

Modelling of Soil Water Regime in Forested Areas:

Seasonally Variable Soil Hydraulic Properties

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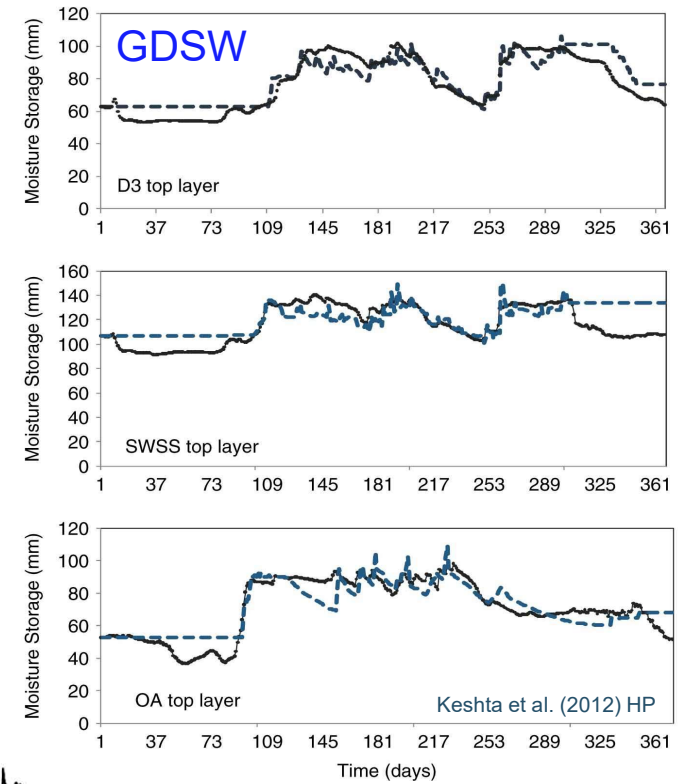
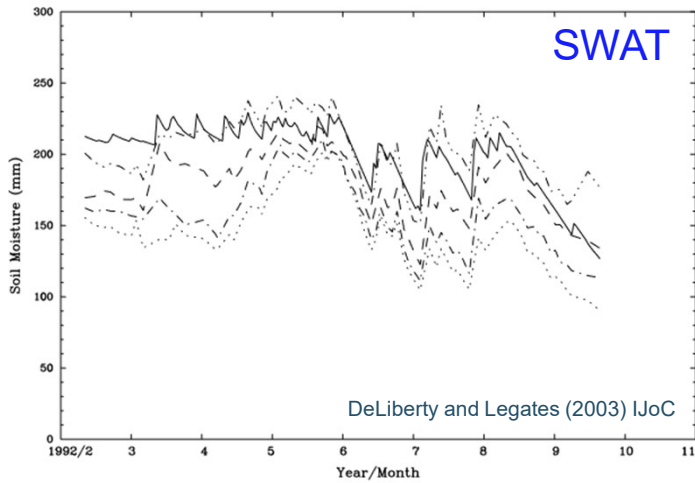


