THREB: DEVELOPING A SPECTRAL LIBRARY FOR FRACTIONAL VEGETATION COVER ANALYSES

2nd EnMAP User Workshop 2025

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DLR

THREB Germany

Spectral lib of image spectra for PV,NPV, BS derived from spaceborne HSI

Temporal → Annual

Hyperspectral → EnMAP

Regional → Germany / based on the number of acquisition

Endmember → Pure spectra of defined classes

Bundle → Group of all EM

Kevin Kühl, EOC-IMF-ASP

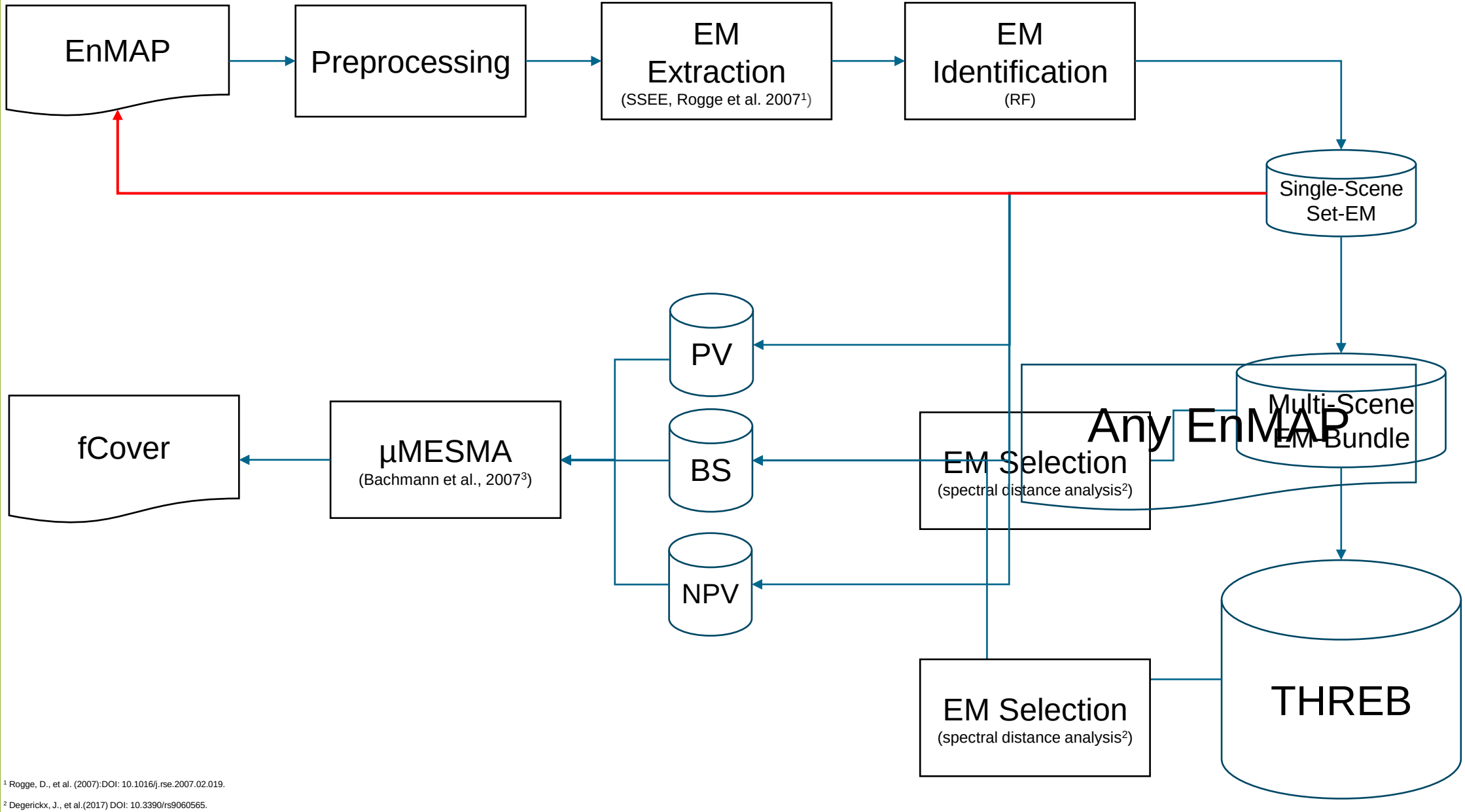
Kevin Kühl[1], David Marshall Ingram[1], Uta Heiden[1], Martin Bachmann[2]

THREB characteristics

THREB should be:

- Representative for Germany & include spectra from different seasons
- Contain spectral variability within and between EM classes.
- !! Overcome scene based EM extraction and EM labelling steps !!

