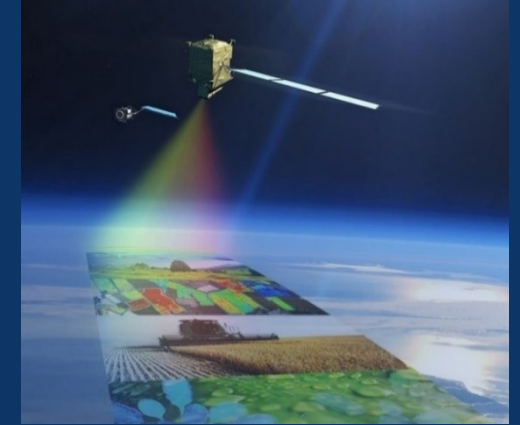


# Measuring fluorescence & reflectance across spatial scales – LIAISE campaign July 2021

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# Instrumentation to measure SIF across spatial scales

- SIF point measurements at leaf level (alfalfa, apple trees and maize) – *ASD + Fluowat*
- SIF point measurements in close distance above the canopy (alfalfa, apple trees and maize) – *stationary/mobile FloX*
- SIF image data at canopy level recorded from 20-30 m above ground (alfalfa, apple trees and maize) – *SIF Dual-camera*
- SIF image data at canopy level recorded from 1430 m above ground (GLORI, FULL and VERDU pattern) – *HyPlant*