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MOTIVATION

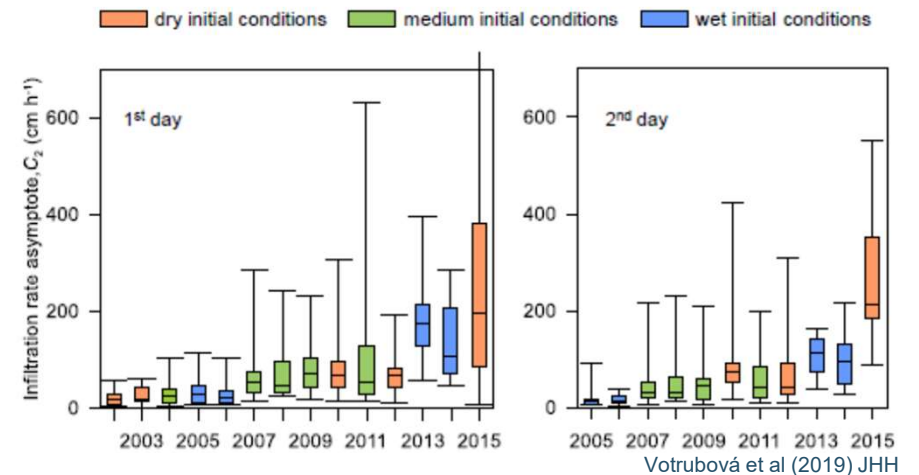
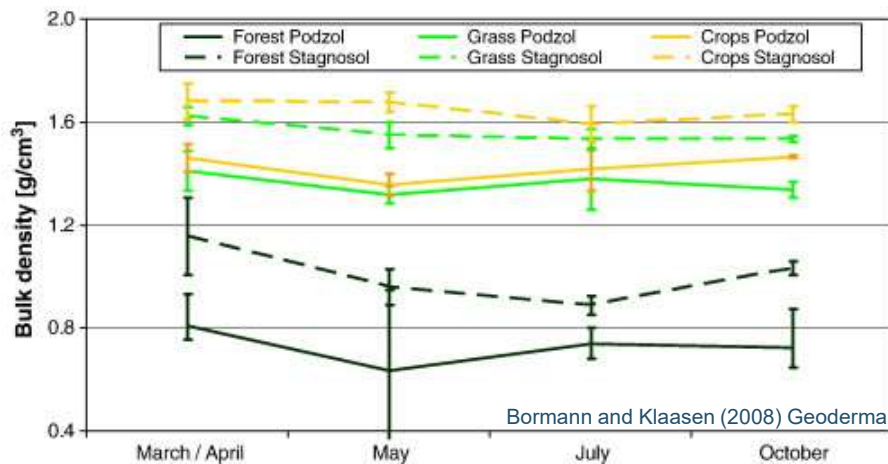
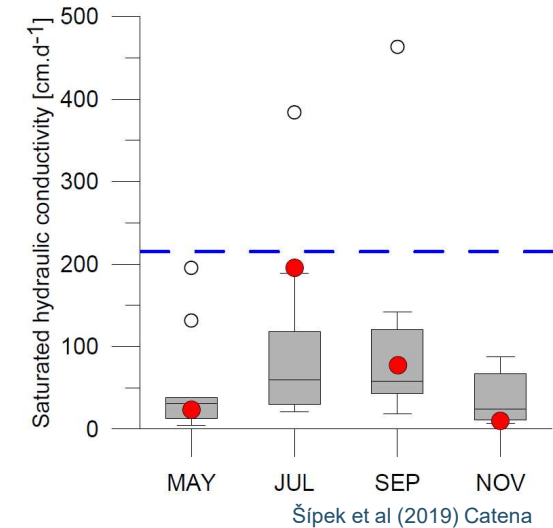
Incorrect representation of **soil moisture storage** by hydrological models



MOTIVATION

- Biological activity
- Initial soil moisture
- Rainfall occurrence
- Freezing/thawing cycles
- Wetting/drying cycles

Non-stationary
soil hydraulic properties



MOTIVATION

- Correct description of **soil-plant-atmosphere** water fluxes
- Exchange of **heat and carbon**
- **Drought** prediction
- **Flood** forecasting
- **Forest growth** models
- **Climate change** impact assessment



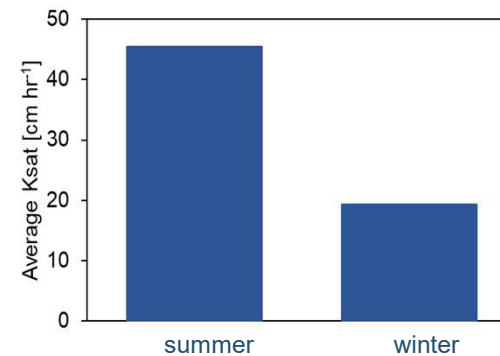
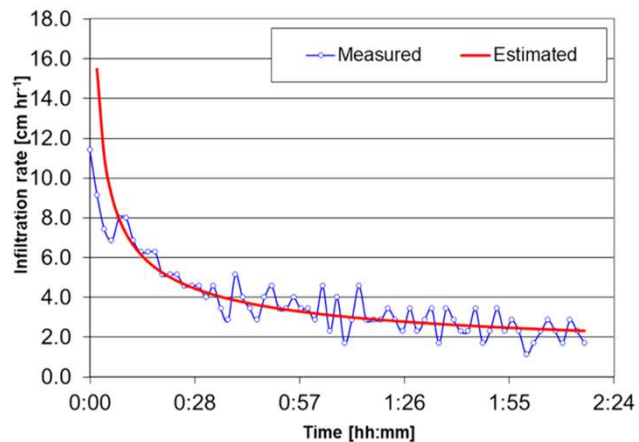
OUR RESULTS



