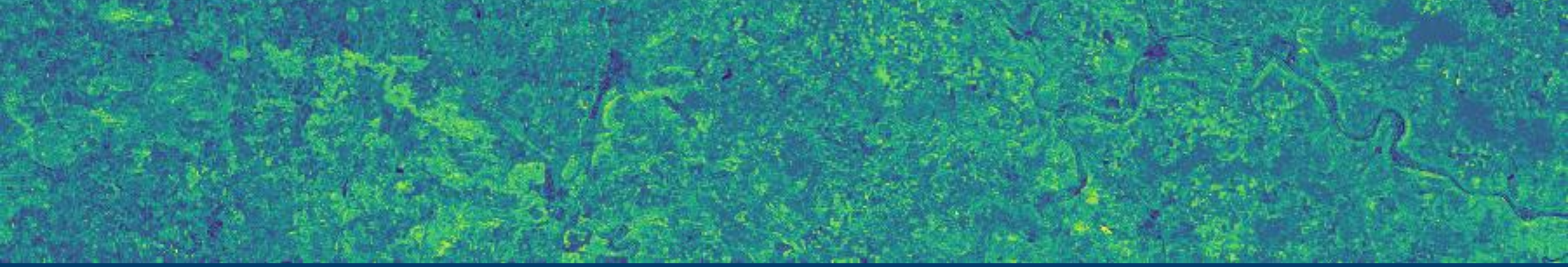


On the potential of ‘EnMAP-like’ emulated hyperspectral data cubes from Sentinel-2 multispectral satellite data: Comparison of emulated and Sentinel-2 biophysical variable maps

DroughtMAP

11.10.23 I DAVID HERRERA, BASTIAN SIEGMANN

Mitglied der Helmholtz-Gemeinschaft

Bundesministerium für Wirtschaft und Klimaschutz

DroughtMAP

JÜLICH Forschungszentrum

INTRODUCTION - Motivation

Canopy level

DOWNSCALE

Leaf level

$$SIF_{760}^{leaf} \approx \frac{\pi \, SIF_{760}^{canopy}}{FCVI} \times fAPAR_{chl}$$

