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BG3.7 Complex case studies for ecosystem responses to climate and hydrological extremes
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Evaluation of riparian forest water supply with groundwater monitoring and numerical modelling

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INTRODUCTION

Riparian zone forests (as a special type of agro-forestry systems) are very vulnerable in changing climate because they strongly depend on additional water.
The effect of an artificial water supply (new lakes and bottom thresholds) was evaluated in Kaszó Forest (South West Hungary).
An eco-hydrological monitoring (with groundwater well settling) was conducted on 14 regular (under the effect of water supply interventions) and 4 control plots (*Fig. 1.*) .

NUMERICAL MODELLING

1-D Hydrus model (using complex field monitoring data) was calibrated for an alder and two common oak forest plots (7., 8. and 9. on *Fig. 1.*). Diurnal signal of groundwater levels was used for evapotranspiration (ET) estimation in the model (*Fig. 4.*). Model results showed that groundwater uptake of forest vegetation was significantly increased (30%) regarding water supply interventions.

HYDRUS 1-D SETUP:

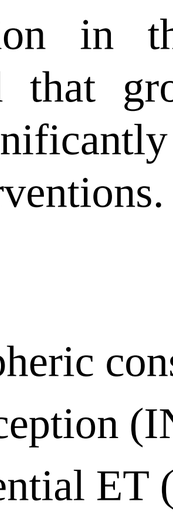
Upper boundary conditions (atmospheric constrains)

- precipitation (P) reduced by interception (INT)
- potential transpiration (PT) = potential ET (PET) reduced by interception (INT)

Lower boundary conditions: variable pressure head
Initial condition: pressure head -80 (0.0 m), +320 (4.0 m deep)
Vertical root distribution: to 1.2 m depth, uniform

Between 380-392 cm a silty clay layer for dampening the effect of bottom pressure head

Soil profile:
4 m deep



MODELLING FRAMEWORK:

- meteorological data (2014-2018)
- soil informations (layering and texture)
- PET calibration by ETgw (*Fig. 4.*)