## Leaf - Level

## Canopy - Level

## UAV - Level

## Aircraft - Level



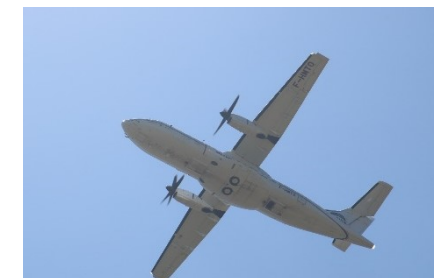
Fluowat



FloX



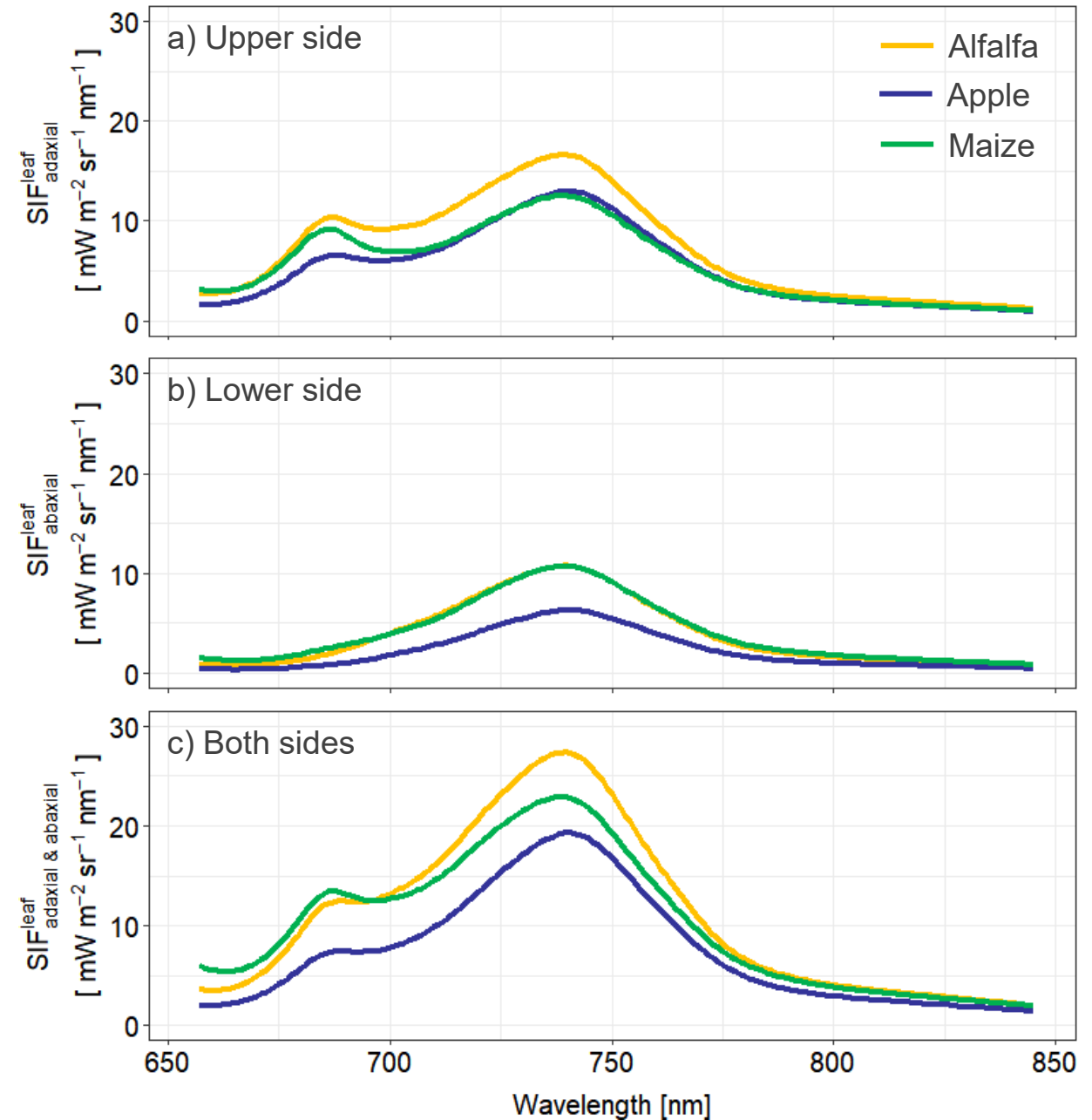
SIF Dual-camera



HyPlant

# Measuring SIF at the leaf level

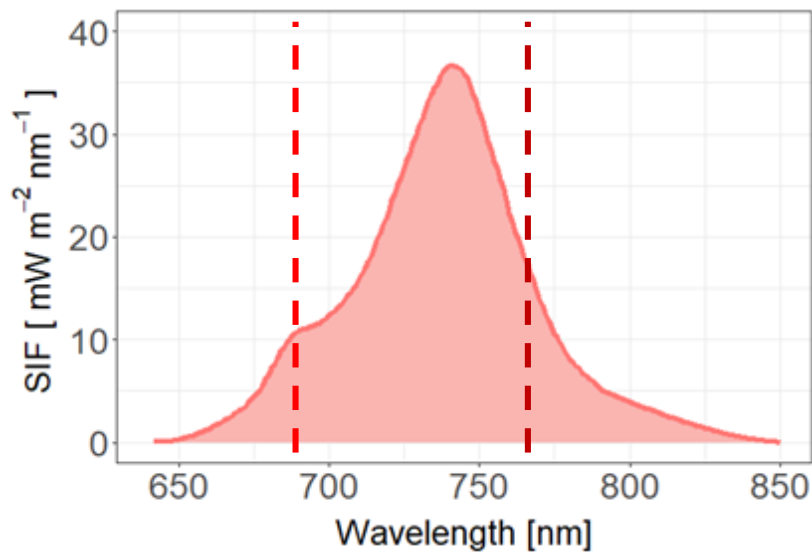
ASD field spectrometer +  
Fluowat leaf clip



# Scaling SIF from canopy to leaf level and vice versa



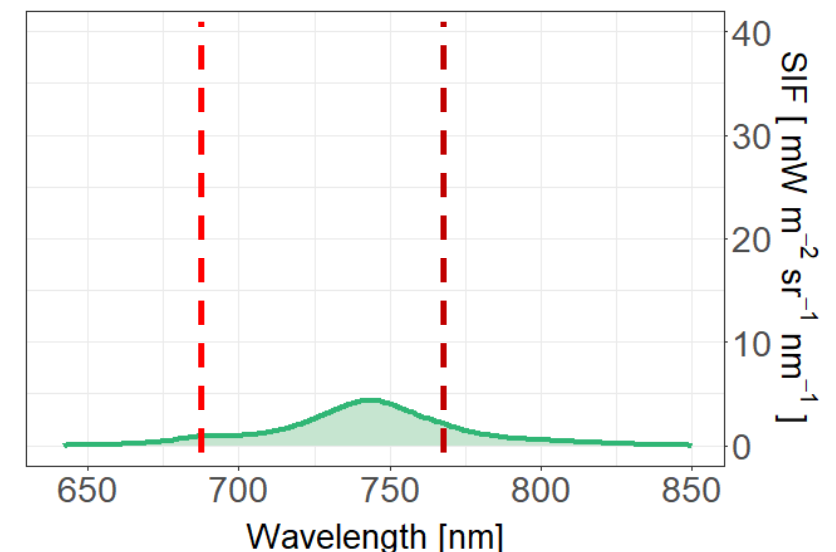
SIF at leaf-level (hemispherical)



down-scaling  
←  
SIF escape fraction  
( $f_{esc}$ )



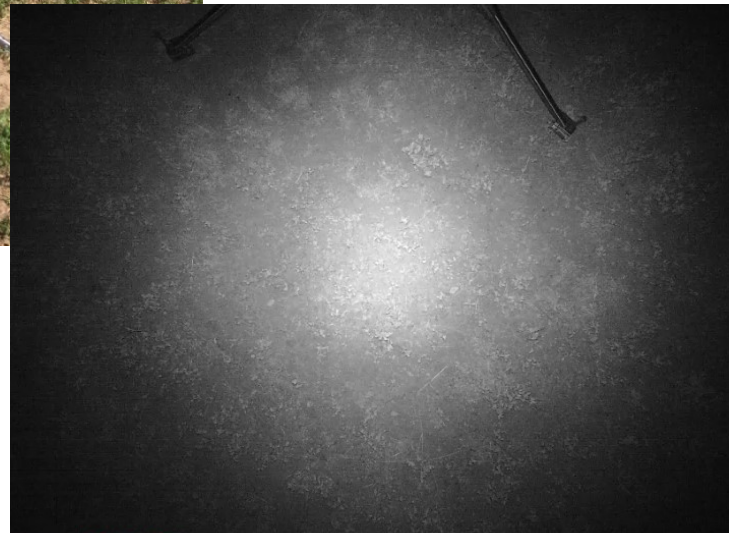
SIF at canopy-level (directional)



