

The effects of agricultural conservation practices on the local water cycle in conditions of the Czech Republic: modelled by SWAT

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Introduction

- Climate Change
- Communist Era
- Agricultural intensification & regulation
 - Agricultural management
 - Land use changes
- Post-Communist Era



lStock



HZS CR

Study Location

Nučice Experimental Basin (2011)

Agricultural

Very small

3 Fields - 2 Farmers

- Typical crops:
- Winter wheat
 - Canola
 - Mustard



SWAT Calibration and Validation

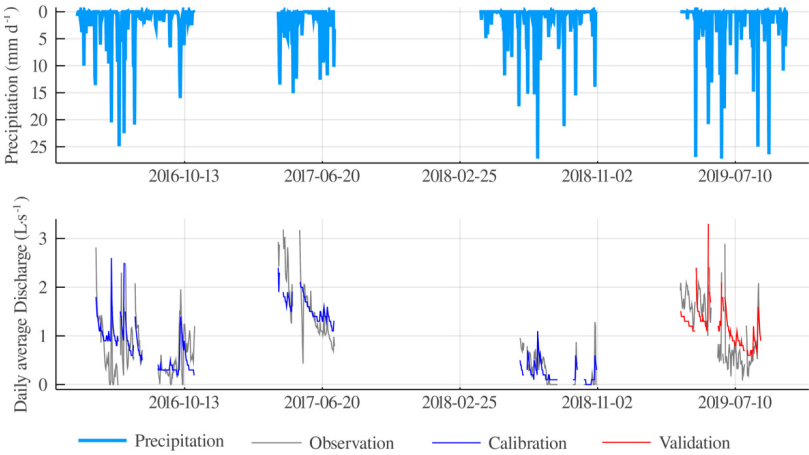
Run at daily timestep

2013-2019 with 1-year warmup period

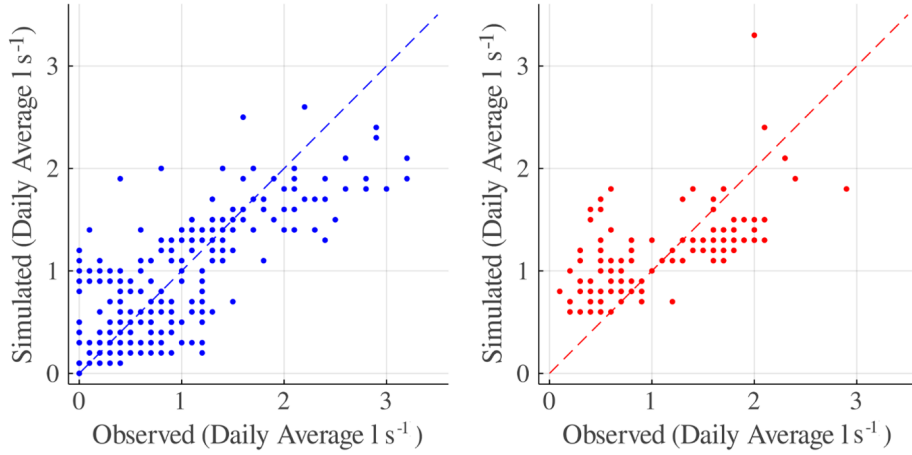
Calibration: 2016-2018

Validation: 2019

On-site weather station



Model Performance Indicator	Calibration (2016-2018)	Validation (2019)
NSE	0.65	0.40
PBIAS	-0.3%	-6.7%
R ²	0.65	0.42
KGE	0.75	0.47
<i>p</i> -factor	0.55	0.71
<i>r</i> -factor	0.22	0.12