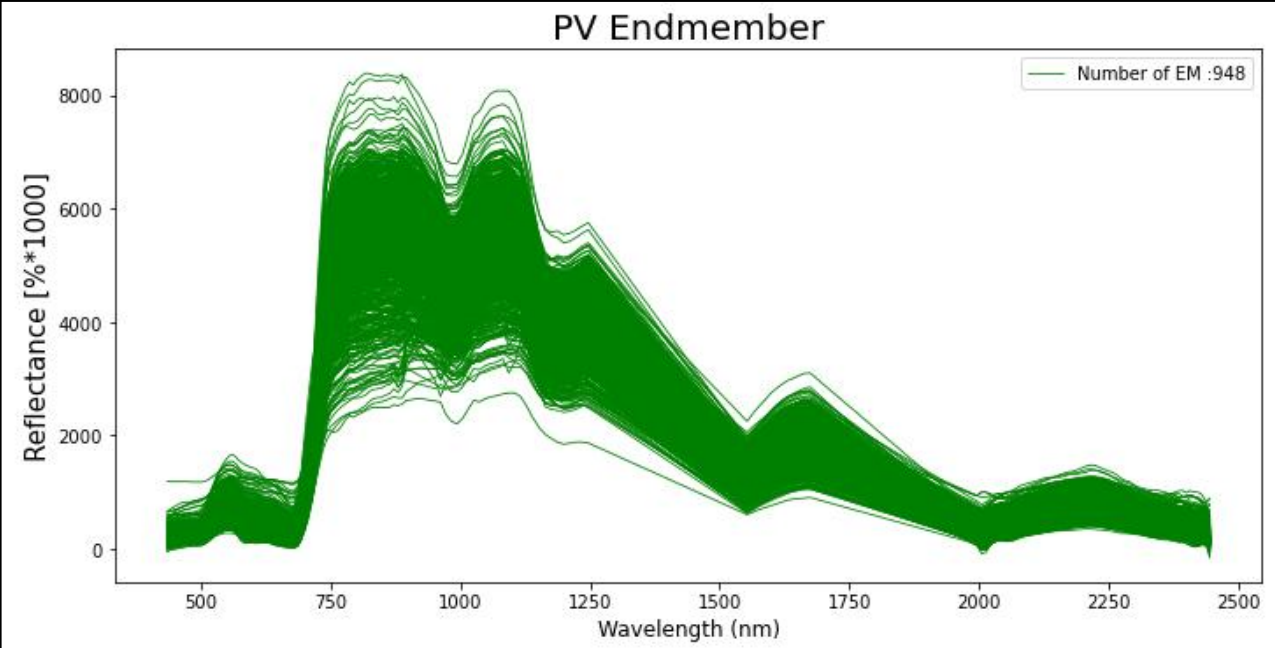
FRANCA for THREB development & usage

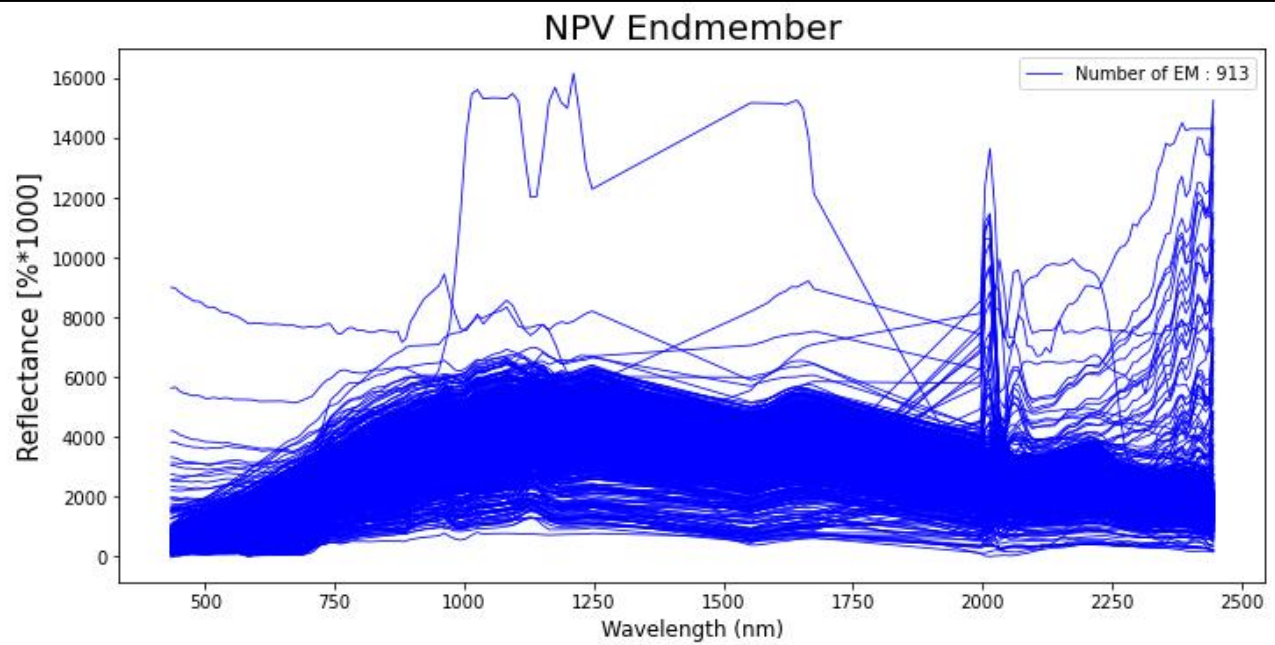


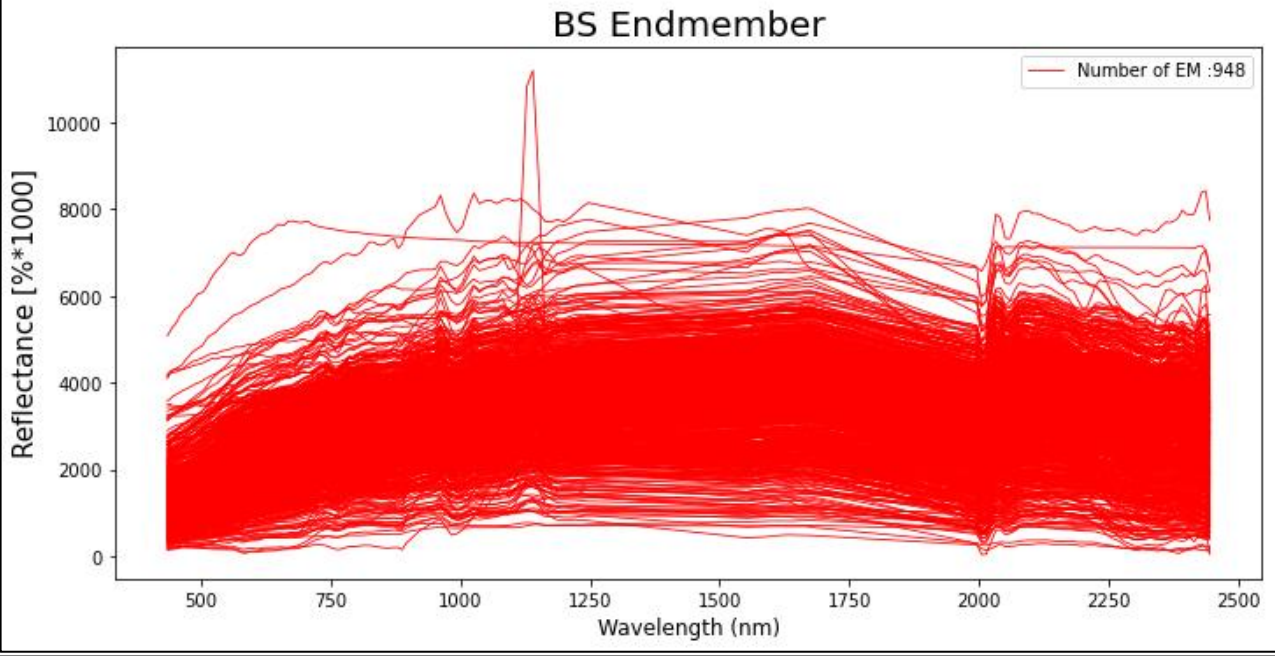