Illumination conditions

Canopy structure

Information about the plant physiology

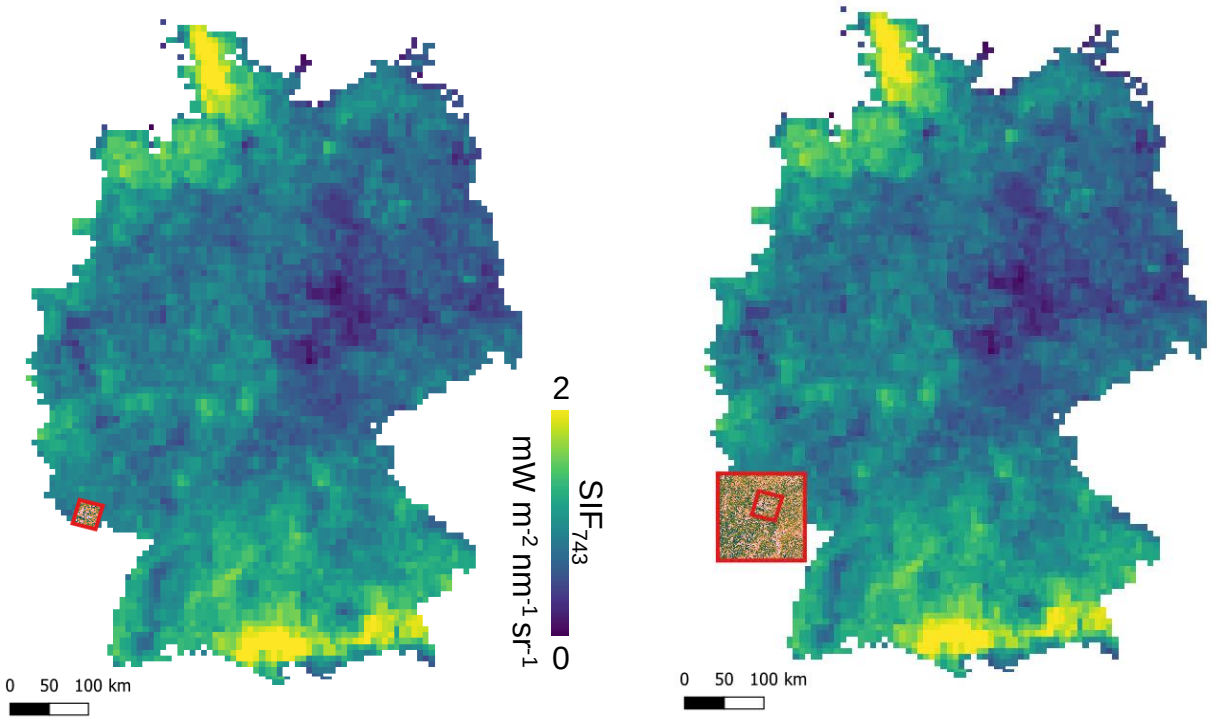
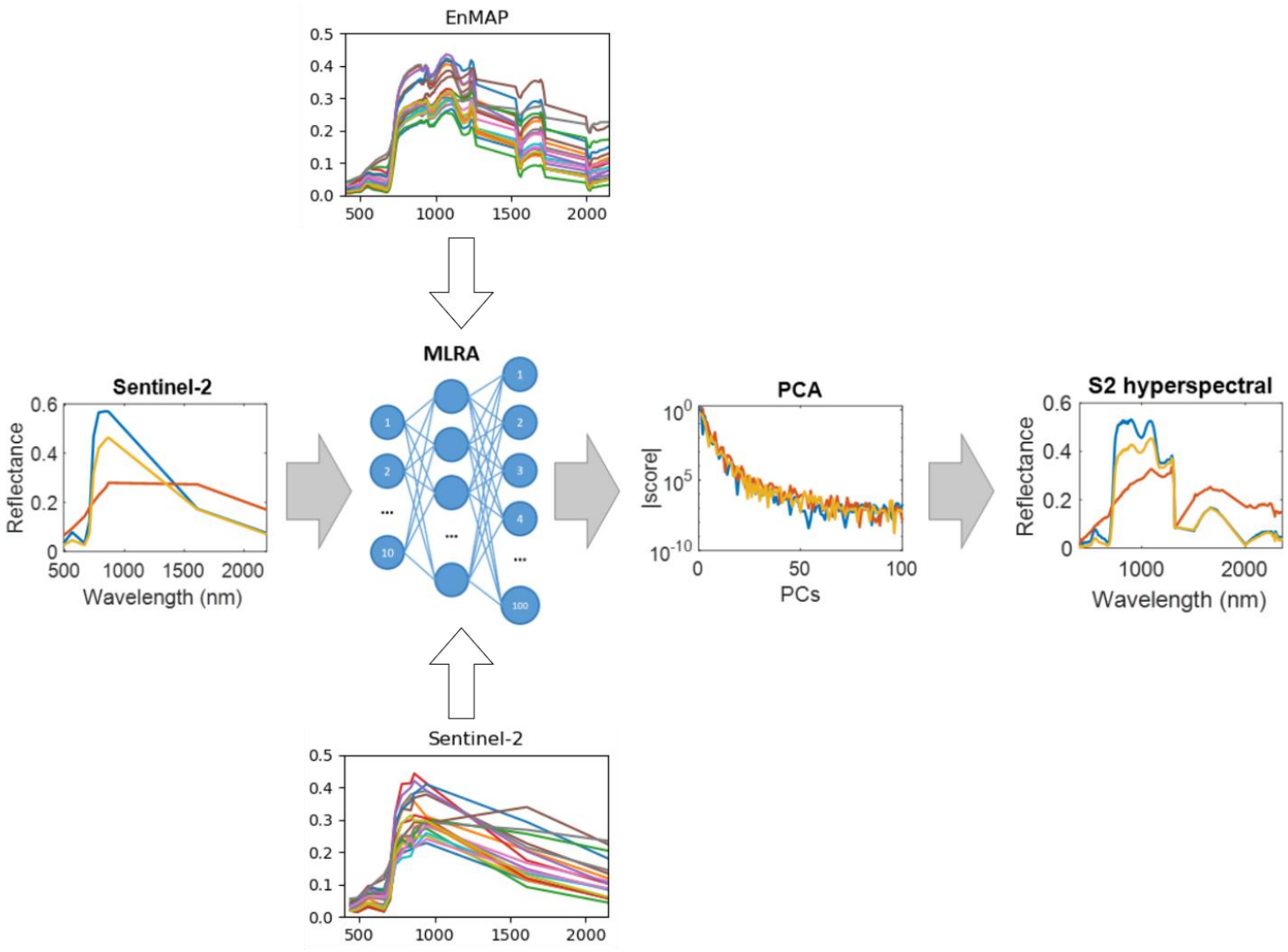