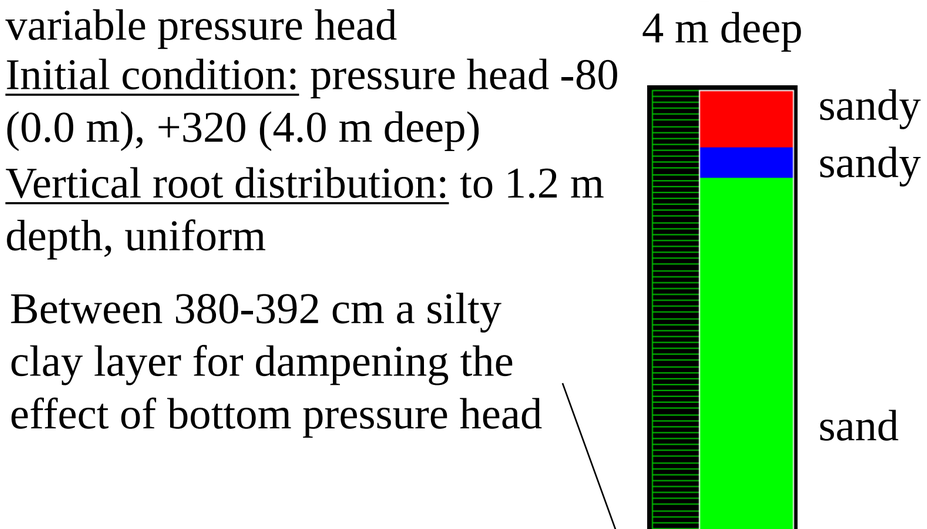


Figure 4. PET calibration using ETgw data for representative dry periods

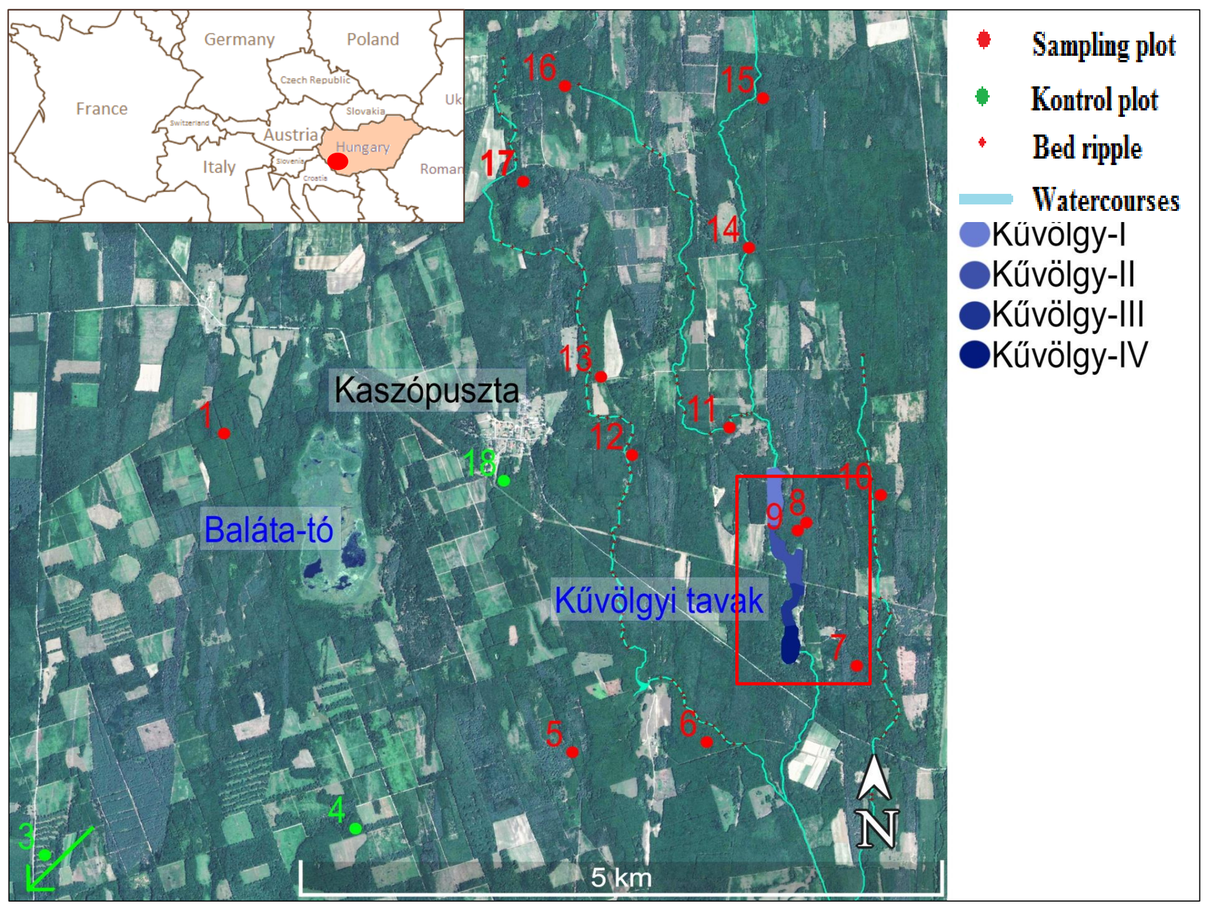


Figure 1. Research area

GROUNDWATER MONITORING EVALUATION

The impact of water supply interventions was interpreted using spatio-temporal groundwater level difference analysis (*Fig. 2.*) and found that lake settling and renewal had positive impact on the riparian zone water table (40-50 cm rise in the neighbourhood of new lakes) while the effects of bottom thresholds are hardly detectable (*Fig. 3.*).