[1] Rogge, D., et al. (2007):DOI: 10.1016/j.rse.2007.02.019.

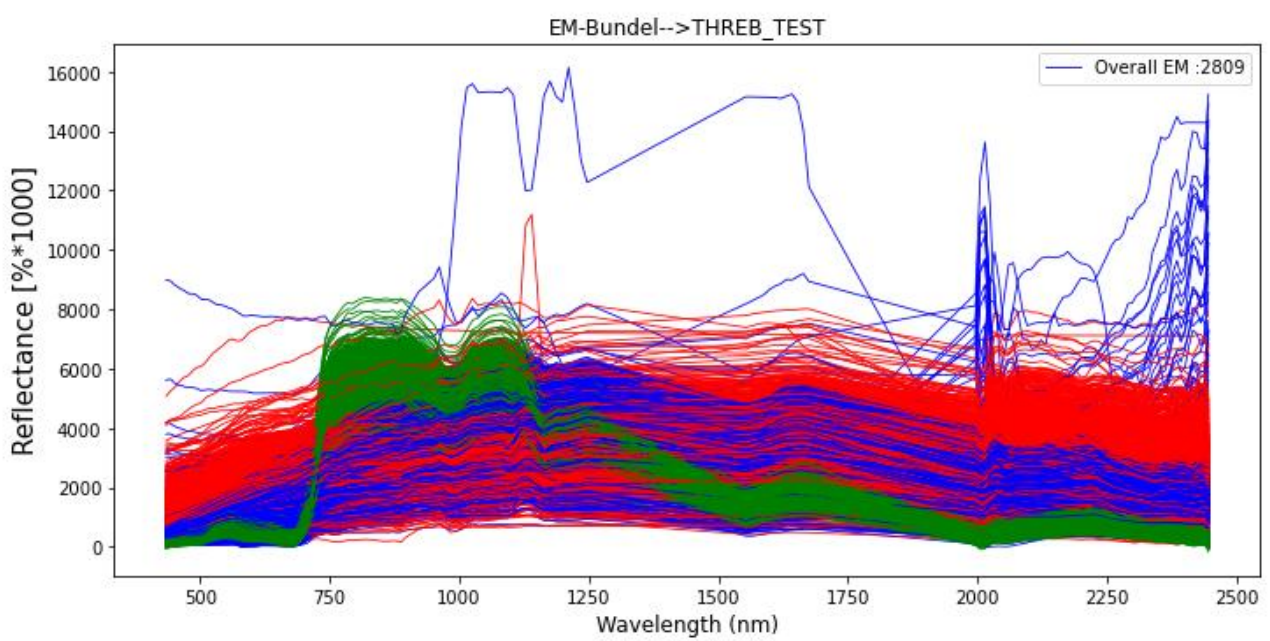
[2] Degerickx, J., et al.(2017) DOI: 10.3390/rs9060565.

