[1] Crop Research Institute

[2] International Institute for Applied Systems Analysis

Extrapolation of the LTE data for regional prediction of crop production and agro-environmental impacts in the Czech Republic with the EPIC-based modelling system

Kateřina Křížová[1], Rastislav Skalský[2], Mikuláš Madaras[1], and Juraj Balkovič[2]

EGU General Assembly 2022

Monday, 23 May 2022

Crop Research Institute in Prague

- National authority in agricultural research, since 1951
- Long-term Experiments (LTE)
  - A. CROP-oriented (varieties, crop rotation)
  - B. NUTRITION-oriented (organic vs. mineral fertilization)
  - C. AGROTECHNICS (soil management and protection)

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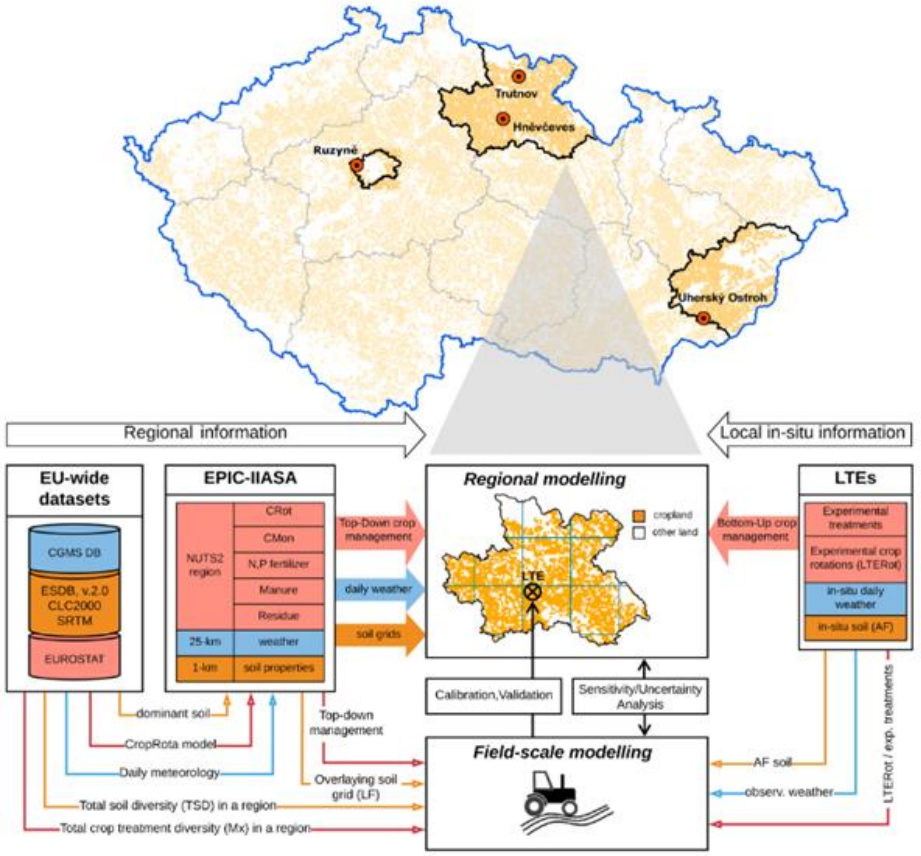
Conceptual background

- LTE: local managemental strategies
- EPIC-IIASA crop modelling system: spatial pattern
- ***LTE data for calibration and validation of regional modelling***
- soil organic carbon balance



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Research article

Verifiable soil organic carbon modelling to facilitate regional reporting of cropland carbon change: A test case in the Czech Republic

Juraj Balkovič [a,b,*], Mikuláš Madaras [c], Rastislav Skalský [a,d], Christian Folberth [a], Michaela Smatanová [e], Erwin Schmid [f], Marijn van der Velde [g], Florian Kraxner [a], Michael Obersteiner [a,h]