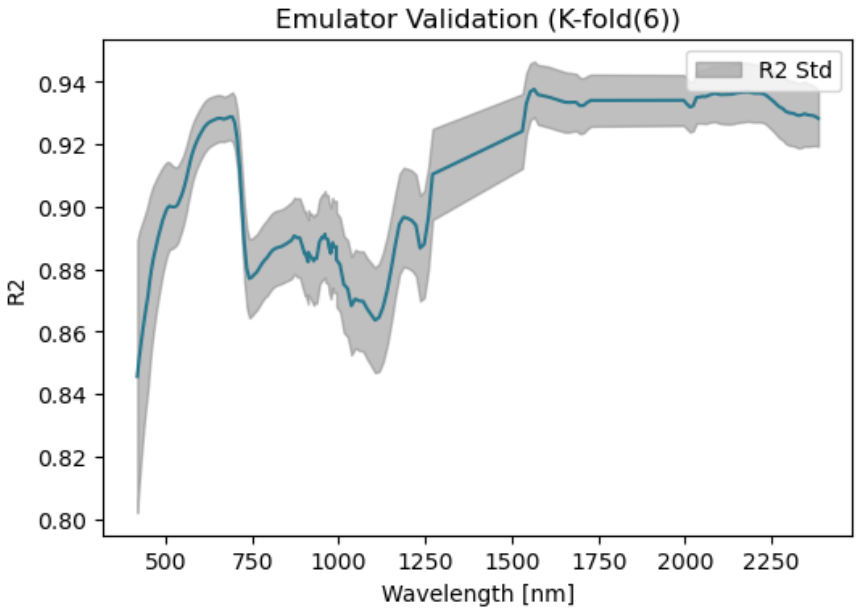
Fig. 2 – Spatial coverage of S2 and EnMAP plotted on a Troposif image of Germany (May 2022)

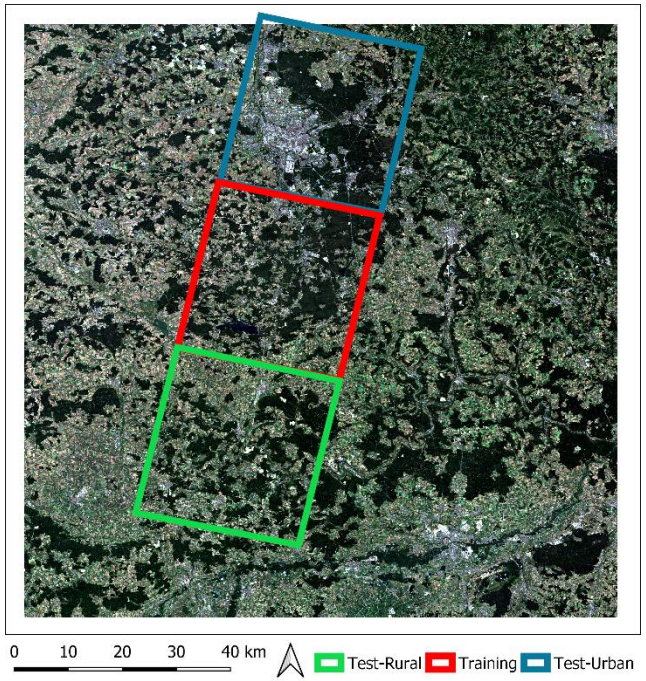
METHODS – Emulation *(Morata et al. 2022)*

