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Biogeochemical modelling vs. tree-ring data – comparison of forest ecosystem productivity estimates

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Forest ecosystems are sensitive to environmental changes as well as human-induce disturbances, therefore process-based models with integrated management modules represent valuable tool for estimating and forecasting forest ecosystem productivity under changing conditions. Biogeochemical model Biome-BGC simulates carbon, nitrogen and water fluxes, and it is widely used for different terrestrial ecosystems. It was modified and parameterised by many researchers in the past to meet the specific local conditions.
In this research, we used recently published improved version of the model Biome-BGCMuSo (BBGCMuSo), with multilayer soil module and integrated management module. The aim of our research is to validate modelling results of forest ecosystem productivity (NPP) from BBGCMuSo model with observed productivity estimated from an extensive dataset of tree-rings.
The research was conducted in two distinct forest complexes of managed Pedunculate oak in SE Europe (Croatia), namely Pokupsko basin and Spačva basin. First, we parameterized BBGCMuSo model at a local level using eddy-covariance (EC) data from Jastrebarsko EC site. Parameterized model was used for the assessment of productivity on a larger scale. Results of NPP assessment with BBGCMuSo are compared with NPP estimated from tree ring data taken from trees on over 100 plots in both forest complexes.

Keywords: Biome-BGCMuSo, forest productivity, model parameterization, NPP, Pedunculate oak