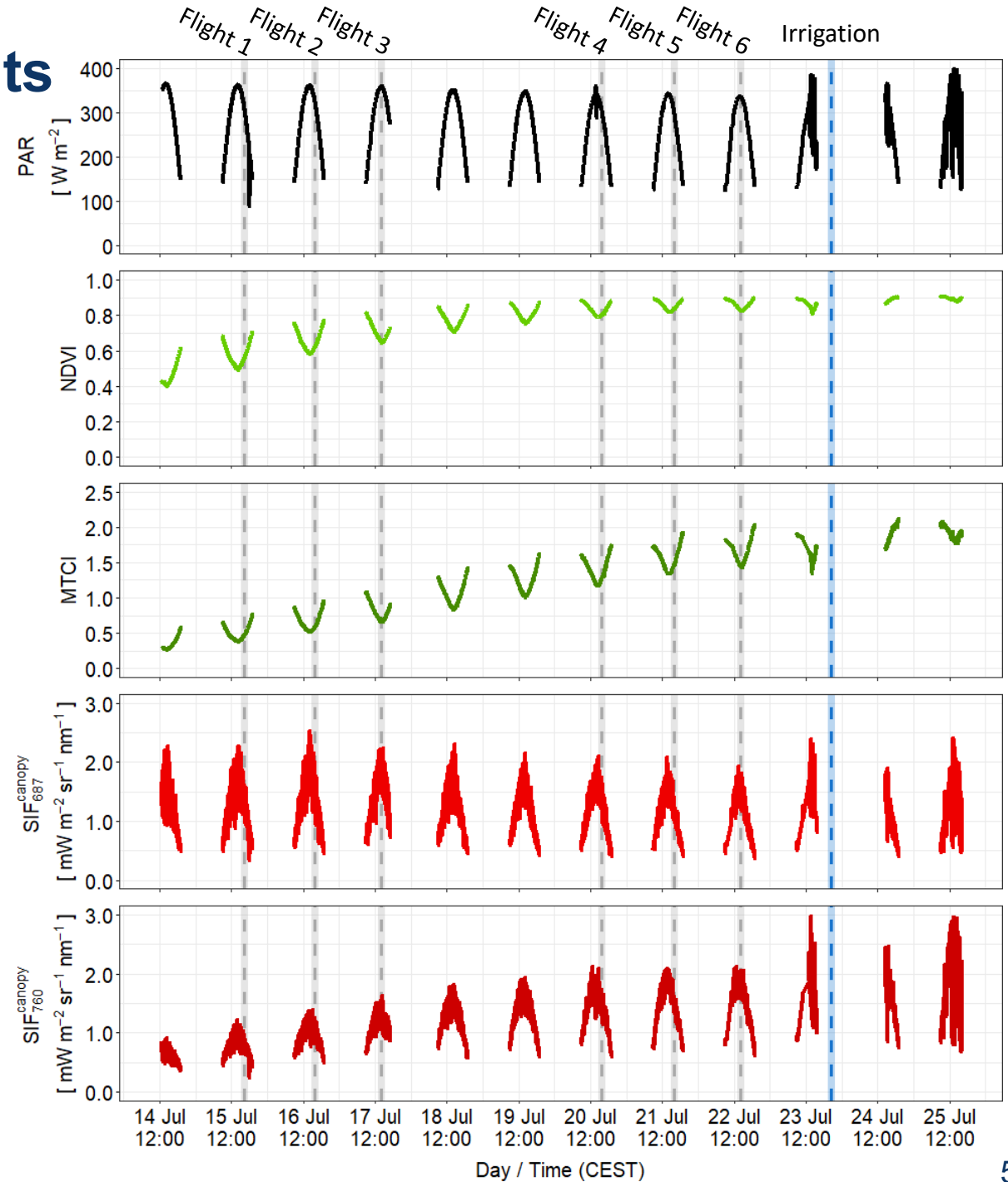
$$f_{esc} \approx \frac{\pi SIF_{canopy}}{SIF_{leaf}}$$