[3] Bachmann, Martin (2007) Automatisierte Ableitung von Bodenbedeckungsgraden durch MESMA-Entmischung. Dissertation, Uni Würzburg.


PV Endmember
Number of EM :948
Reflectance [%*1000]
Wavelength (nm)


NPV Endmember
Number of EM : 913
Reflectance [%*1000]
Wavelength (nm)


BS Endmember
Number of EM :948
Reflectance [%*1000]
Wavelength (nm)


EM-Bundel-->THREB_TEST
Overall EM :2809
Reflectance [%*1000]
Wavelength (nm)

Example
EnMAP aquisition from 07.03.2025

Scenario ONE

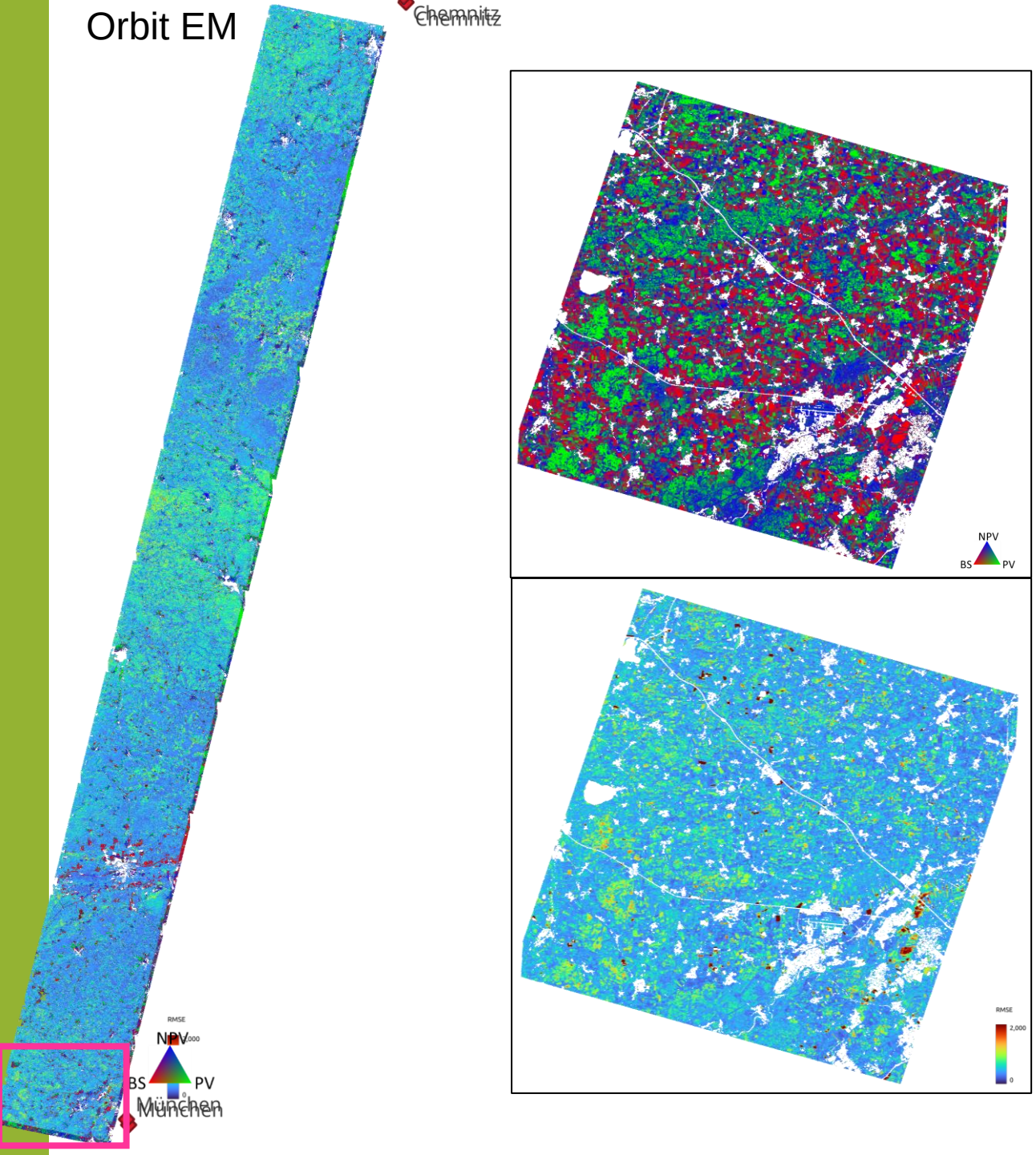
- Extract & use EM from a complete EnMAP strip