HYDRAULIC CONDUCTIVITY

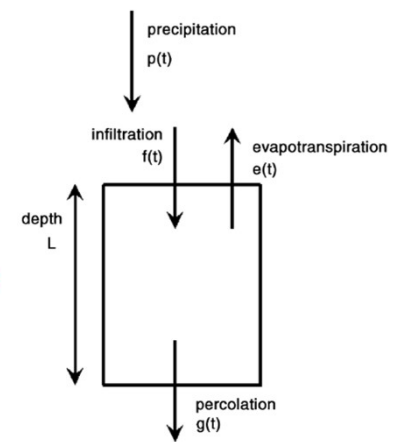
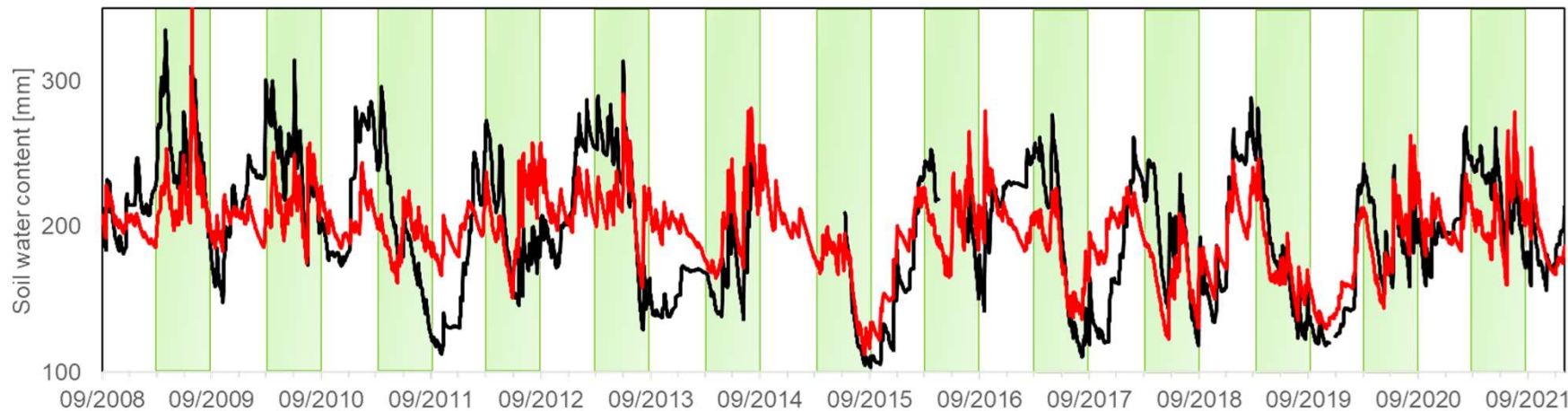
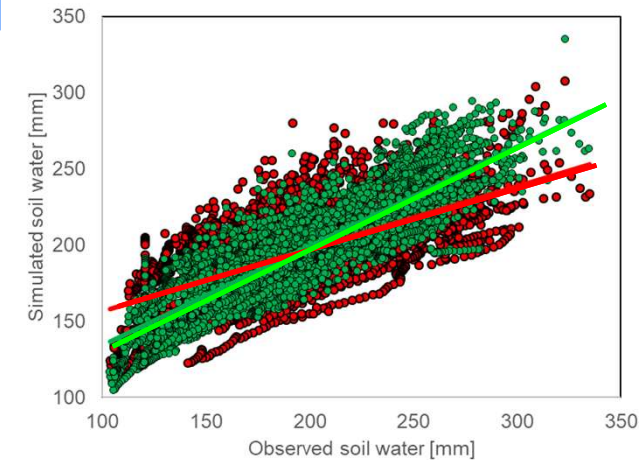
- Measured **in summer and winter season**
- **10** replications (plot 30x30 m)
- Single-ring infiltrometer