# SIF canopy close-range measurements

FloX at La Cendrosa

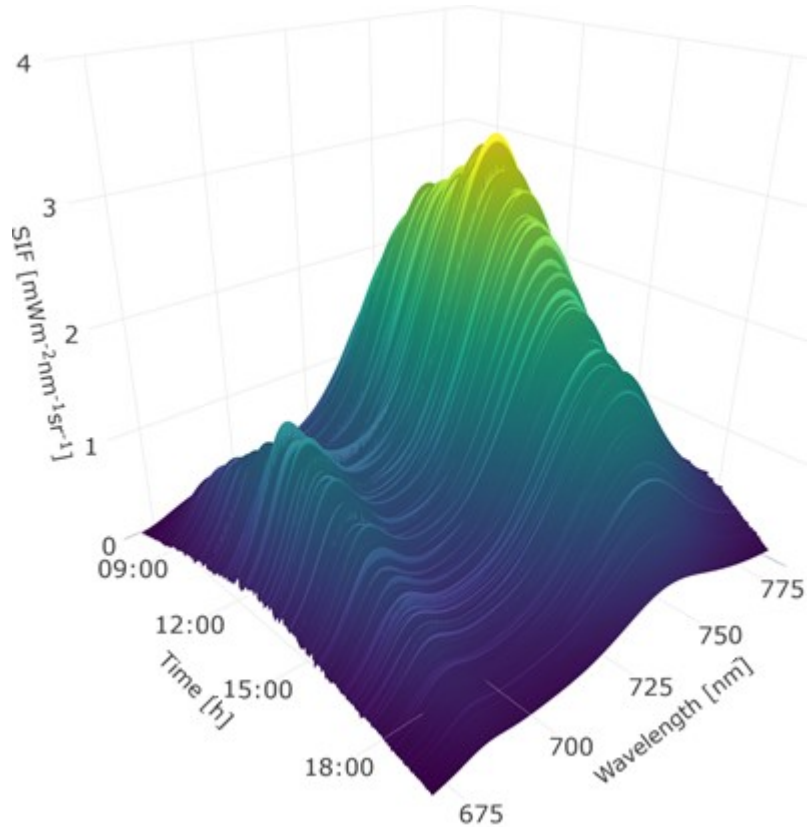


SECACAM KOMETa 16C Mo 02.01.2017 01:12:48

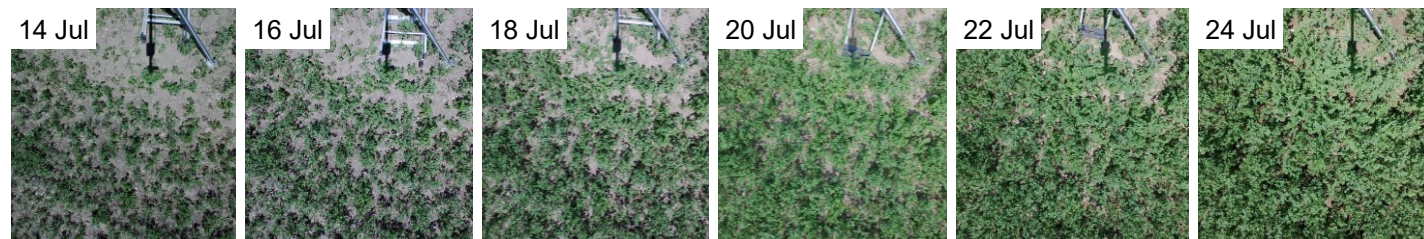
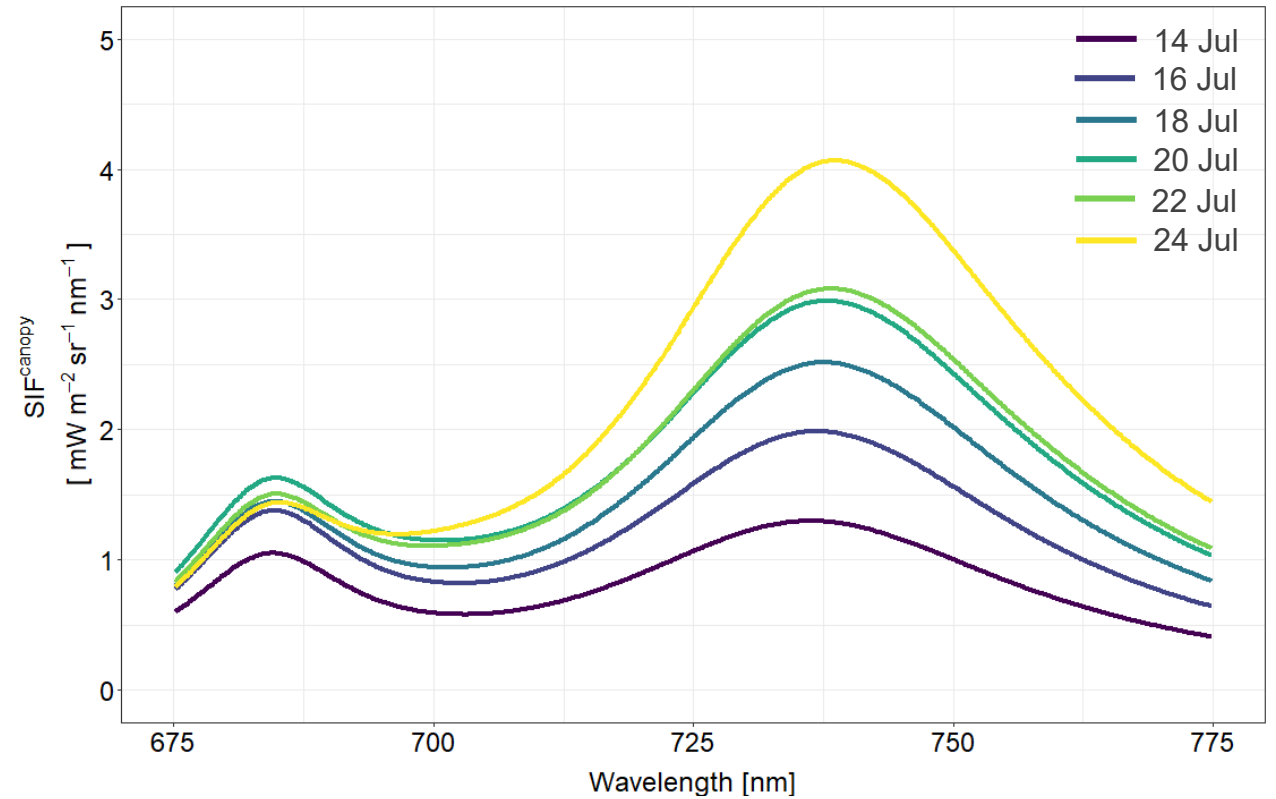