Scenario TWO

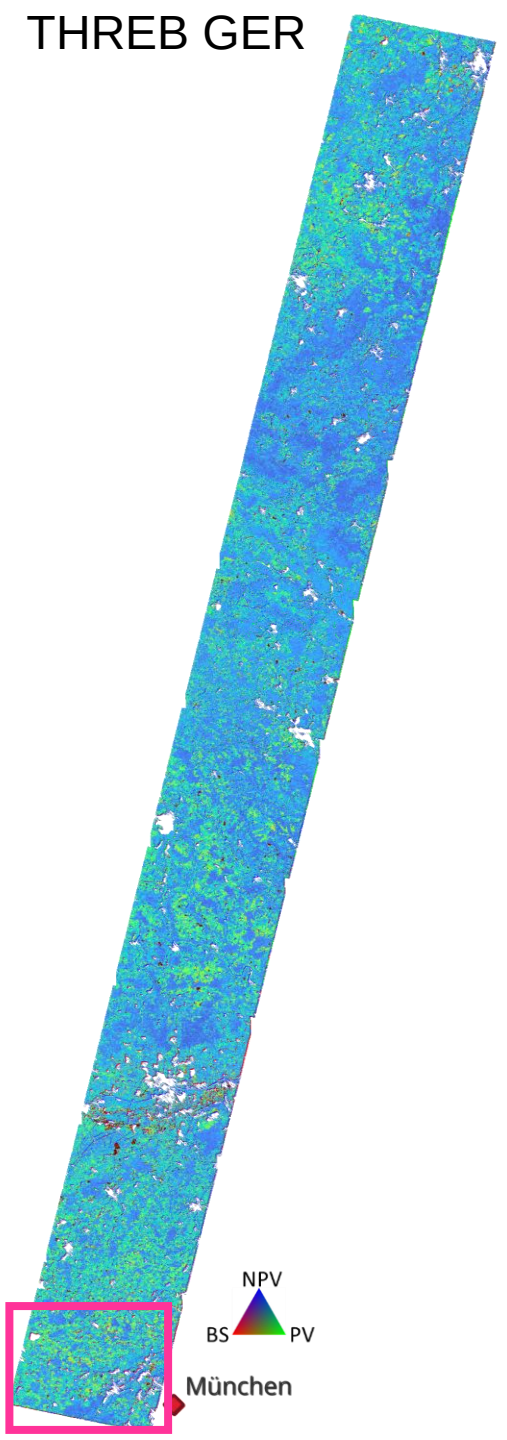
- Unmixing based on THREB

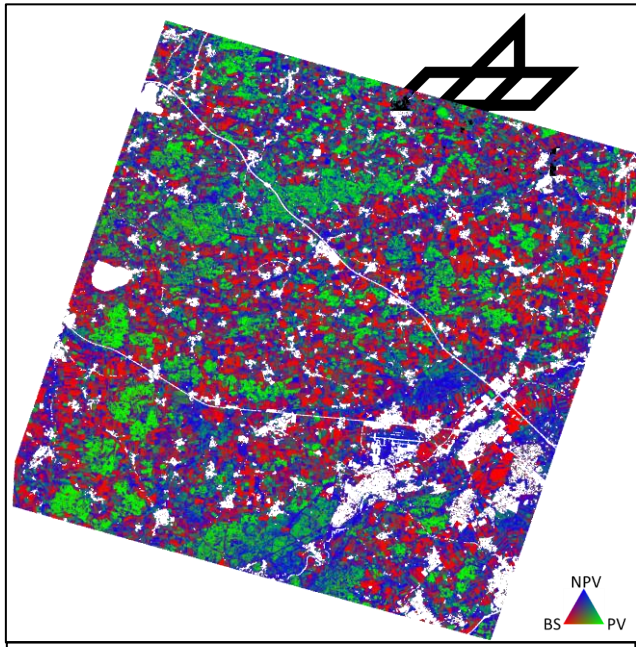
EnMAP aquisition from 07.03.2025

