



## Phenomena of Intense Climatic Changes over the Territory of Ukraine and a Vision for the Extension of the Climatic Monitoring System

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The purpose of the presentation is to present evidence and analyze the temporal-spatial changes in the climatic zonation of the territory of Ukraine based on the evaluation of the following metrics of meteorological and water balance parameters for the period from 1945 to 2021: temperature, precipitation, relative humidity, evapotranspiration (ET), Standard Precipitation Index (SPI), and Standard Precipitation Evapotranspiration Index (SPEI). We then performed multivariate and univariate (ET and SPEI) hierarchical clustering and Principal Component Analysis (PCA) for periods before and after the temporal structural breaks/breakthroughs, which were used for zonation and 2D mapping of the territory of Ukraine. These data indicate a remarkable pattern of the spatial and temporal variability of climatic changes within the territory of Ukraine, which apparently exceeded the averaged trend of global warming. The most significant increase in temperature occurred in January–March and July–August periods. Almost in all regions of Ukraine, with the exception of central and northern parts, annual precipitation slightly increased, with the most significant increase in precipitation during the September–October period. Despite of a slight increase in precipitation, the level of moisture supply within the territory of Ukraine, resulting from the increased evaporation, has significantly worsened. However, the obtained 2D spatio-temporal data are insufficient to explain the impact of climatic processes on land-atmosphere processes in Ukraine. We hypothesize that an extension of the FLUXNET global network of micrometeorological tower sites (based on the application of eddy covariance methods) over the territory of Ukraine is needed to measure and calculate vertical turbulent fluxes within atmospheric boundary layers. This will help construct reliable 3D climatic models, which will help explain the impact of observed climatic changes on water cycle in Ukraine and surrounding European regions.