Challenges of Eco-Physiological Interpretation of the Climatic Signal in Dendrochronological and Dendroisotope Time Series

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Abstract. *Interpretation of statistically significant relationships between meteorological parameters like average or daily monthly air temperature, the sum of precipitation of the previous and current year of the tree-ring formation versus variability of dendrochronological parameters (e.g., tree-ring width, maximum latewood density, anatomical parameters of tree rings, and variability of stable isotopes in tree rings) is crucial for the modern dendroclimatology. After the identification of statistically significant correlations, it is necessary to interpret them in a biologically competent manner to adequately understand what eco-physiological mechanisms are behind them, and what meaningful load, prognostic, and cognitive value this information has in ecological, eco-physiological, and eco-hydrological aspects. Like any separately taken biological object, trees of temperate latitudes have their specificity, which differs in connection with hereditary properties of species and physiographic tree growth conditions. The simplest way to reliably interpret the discovered dependencies is to conduct direct observations of the intra-seasonal dynamics of annual tree-ring formation and the dynamics of the surrounding environmental conditions, which is impossible in most cases. Eco-physiological models combined with direct measurements of $\delta^{13}C$, $\delta^{18}O$, and $\delta^{2}H$ in wood and tree-ring cellulose are proposed as one of the options for solving this scientific problem.*

Key words: *dendrochronology, dendroclimatology, dendroisotopology, plant physiology, forest science.*

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