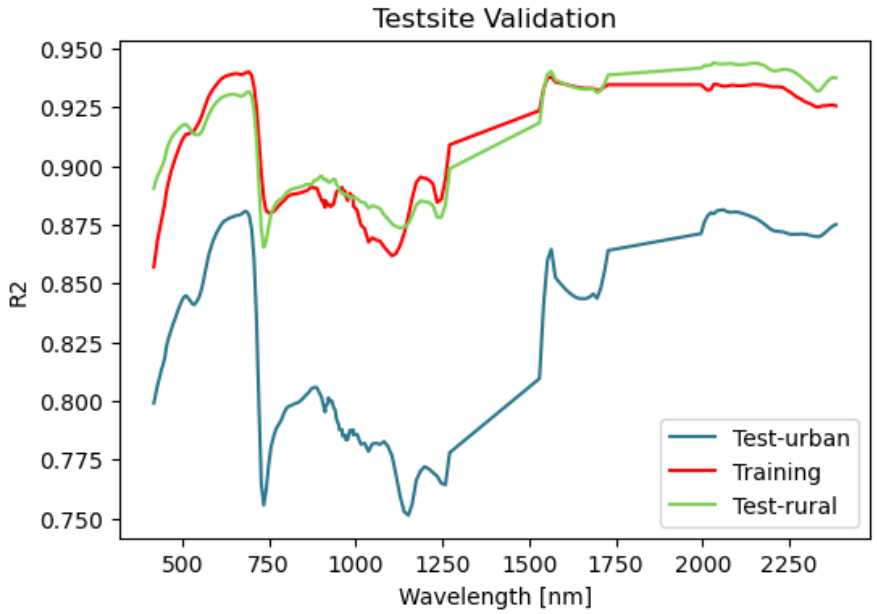


**Plot edited from Morata et al. 2022*

METHODS – Emulator Validation



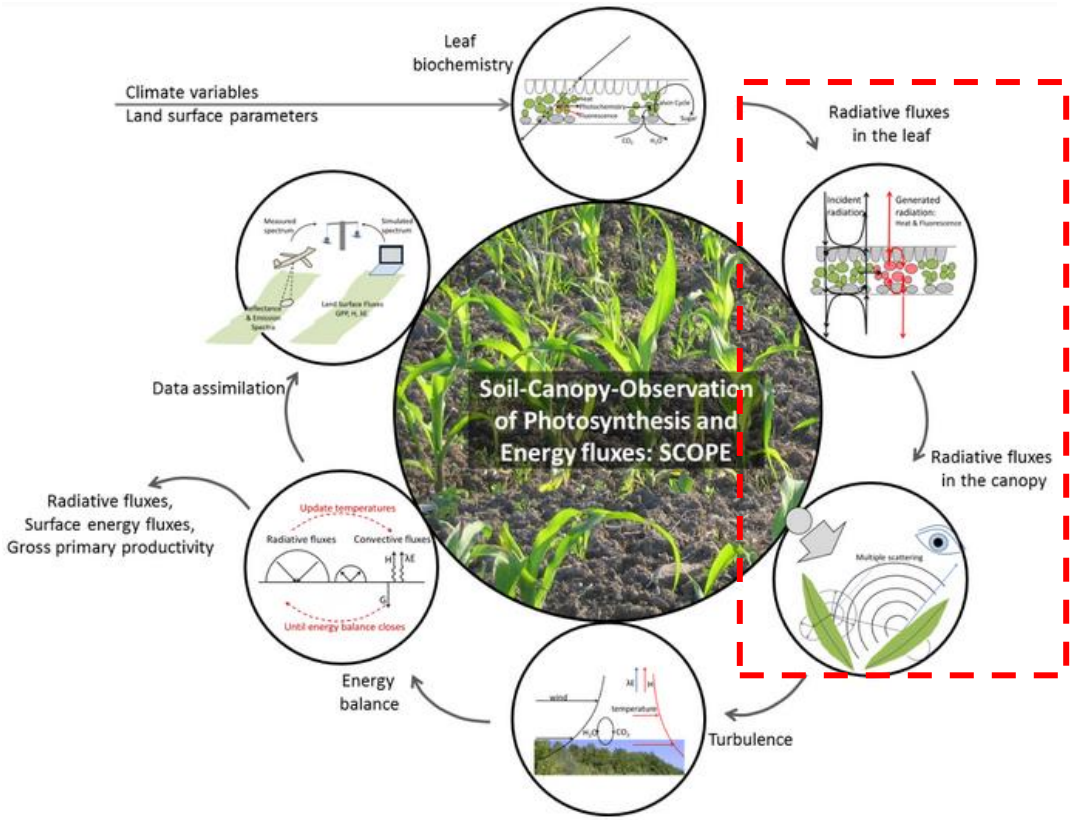


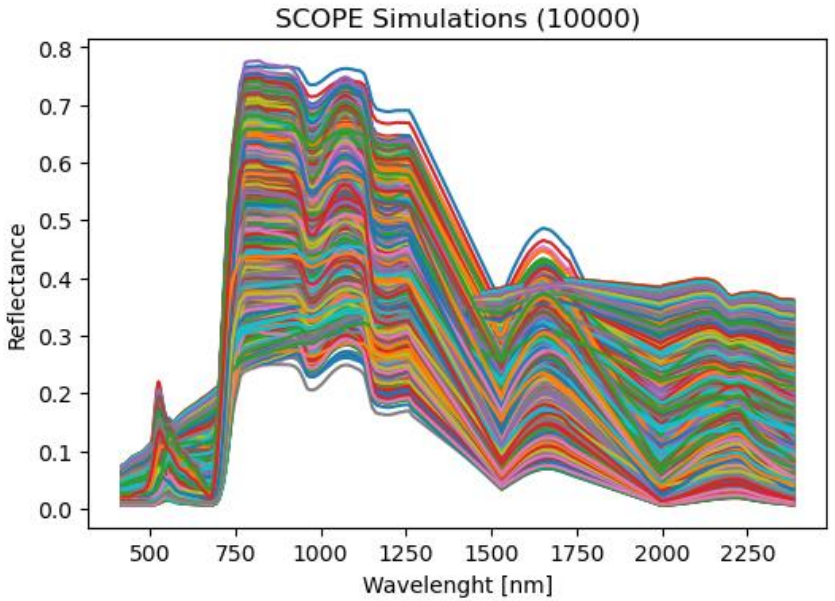


METHODS – Hybrid regression method using SCOPE

