

EGU GENERAL ASSEMBLY · 7 MAY 2026 · SESSION BG9.9

Large-scale, high-resolution **fractional cover** mapping from Sentinel-2

for Agri-Environmental Monitoring

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Croplands loose up to x2 more soil and nutrients than 'natural' landuse

10 % of Swiss arable land is at elevated erosion risk



Erosion risk and soil cover

The Swiss Agro-Environmental Monitoring Program reports a yearly **erosion risk indicator**

C-factor

- How vegetation and land management contribute to erosion
→ depends on fractional cover
- 0 – low, 1 – high contribution

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CURRENT PRACTICE

Assumed crop development.
Assumed field cover per crop over time.

WHAT SENTINEL-2 OFFERS

A direct, field-level observation of cover dynamics, at 10m resolution, every ~5 days.

Fractional Cover (FC) estimation

Every 10m pixel is a **mixed spectral signal**



Photosynthetic vegetation
living canopy



Non-photosynthetic vegetation
stubble, residues, senesced cover



Bare soil



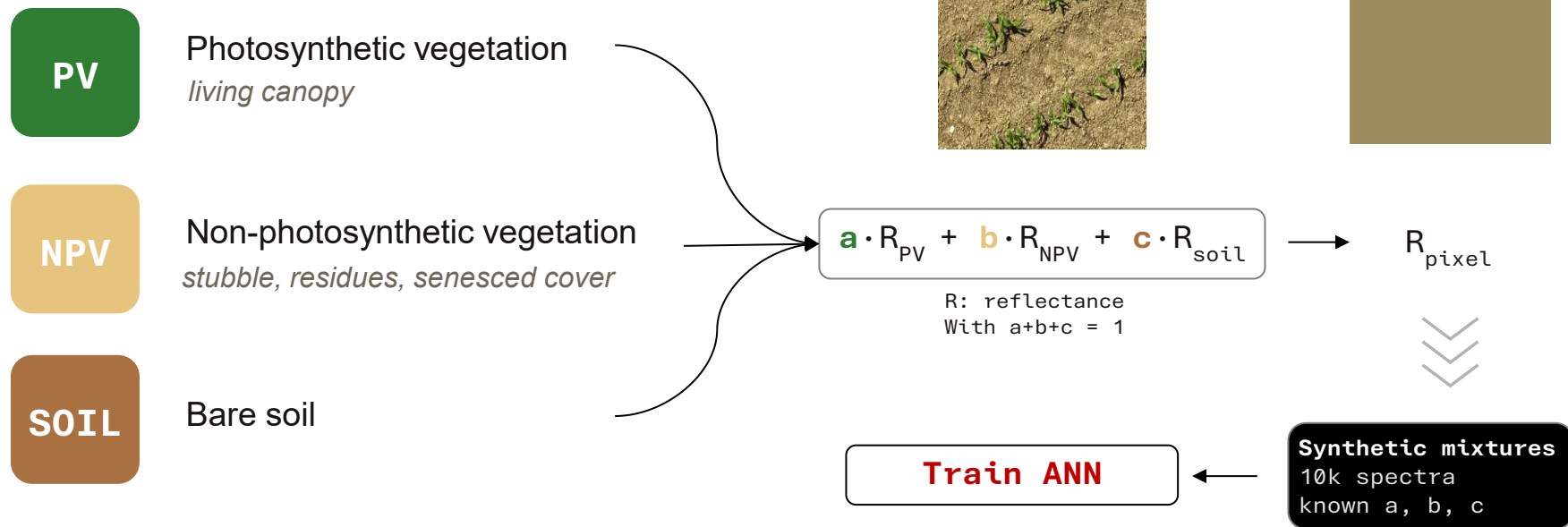
$$a \cdot R_{PV} + b \cdot R_{NPV} + c \cdot R_{soil}$$