Summer Ksat 2.4x higher than winter Ksat



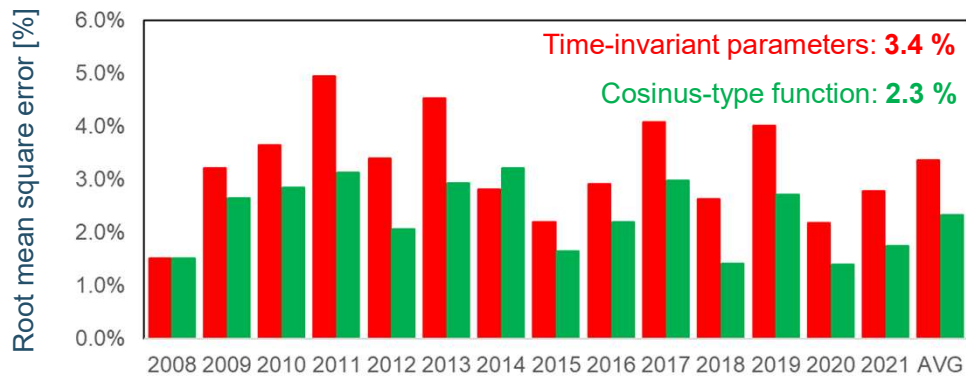
SOIL WATER MODELLING

- Bucket-type soil water balance model
- Daily time step (2009–2021)
- **1) Time-invariant parameters**
 - > Reliable estimation of soil moisture only in vegetation season
- **2) Cosinus-type function**
 - > Introducing temporally variable K_{sat}

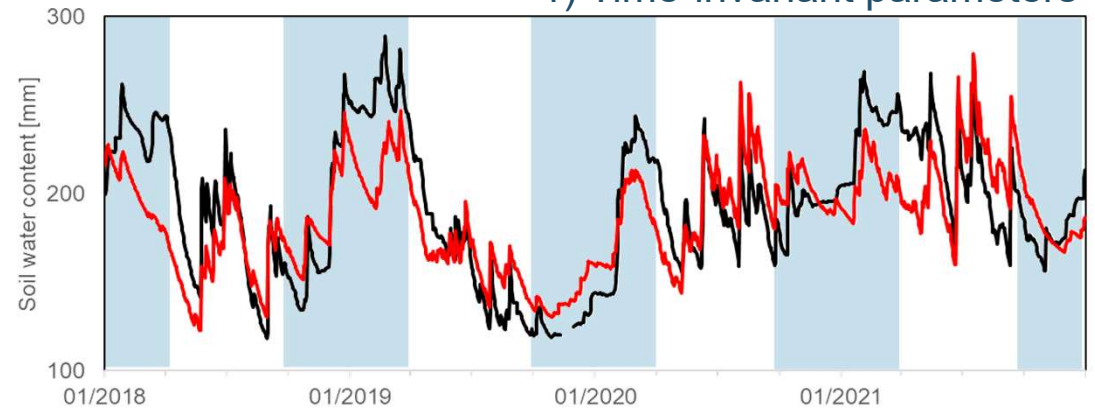


SOIL WATER MODELLING

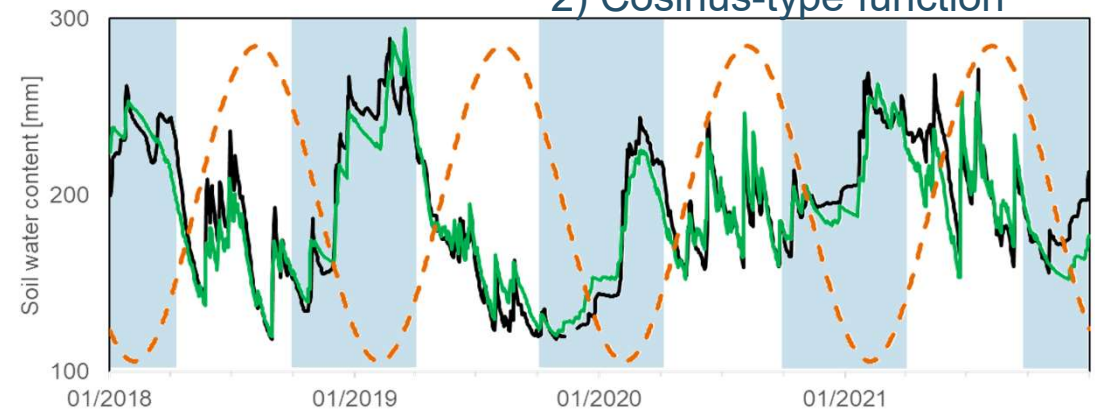
- RMSE decreased by **40 %**
- Nash-Sutcliffe from **0.45** to **0.74**
- Correlation increased from **0.68** to **0.87**



1) Time-invariant parameters



2) Cosinus-type function



CONCLUSION

- **Higher Ksat** observed in **summer season** (May-Sep)
- Introduction of **seasonally variable** Ksat
increased soil water modelling **efficiency**
- Representation of **soil-plant-atmosphere** interactions
can be significantly **enhanced**

THANK YOU

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