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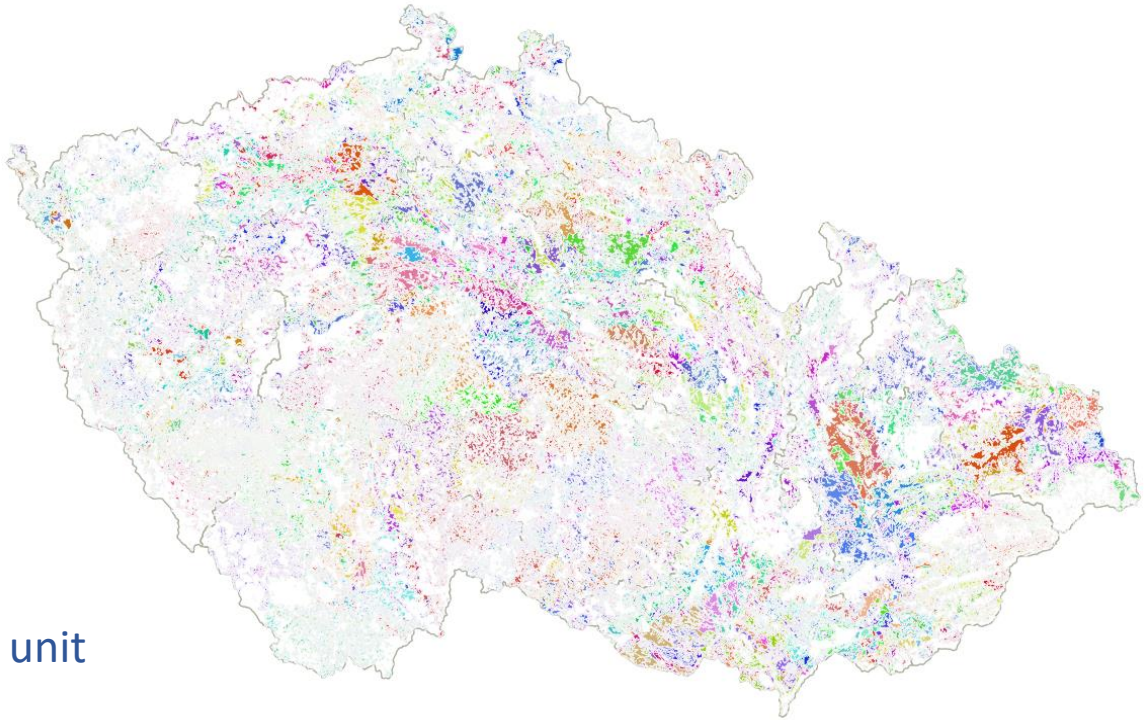
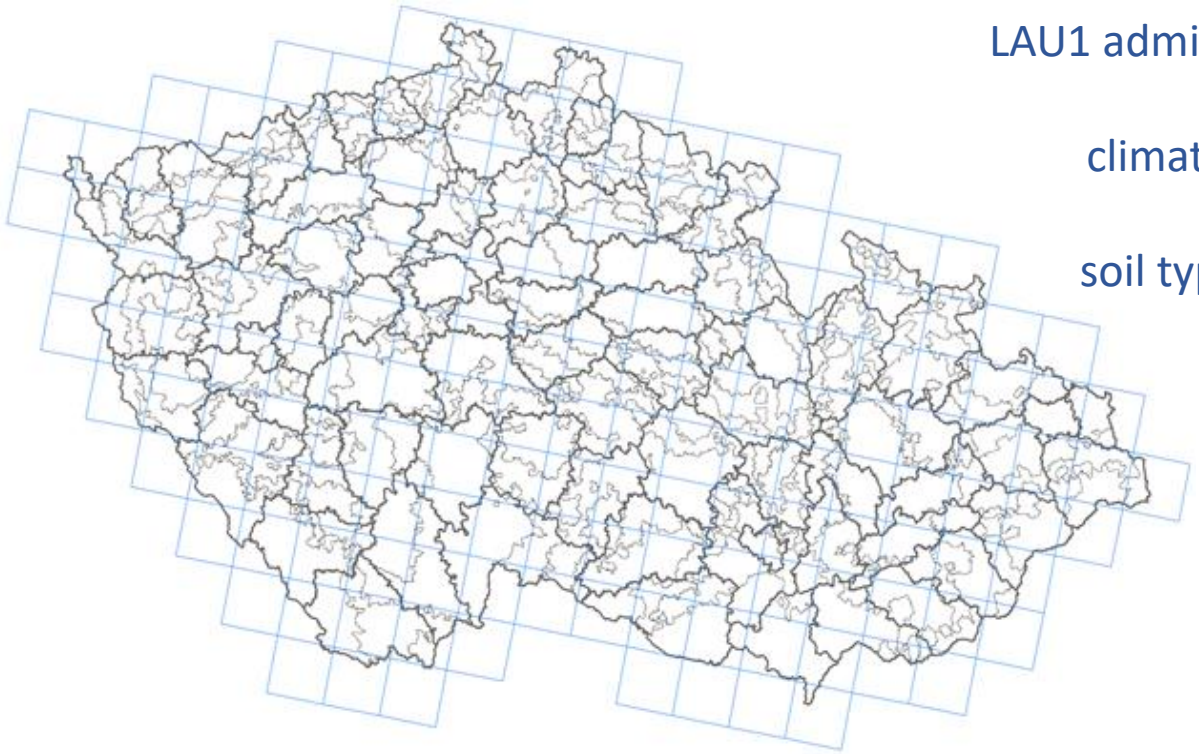
EPIC-IIASA (CZ)