(van der Tol et al. 2009)

- Retrieval using **hybrid regression method** of LAI, CCC, fAPAR and fAPARchl

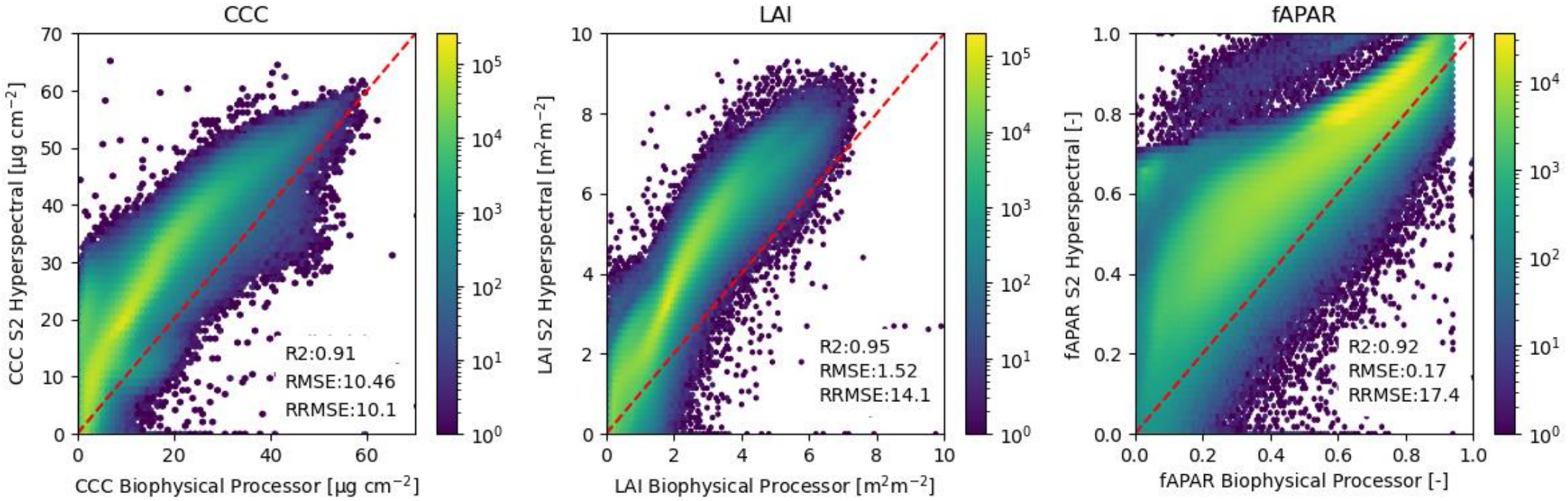




Each simulation linked to specific biochemistry parameter (Cab, LAI, …)

