Indian Journal of Ecology (2019) 46(2): 402-407

Manuscript Number: 2850
NAAS Rating: 4.96

Retrospective and Forecast of Heterochronal Climatic Fluctuations Within Territory of Dnieper Basin

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Abstract: The article presents a study of zonal (mixed forest zone, forest-steppe and steppe) patterns of long-term changes in climatic conditions over the past 200 years on the territory of the Dnieper transboundary basin using multivariate statistics, GIS technologies, and neurotechnologies. For a comprehensive analysis, assessment of series heterogeneity, determination of temporal and spatial patterns of formation and synchronicity of the dynamics of climatic parameters (air temperature, amount of atmospheric precipitation), the study applies the following methods of multivariate statistics: descriptive statistics, regression analysis, transformation of variables (T4253H-smoothen, method of difference integral curves of modular coefficients) and cross-correlation analysis. Climate change probability is predicted using the artificial neural network method. The findings show an increase in the average annual air temperature in three physical and geographical zones by 1.0-1.2°C in the period from the late 80's to the present. The largest proportion of abnormal manifestations of temperature changes is observed in the steppes (34.9%) and mixed forests (34.5%), and the greatest probability of abnormal precipitation changes is observed in the forest-steppe zone (30.3%). Long-term dynamics of intra-annual climatic changes reflect the 2°C warming during the first 10 months of the year, and an increase in average annual precipitation by 90 mm for the period from May to October. The forecasting results show that if the retrospective trend-cyclical tendency is preserved, by 2030 there will be zonal synchronicity of consistently unfavorable changes in climate indicators, characterized by an increase in the average annual temperature by 0.8 °C, and a decrease in annual precipitation amounts by 24 mm. The results and approaches to the multivariate processing of meteorological data presented can be used for spatiotemporal research on long-term regularities of changes in the state of hydrogeocosystems of river basins under the conditions of global climate change, as well as for the development of programs on adaptive and eco-friendly nature management in river basins.

***Keywords*:** Climate, Air temperature, Atmospheric precipitation, Zonal patterns, Dnieper River basin, Multivariate statistics, Modeling, forecasting, GIS-technologies