- simulation infrastructure
- crop production and agro-environmental parameters
- calibration with LTE data

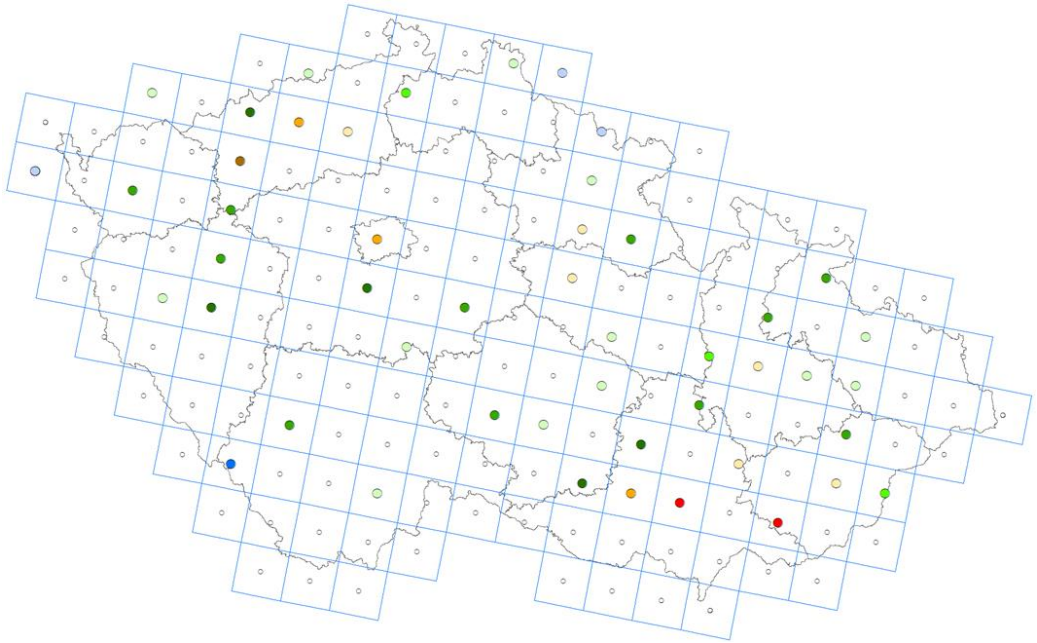


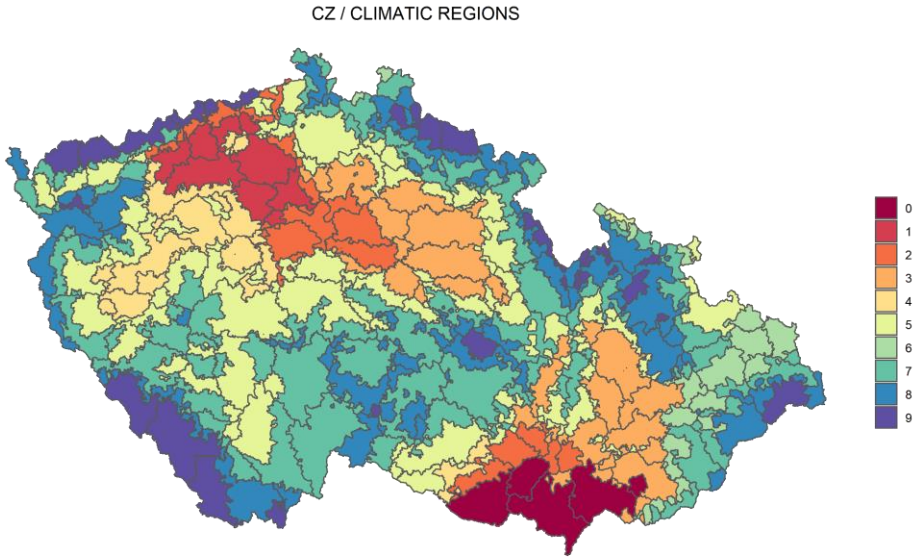


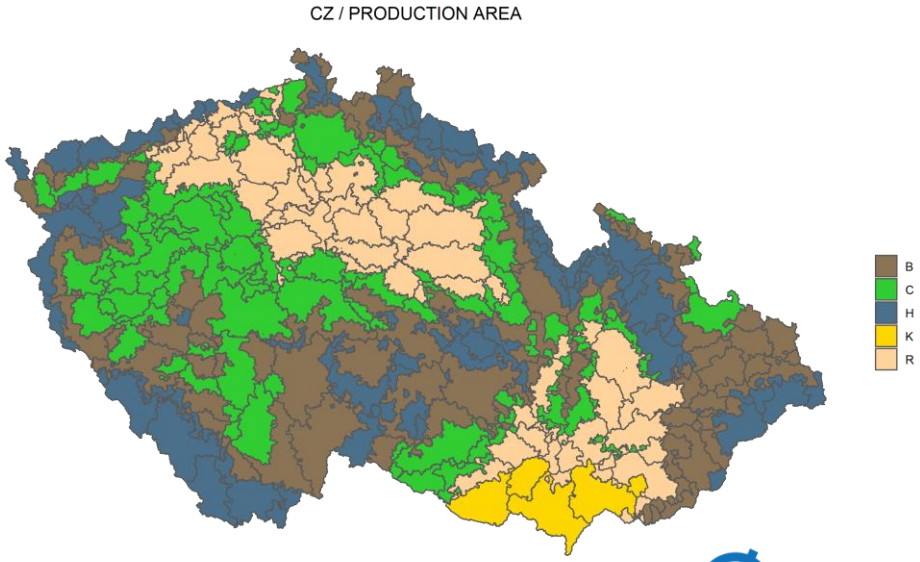
LAU1 administrative unit
*
climatic region
*
soil type region → 977 simulation units

Inputs

- CLIMATE (daily weather): clima grid of Agri4Cast[1]