RESULTS – Biophysical Variables

S2-Hyperspectral vs. S2-Biophysical Processor



CONCLUSION

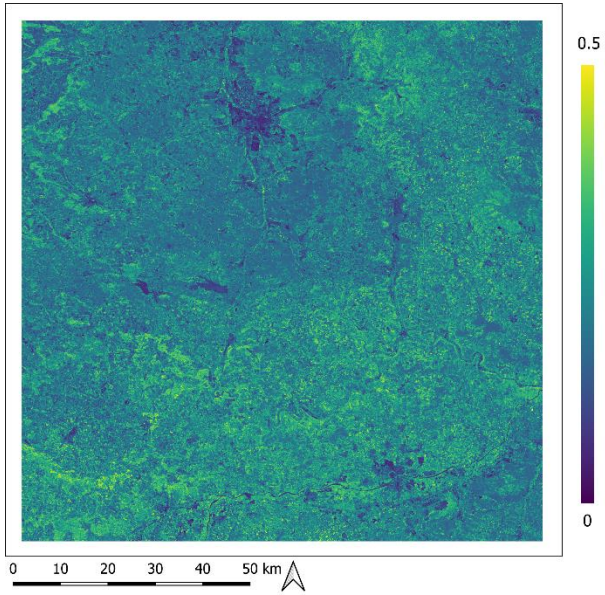
- **Emulator works well** for investigated tile and tiles with similar land cover types, tiles characterized by different land cover classes need to be further evaluated
  - EnMAP data **(~ 950 km²)** enlarged to S2 extent **(~12.200 km²)**

- **FCVI** as well as **fAPARchl** can be retrieved from hyperspectral S2 to calculate SIF emission efficiency at leaf level

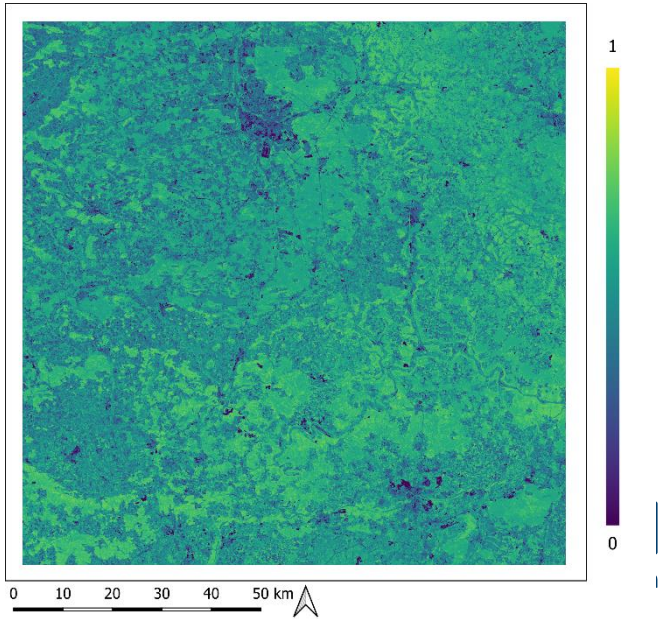
- Emulator approach **transferable** to other hyperspectral missions (e.g. **PRISMA and DESIS**)

- Is **ground truth data** of vegetations parameters (e.g. LAI, LCC) collected in parallel to EnMAP data acquisitions available? Any field campaigns planned in the near future?

FCVI



fAPARchl



Thank you for your attention!