# SIF canopy close-range measurements

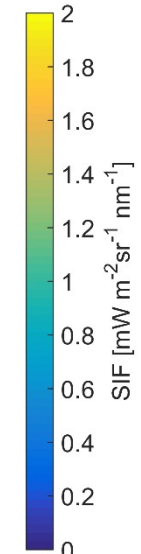
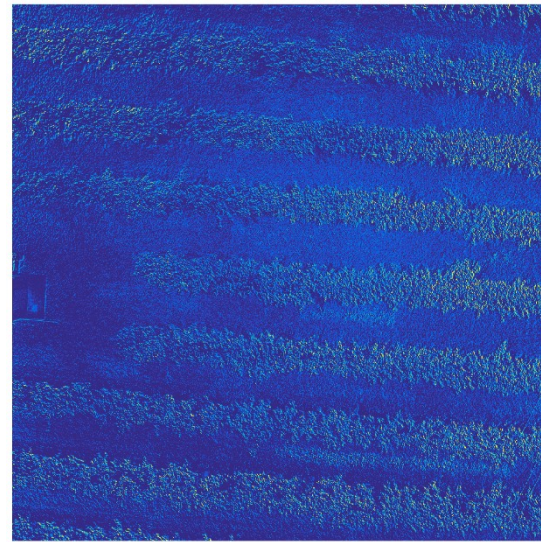
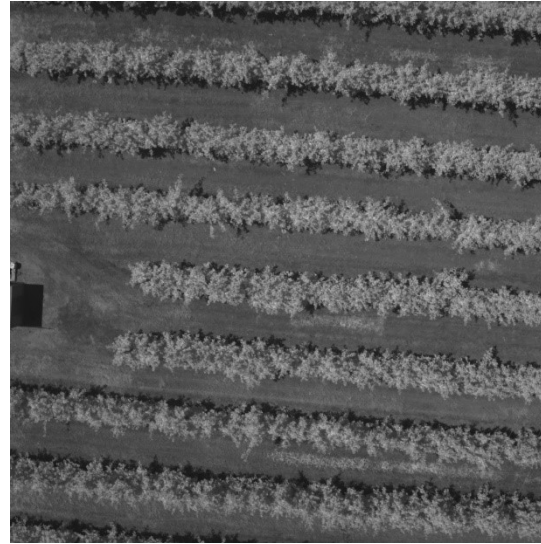
## SIF diurnal course 21 July 2021



## SIF time-series 14-24 July 2021



# SIF UAV measurements – Dual-camera system

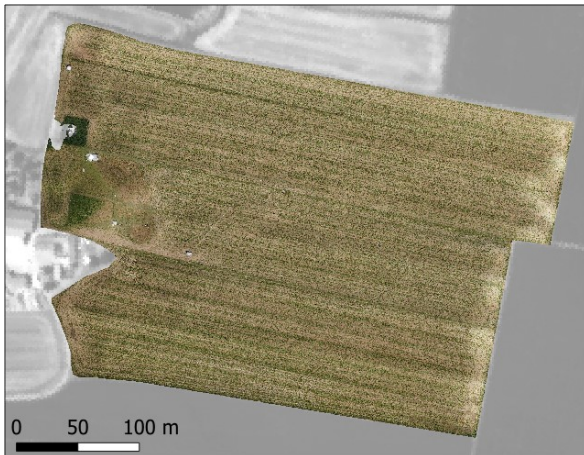


# UAV measurements at La Cendrosa

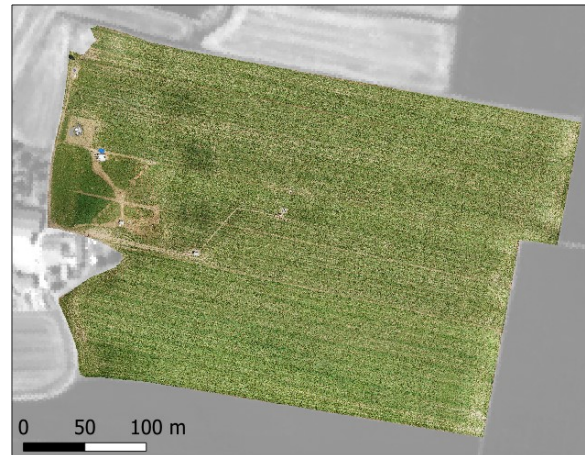
- Data acquisition with two different sensor packages
  - Sony  $\alpha 7$  (RGB)
  - MicaSense RedEdge MX dual (multispectral) camera