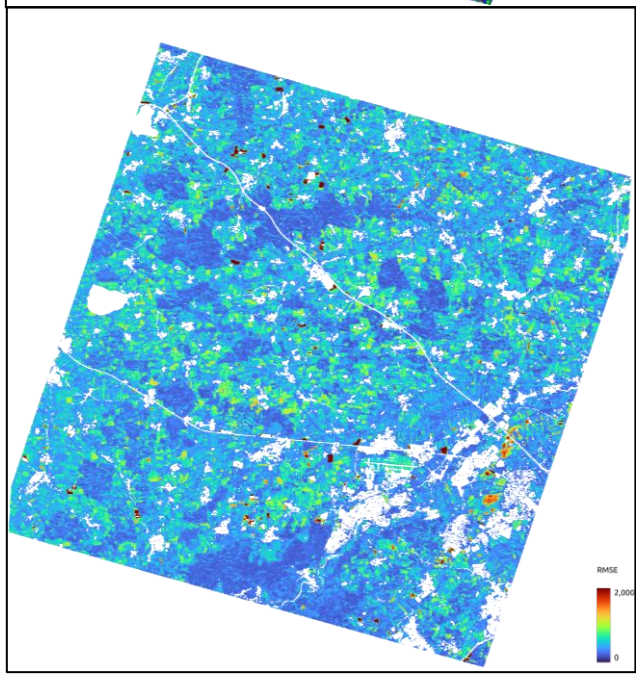
Orbit EM



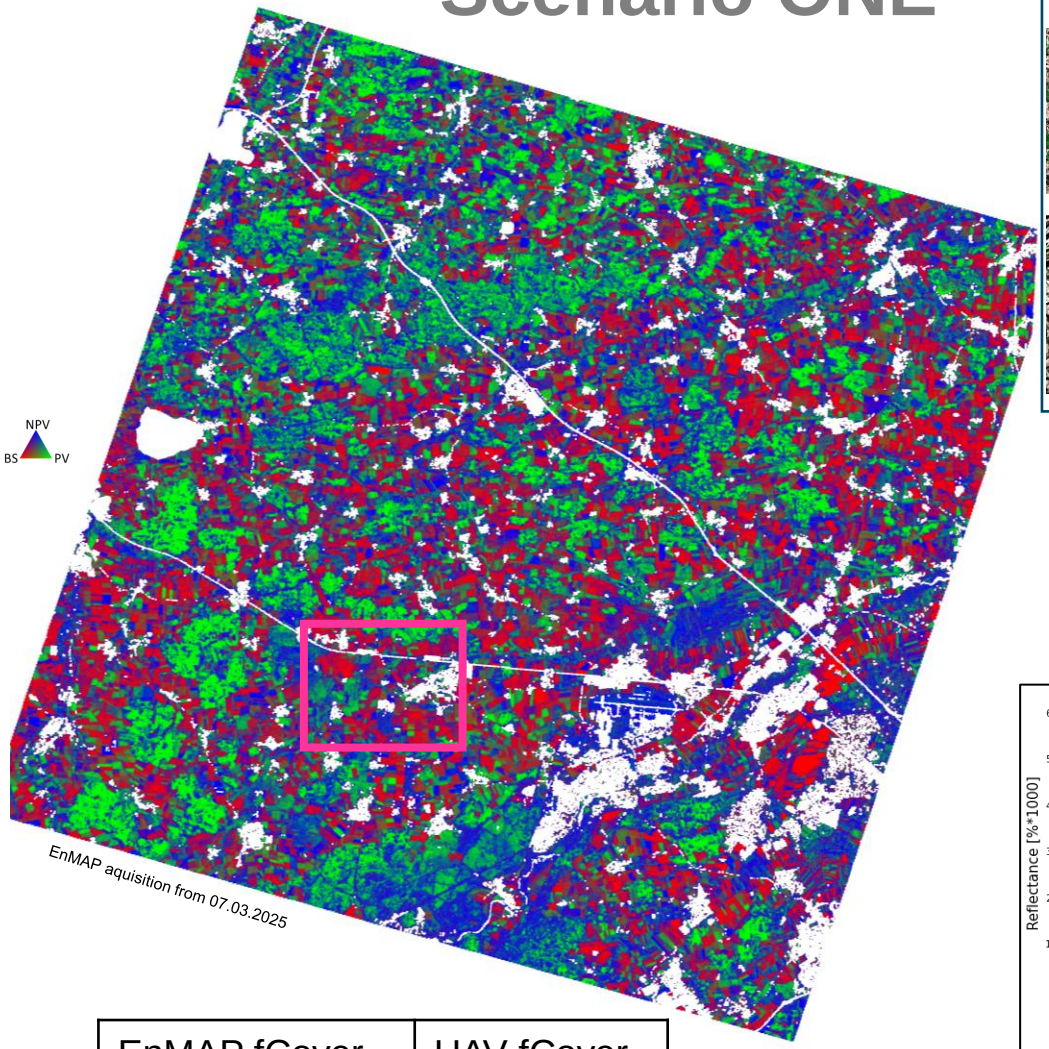
THREB GER

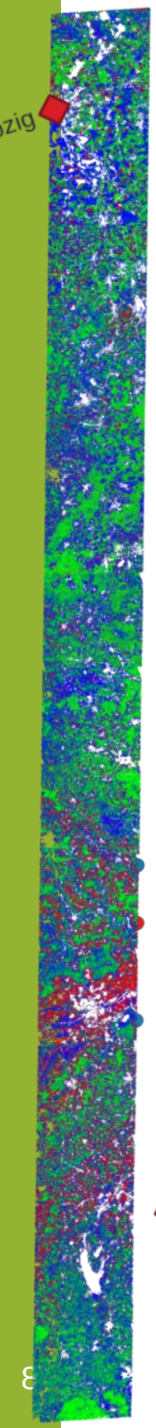






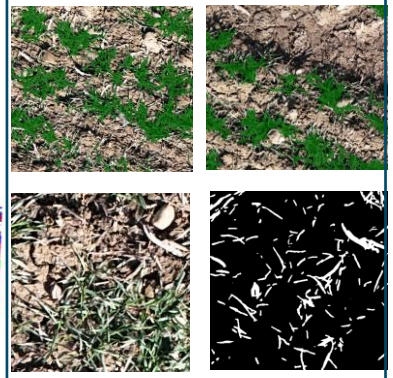