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Dr. Bastian Siegmann
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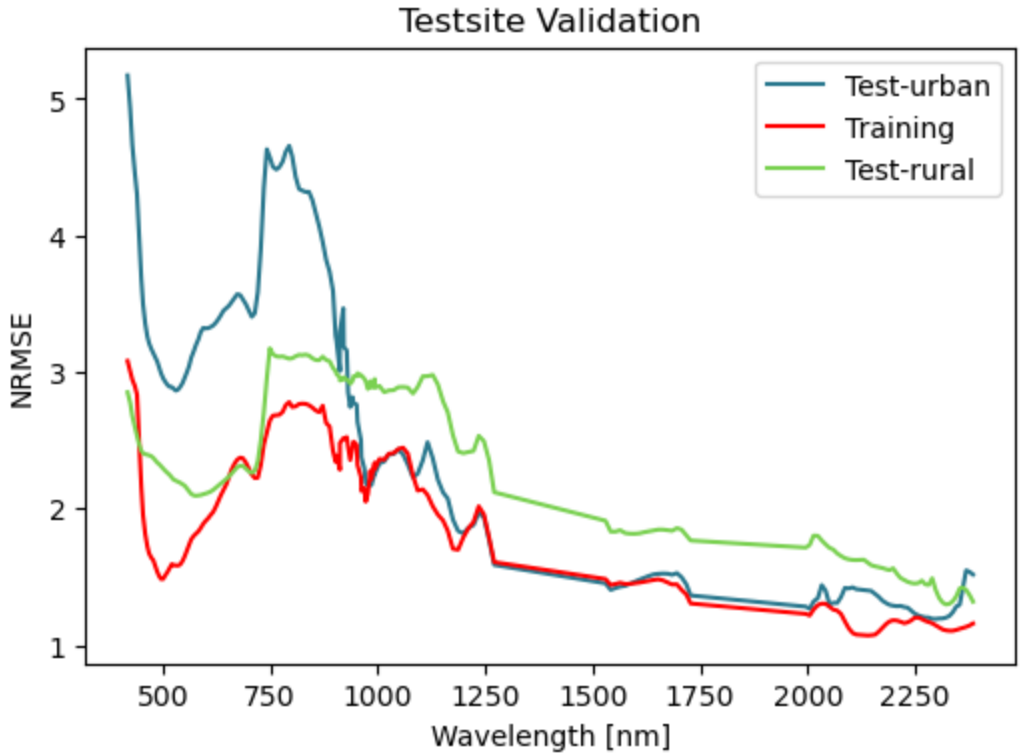
APPENDIX


Testsite Validation
Test-urban
Training
Test-rural
NRMSE
Wavelength [nm]
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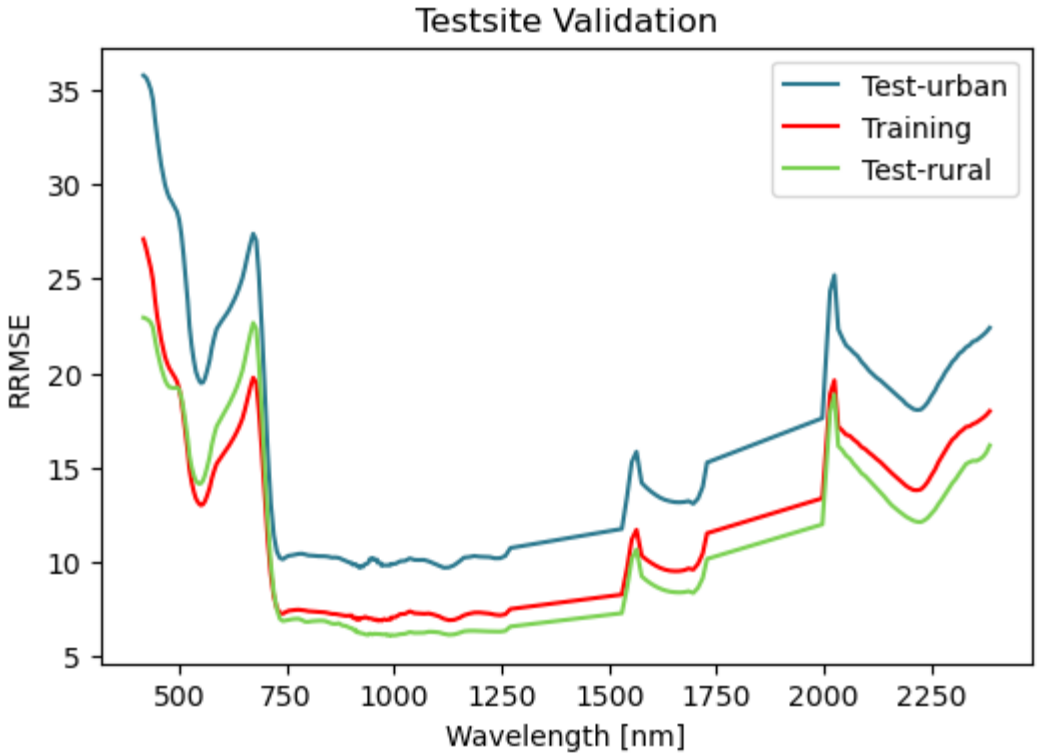
2
3
4
5
500
750
1000
1250
1500
1750
2000
2250


Testsite Validation
Test-urban
Training
Test-rural
RRMSE
Wavelength [nm]
5
10
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500
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