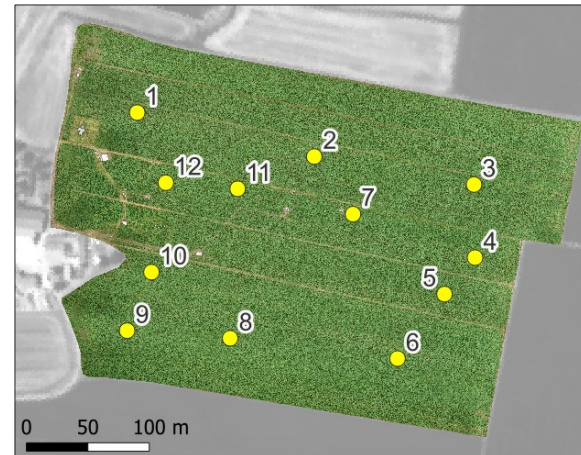
14 July



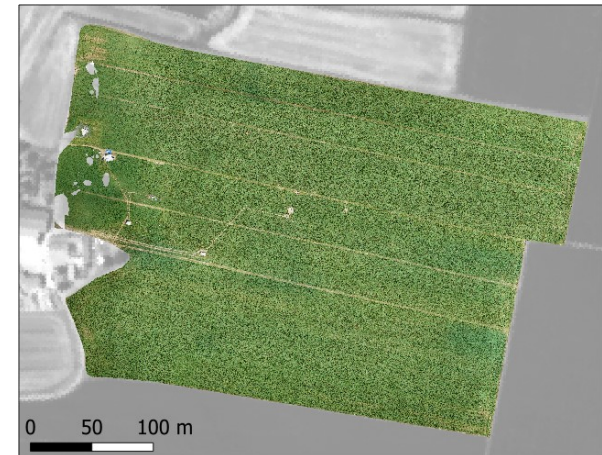
19 July



26 July



28 July





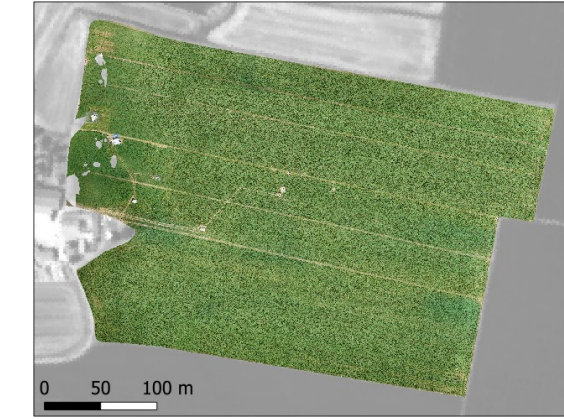
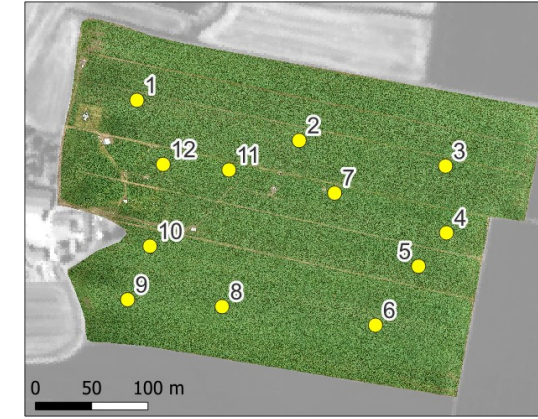
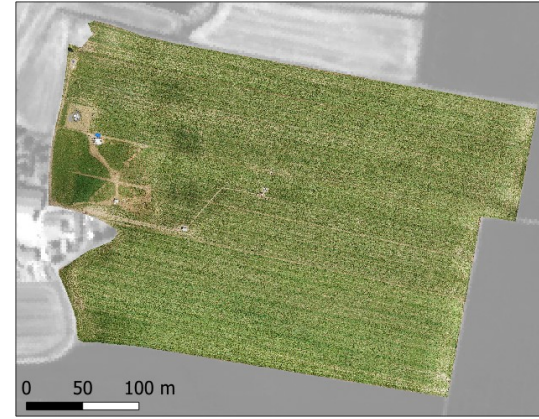
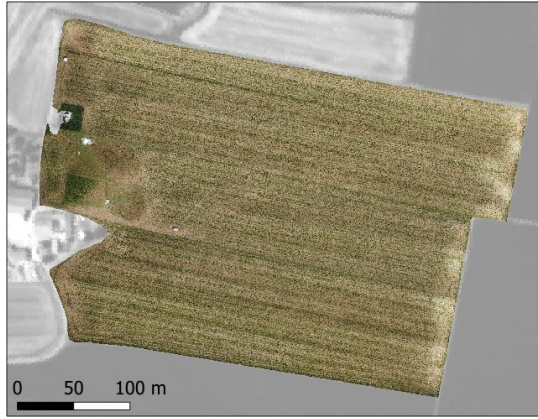
14 July