- SITE (elevation, slope, field size, slope length): DEM
- SOIL (typical soil profiles): soil maps, soil profiles
- CROP MANAGEMENT: regional setup







[1] https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx

Calibration

4.3.2. Spring Barley

Phenological crop calendar

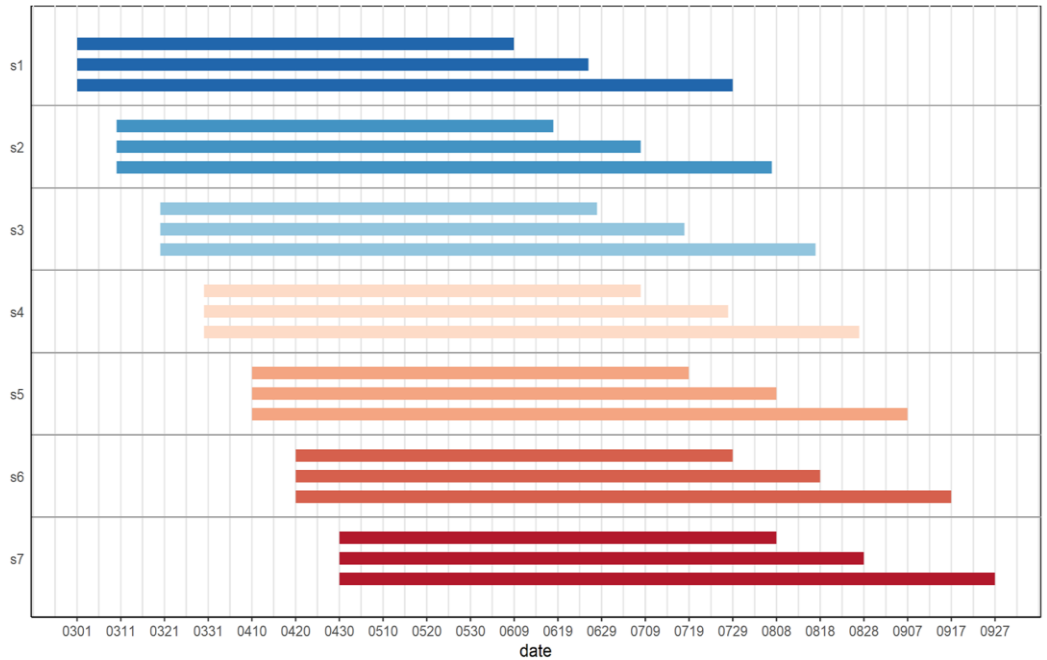
Table CZ06 – Phenological crop calendar for spring barley