Scenario ONE

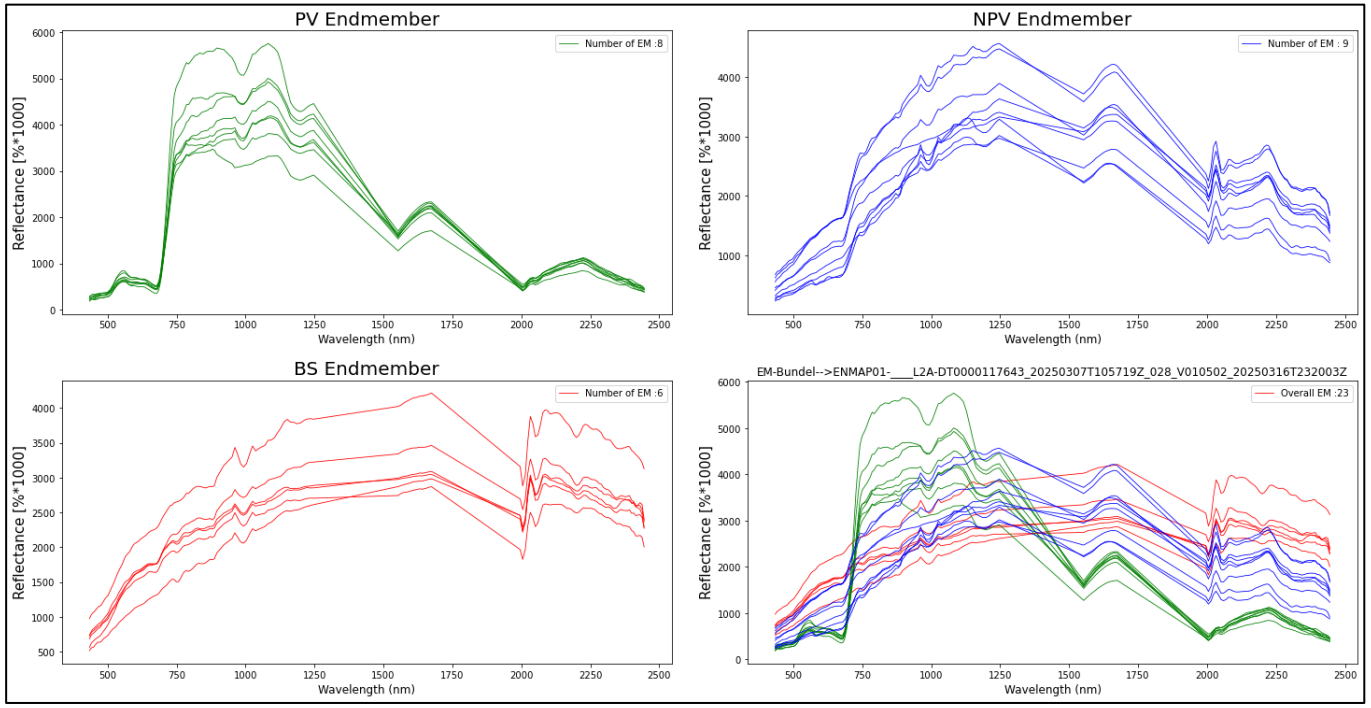




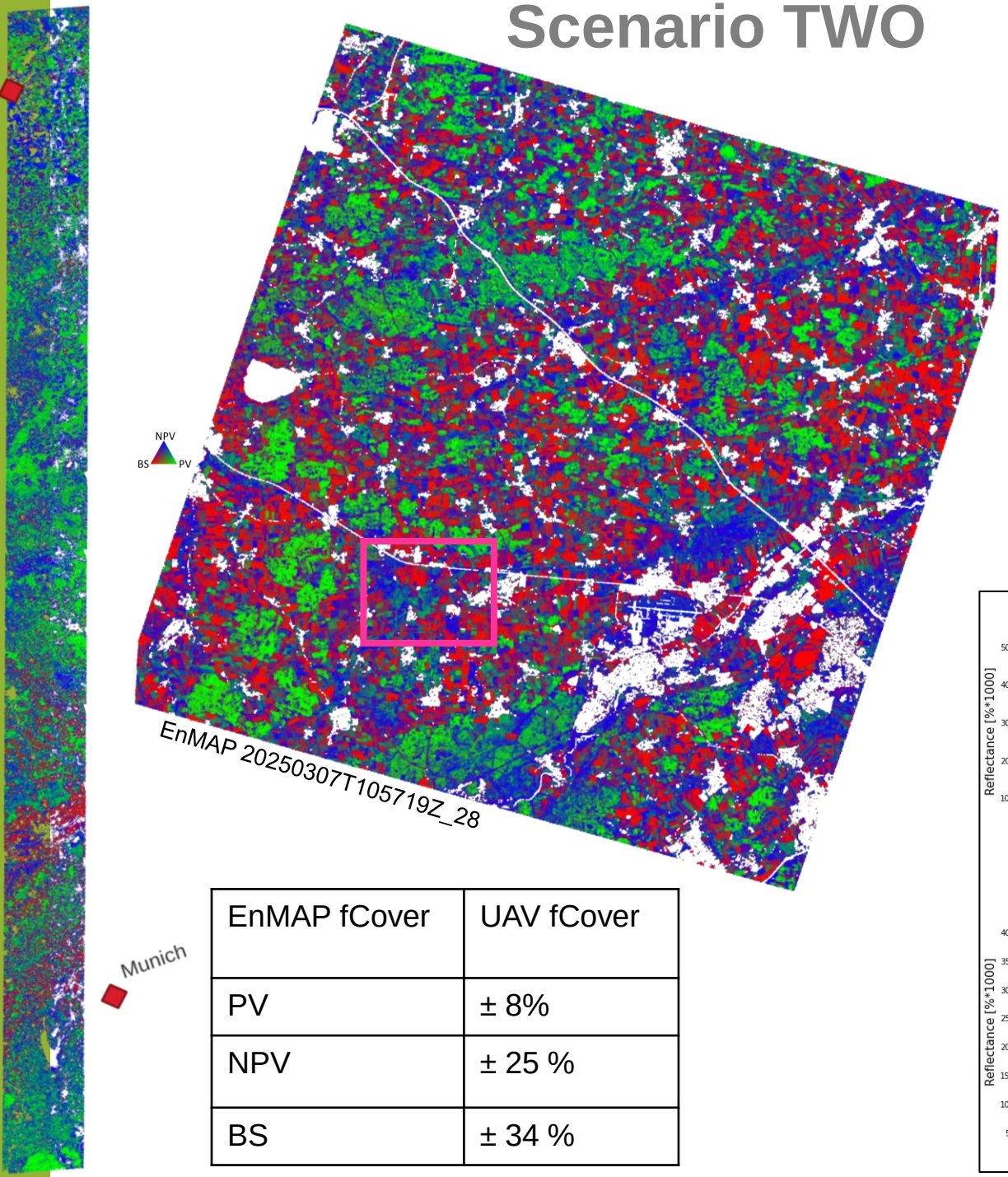
EnMAP fCover	UAV fCover
PV	± 17%
NPV	± 23 %
BS	± 40 %