19 July

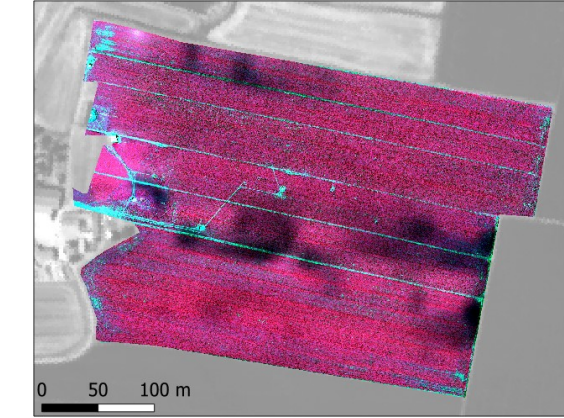
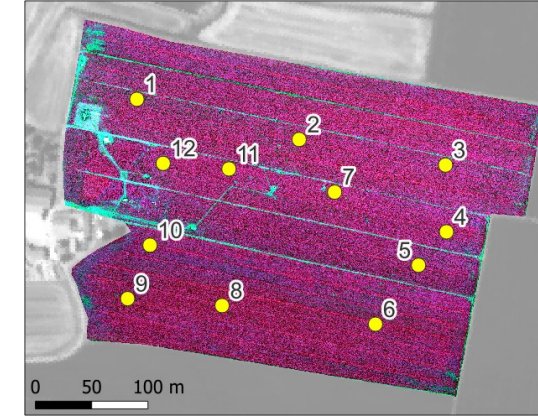
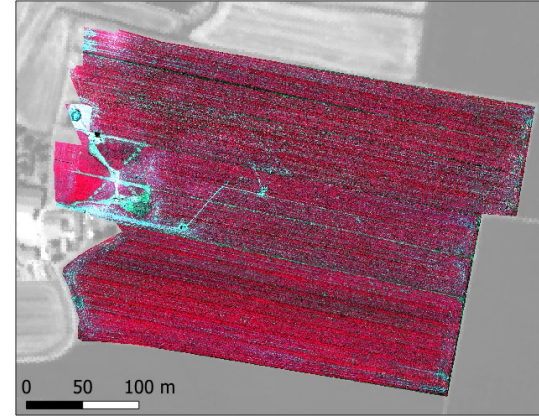
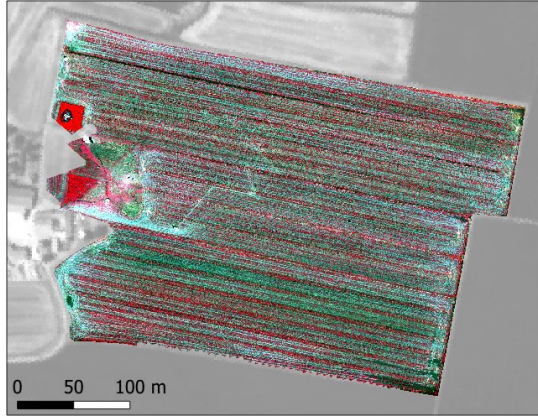
26 July

