a global climate calls for the necessity of studying the climatic factors contribution to the runoff formation process. In present paper we consider and try to solve the problem of the "climate-runoff" interaction with the use of mathematical and computer modelling on the basis of the empirical orthogonal functions (EOF) and water-heat balance methods (c.f./1/).. The approach is illustrated by studying the north-west Black Sea region, where data about a runoff in a natural condition is not available and, therefore, it is necessary to develop methods of its account on basis of meteorological information. For modelling of natural annual runoff series the results of analysis of annual precipitation and maximally possible evaporation fields with the empirical orthogonal functions method are used. Spatial distribution of the first four weight expansion coefficients for annual flow can be considered as a result of the interaction between the climatic factors in the meso- and macroscale. For an evaluation natural (not infringed the economic activity) runoff in conditions of defect of the hydrological observations data there have been proposed the modification of method of water-heat balance, in which the meteorological data are used (Loboda, 1998b, 1999). Basis of water-heat balance method is joint solving of the equations of water and heat balances of an earthly surface, which contain a common component - total evaporation. The empirical orthogonal functions analysis of the annual precipitation, maximum possible evaporation and runoff data showed that the fields of main climatic factors (annual precipitation and maximum possible evaporation) and annual flow are formed under influence of the common physical processes, which can be reflected by the first components of the fields expansion on the empirical orthogonal functions. Spatial distribution of the first four weight expansion coefficients for the annual runoff can be considered as a result

of the interaction between the climatic factors in the meso- and macroscale. For river, where there are no measurements of runoff, this coefficients can be calculated as linear functions of norms of annual precipitation and maximally possible evaporation by maps of isolines. The water-management transformation of annual runoff is excluded by fulfilling the filtration of initial data on the basis of the first components. Approach proposed opens the new perspective possibilities for the natural rivers runoff (runoff non-transformed by the economic activity) restoring problem solution. For regions where the meteorological studying is better than hydrological one, the average arithmetical values and average quadratic deviation of a natural runoff series (necessary for modelling within the empirical orthogonal functions formalism) can be determined by using the regional generalization of the climatic flow characteristics, calculated on the basis of meteorological information.

References:

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