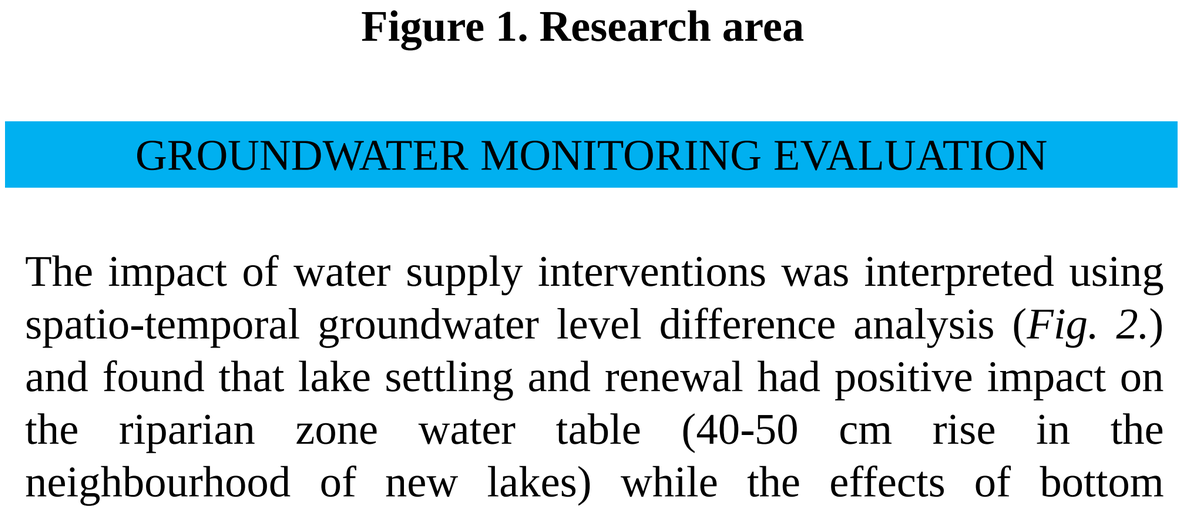


Figure 2. Principle of treatment-control space and time deviation analysis

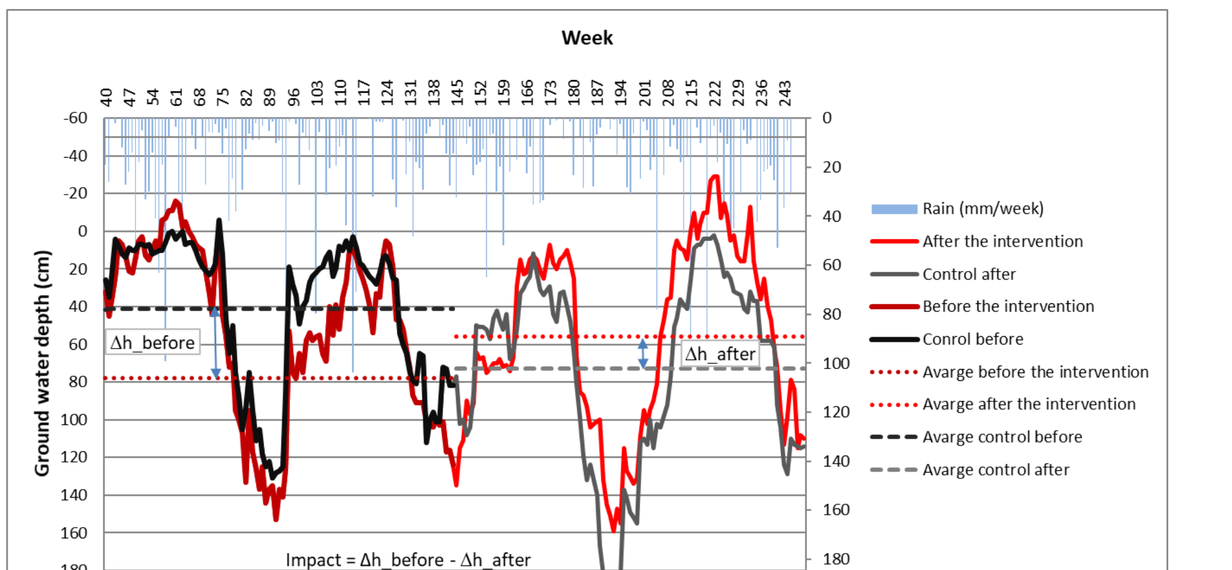


Figure 3. Water-table change related to control

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