R: reflectance
With $a+b+c = 1$

R_{pixel}

Fractional Cover (FC) estimation

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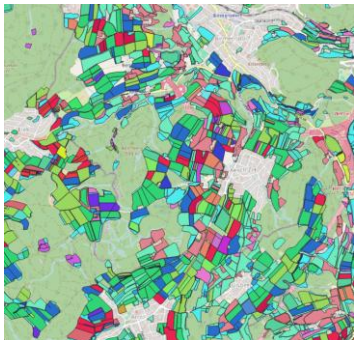
Data

Build a representative Swiss endmember library to create mixtures

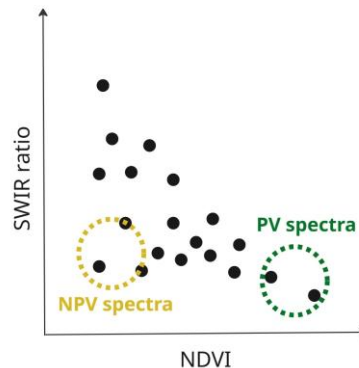
PV

NPV

CROP TYPE MAPS



- Identify top 15 crops
 - Sample 10'000 Sentinel-2 pixel timeseries per crop and per year (2021-2023)
- Use feature space to extract purest PV and NPV



Data

Build a representative Swiss endmember library to create mixtures

PV

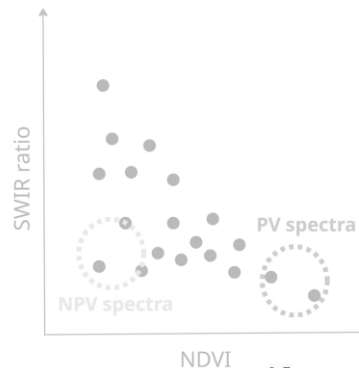
CROP TYPE MAPS



NPV

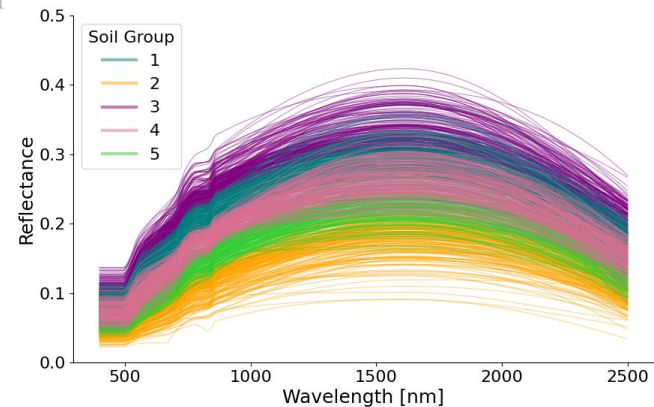
SOIL

BARE SOIL COMPOSITE (DLR SOILSUITE)