spring barley - phenological crop calendar

region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CZ_R01			6_1	6_2		6_5 6_6	6_8 6_9					
CZ_R02			6_1 6_2			6_5	6_8 6_9					
CZ_R03			6_1	6_2		6_5 6_6	6_8 6_9					
CZ_R04				6_1 6_2			6_5	6_8 6_9				
CZ_R05			6_1	6_2 6_3		6_5	6_8 6_9					

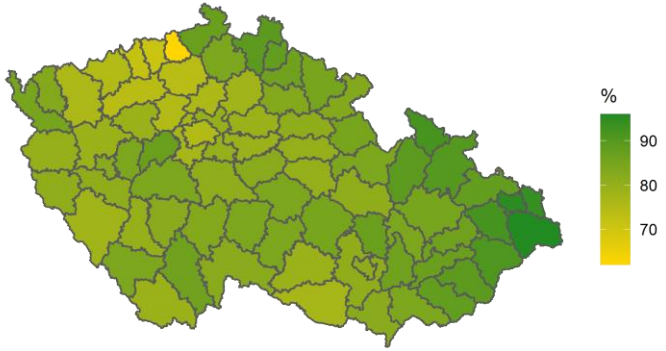
6_1 sowing
6_2 emergence
6_3 tillering
6_4 shooting
6_5 heading (ear emergence)
6_6 flowering
6_7 ripening
6_8 physiological maturity
6_9 harvest