Results & Discussion

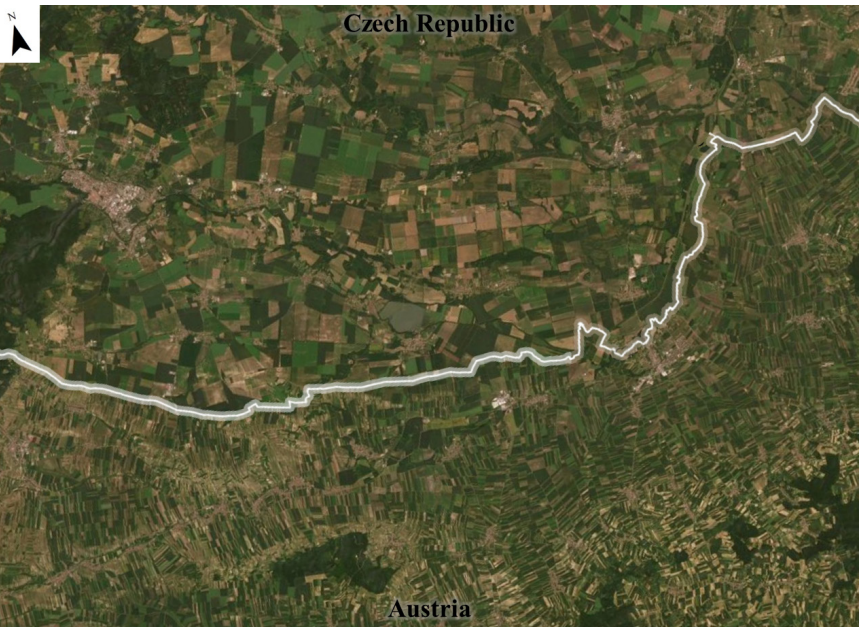
Parameter	Conservation Tillage	Contour Tillage	Contour w/ Residue	4 ha Fields
PERC		+	+	+
ET		+	+	+
SURQ		-	-	-
LATQ		+	+	+
SW	-	+	+	+
SED	-			-
Q		-	-	-

Agricultural conservation techniques:

Generally reinforce the small water cycle

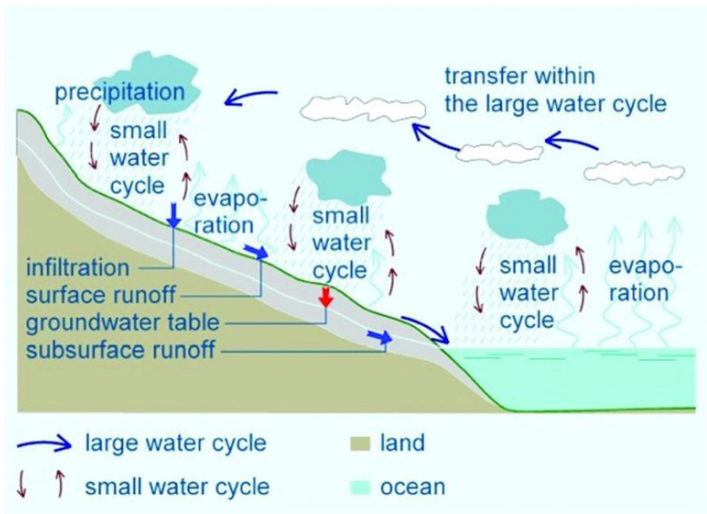
Smaller field size:

Overwhelmingly reinforces the small water cycle



ESRI, 2021

The Small Water Cycle & Conservation Agriculture



Kravčík, 2015

Principles of Conservation Agriculture



Method

4 Scenarios

Contour Tillage

Contour Tillage w/ Residue

Conservation Tillage

Field Size Reductions (4 vs 17 ha)



<https://pixels.com/featured/farm-greens-and-hillside-contour-plowing-blair-seitz.html>



African Conservation Tillage Network

Future Work

- Upscale efforts from “farm-scale” to “management-scale” (0.52 km² to 100 km²)
- Do agricultural conservation practices adopted at two different scales have additive or multiplicative effects?
- Do field size reductions have as significant of effects on the small water cycle as agricultural conservation practices?
- How should the Czech Republic adapt its land management in a post-communist world?

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