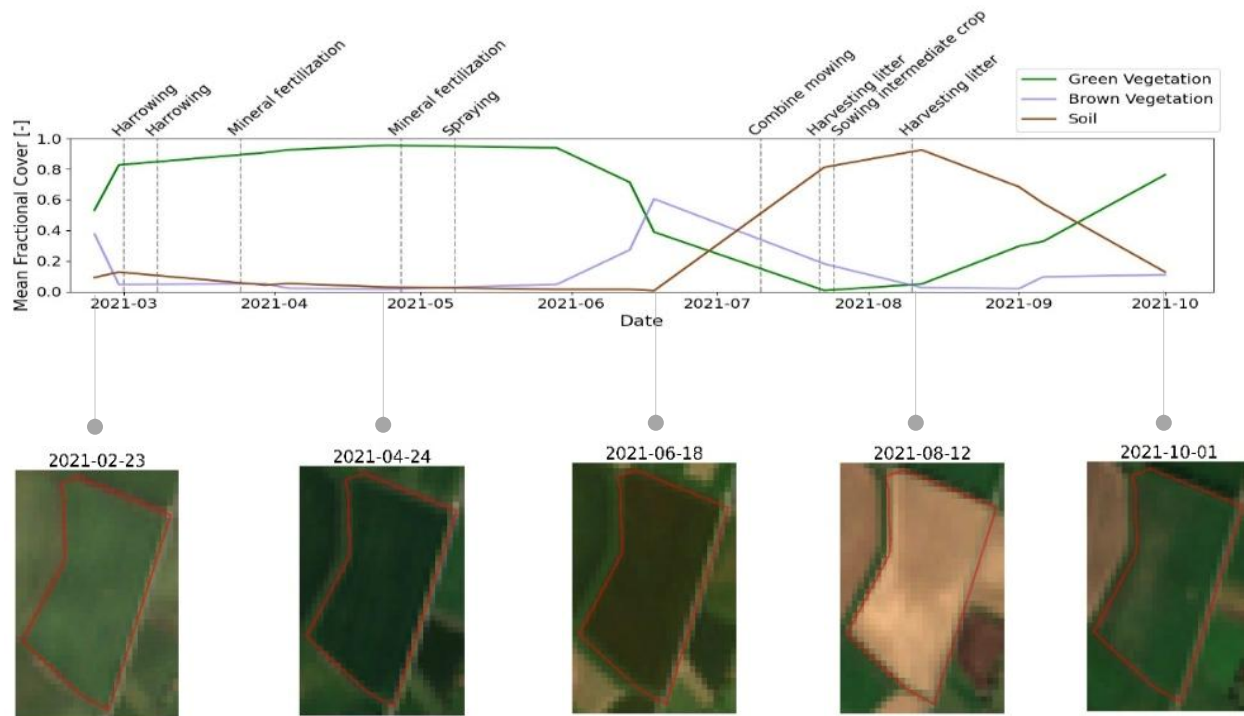
K-Means clustering

- Soil pixels on arable land
- Input satellite bands



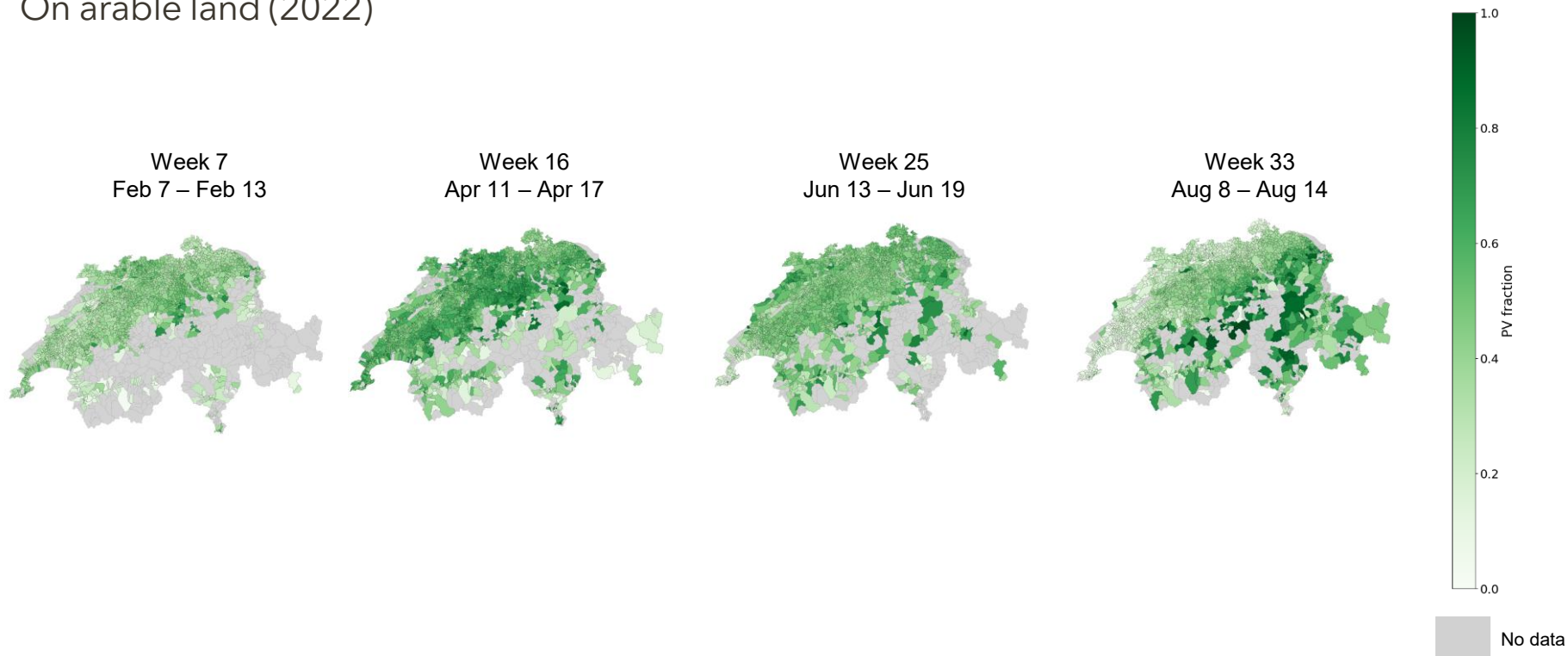