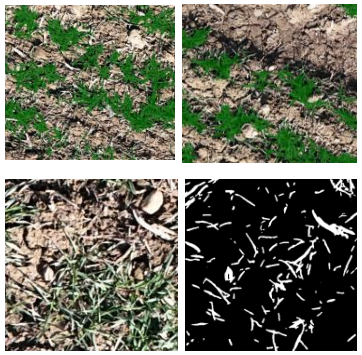
Two U-Nets



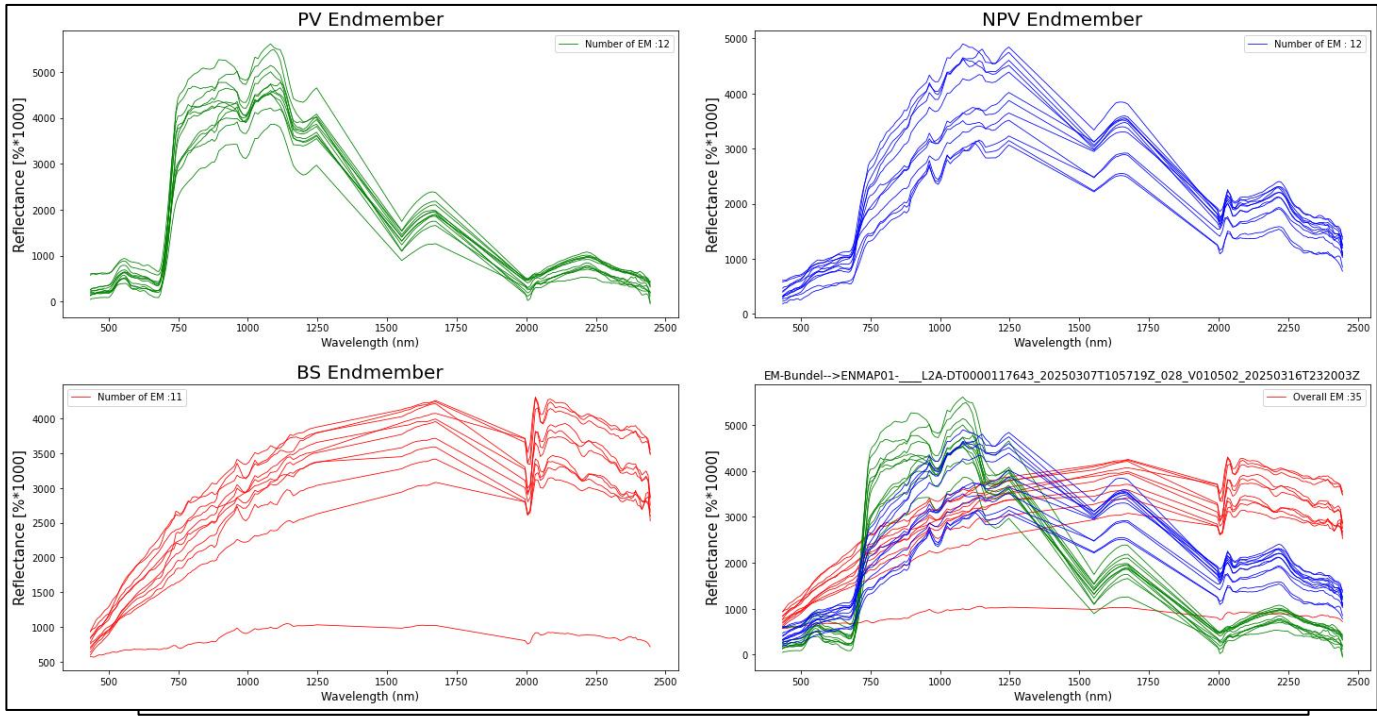


Scenario TWO





EnMAP fCover	UAV fCover
PV	± 8%
NPV	± 25 %
BS	± 34 %



Conclusion & Outlook

- Successfully skipped EM extraction and EM labelling steps

- Unmixing result:
  - Improvements for PV (±9) & BS (±6)
  - Constant results for NPV (±2)
  - Overall lower RMSE, due to better unmixing accuracy's

- EM-Quality assessment:
  - Improving filter for spectral extremes

- Sensitivity test