SPRING BARLEY PLANTING SCENARIOS

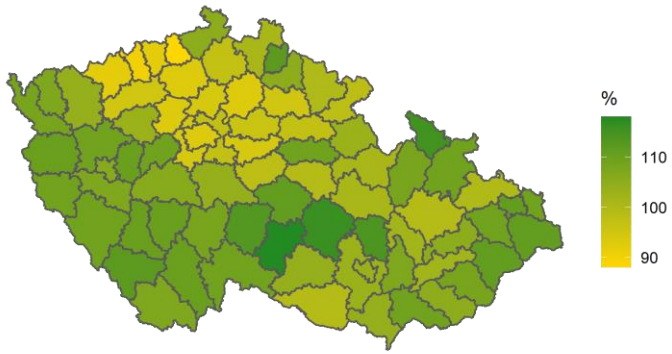


VOLTR vs. EPIC-IIASA (CZ) : RUN 5

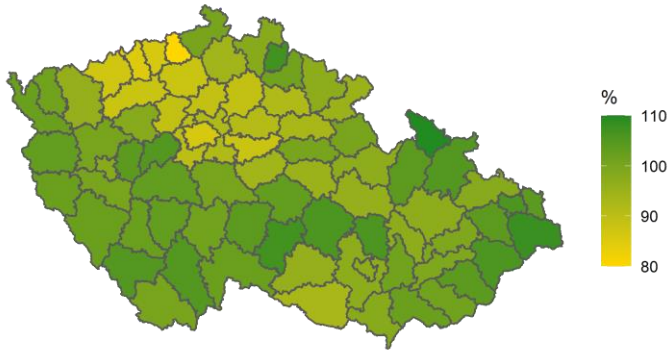
YIELD WEIGHTED MEAN



MAX YIELD



25% MOST PRODUCTIVE YEARS



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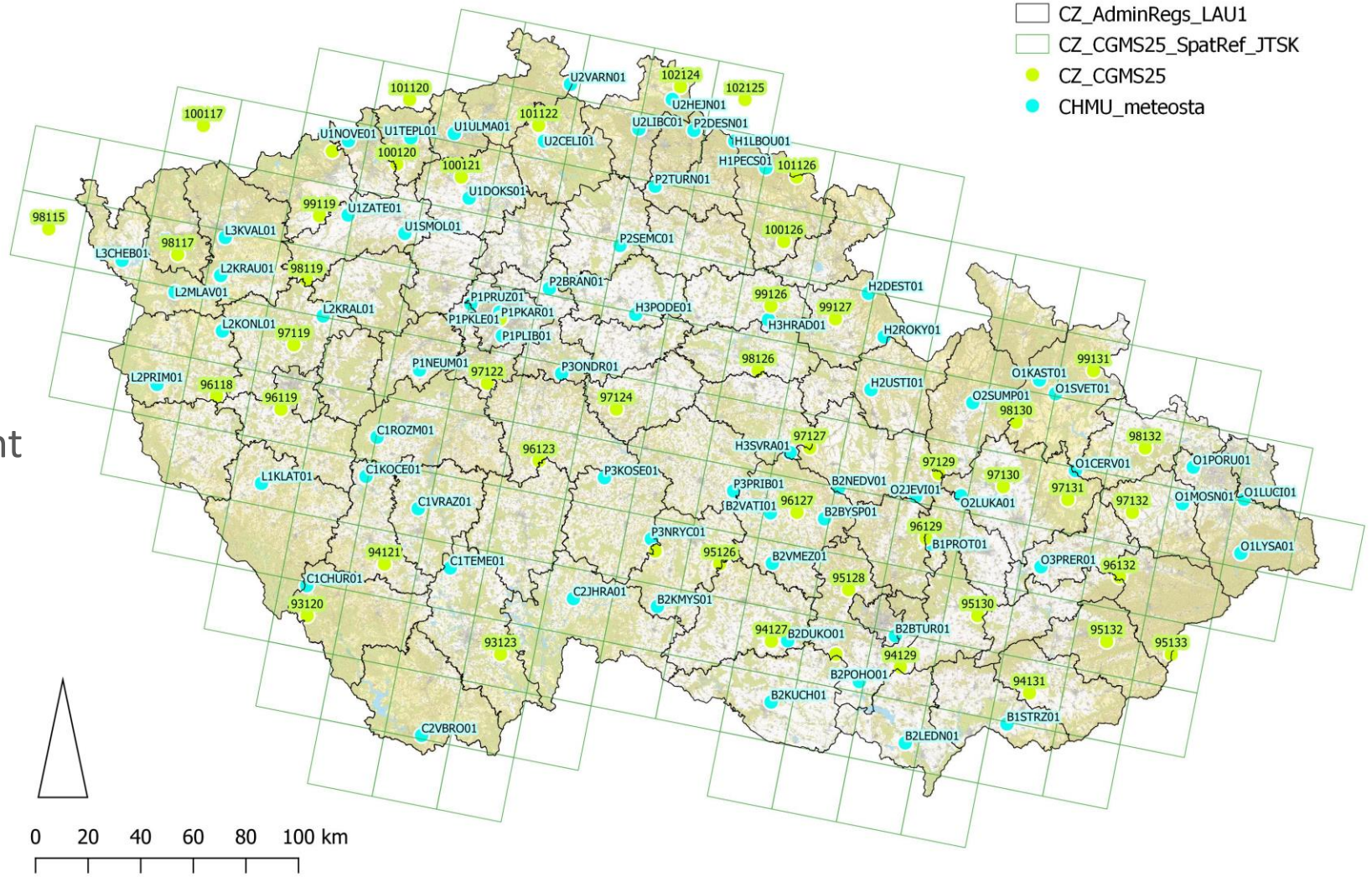
Next steps

- top 10 crops in CZ
- universal crop rotation system
- meteorological data refinement

1	winter wheat	✓
2	winter rapeseed	
3	spring barley	✓
4	corn	
5	winter barley	
6	corn	
7	lucerne	
8	sugar beet	
9	spring wheat	
10	oat	



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Thank You for Your Attention.

krizovak@vurv.cz