FC models

Models capture **cover dynamics** and **management**



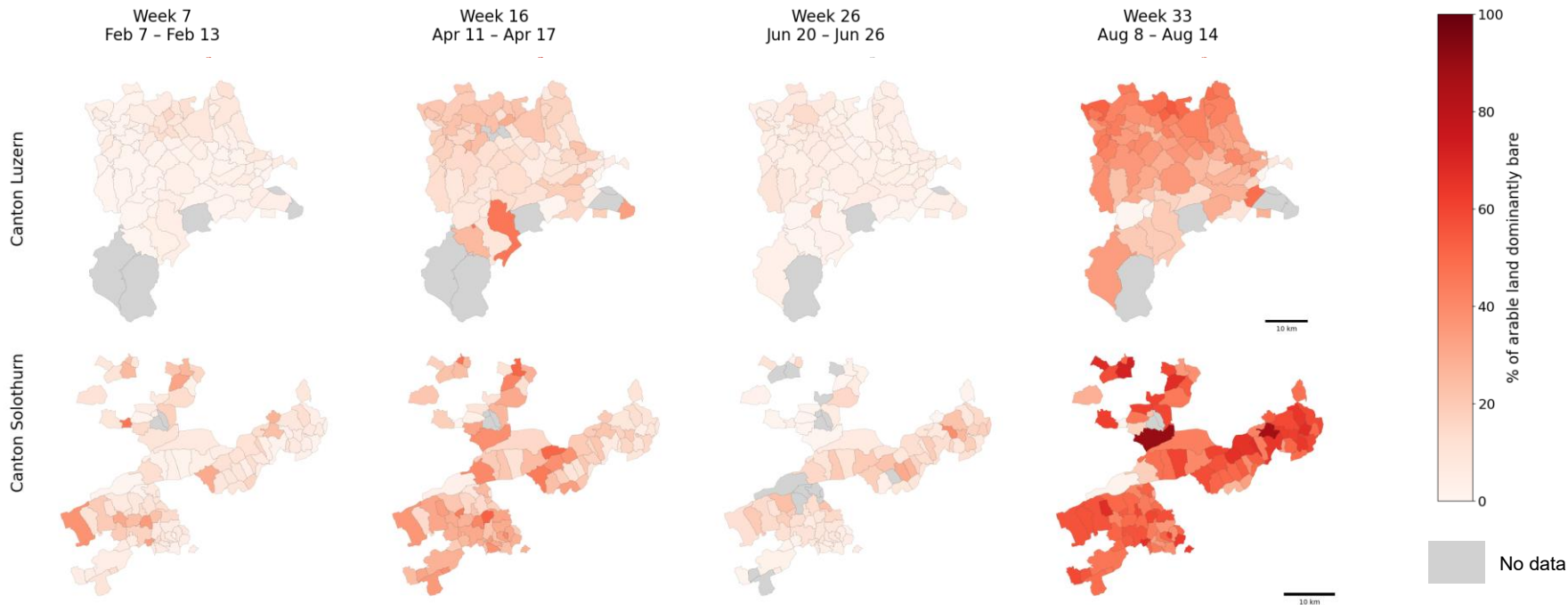
Average weekly municipal FC PV

On arable land (2022)



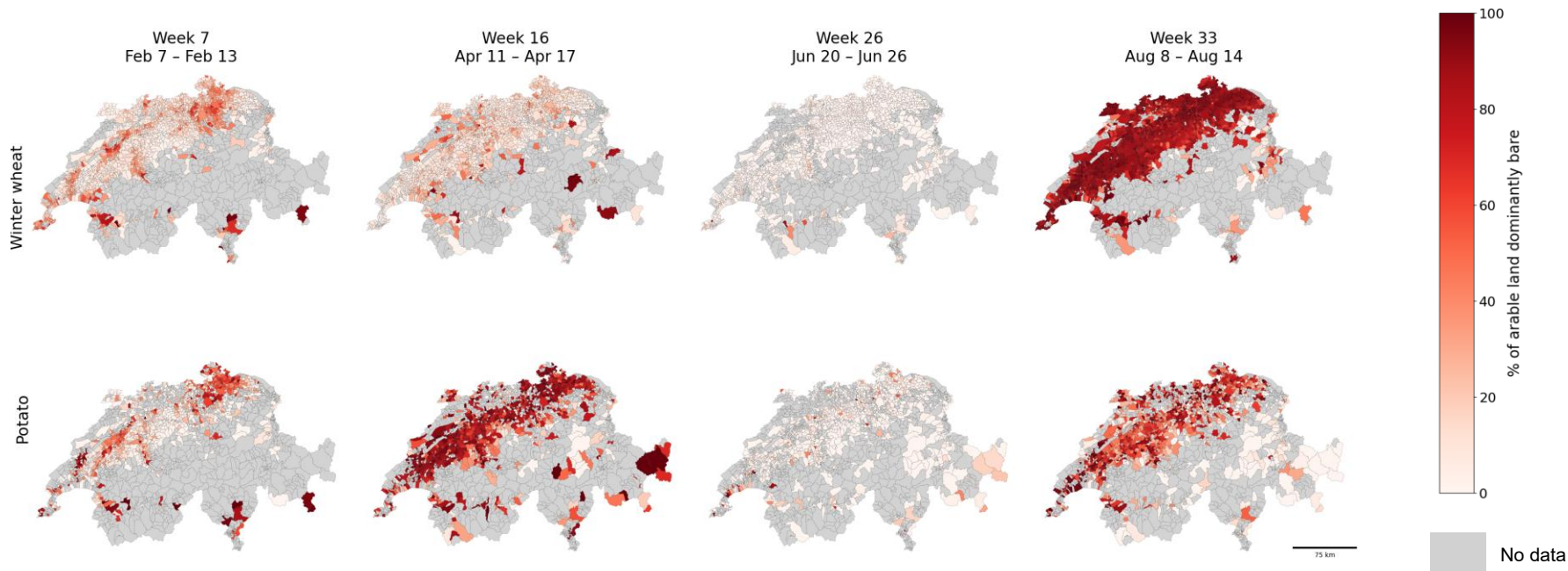
Fraction of land dominantly (>50%) bare

Average weekly municipal (2022)



Fraction of crop area dominantly (>50%) bare

Average weekly municipal (2022)



Outlook

Fractional cover

10m resolution · 5 days

Rainfall erosivity

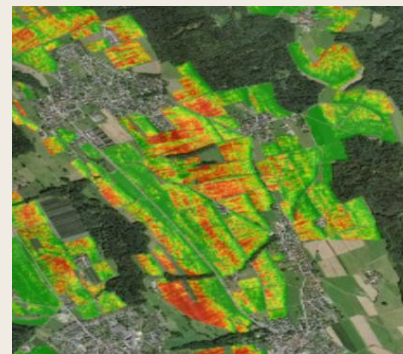
Erosive events

Updated C-factor

TARGET PRODUCT

Live Swiss erosion-risk map

Parcel-level · updated with satellite data





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Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
Agroscope



Earth Observation of Agroecosystems team



Thanks for your attention!

& to colleagues and collaborators for their support

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