28 July

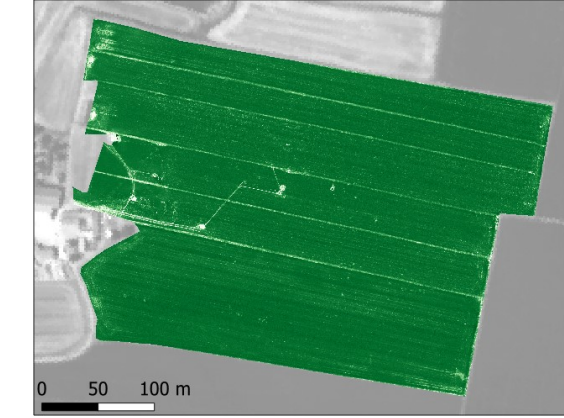
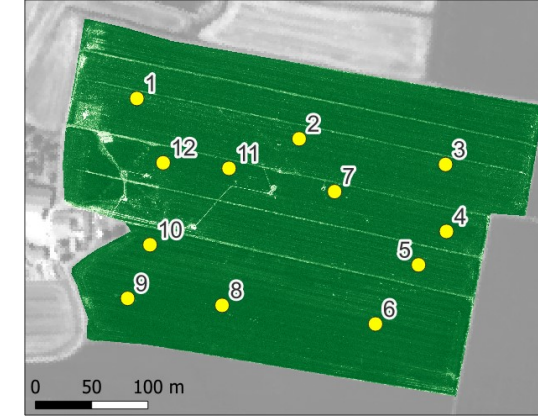
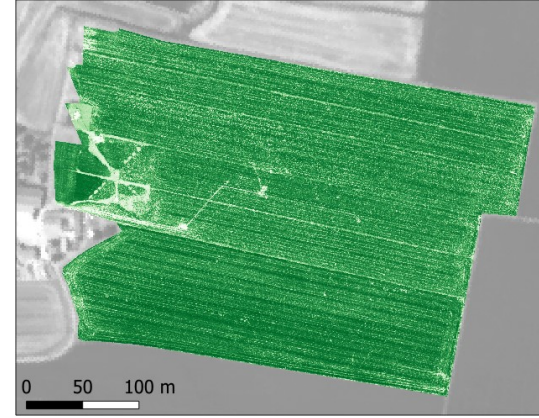
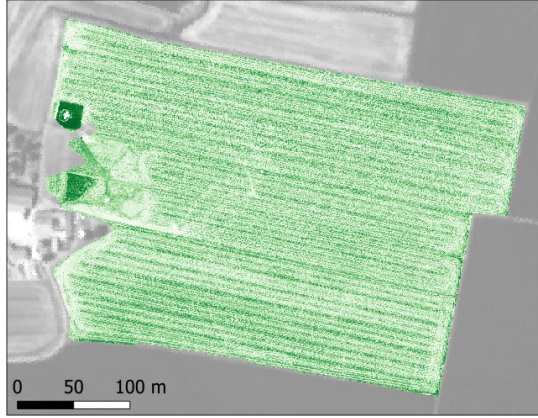
True color composite



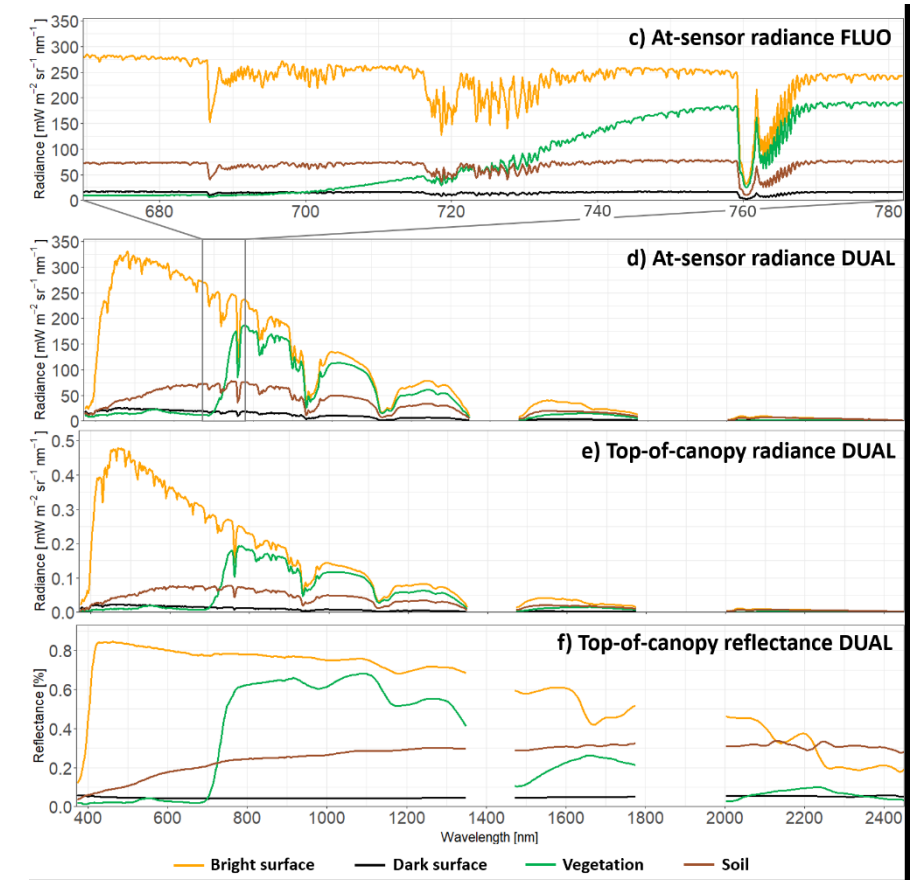
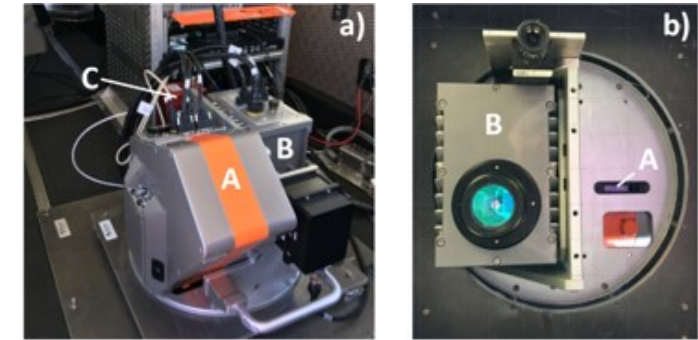
Color infrared composite



NDVI



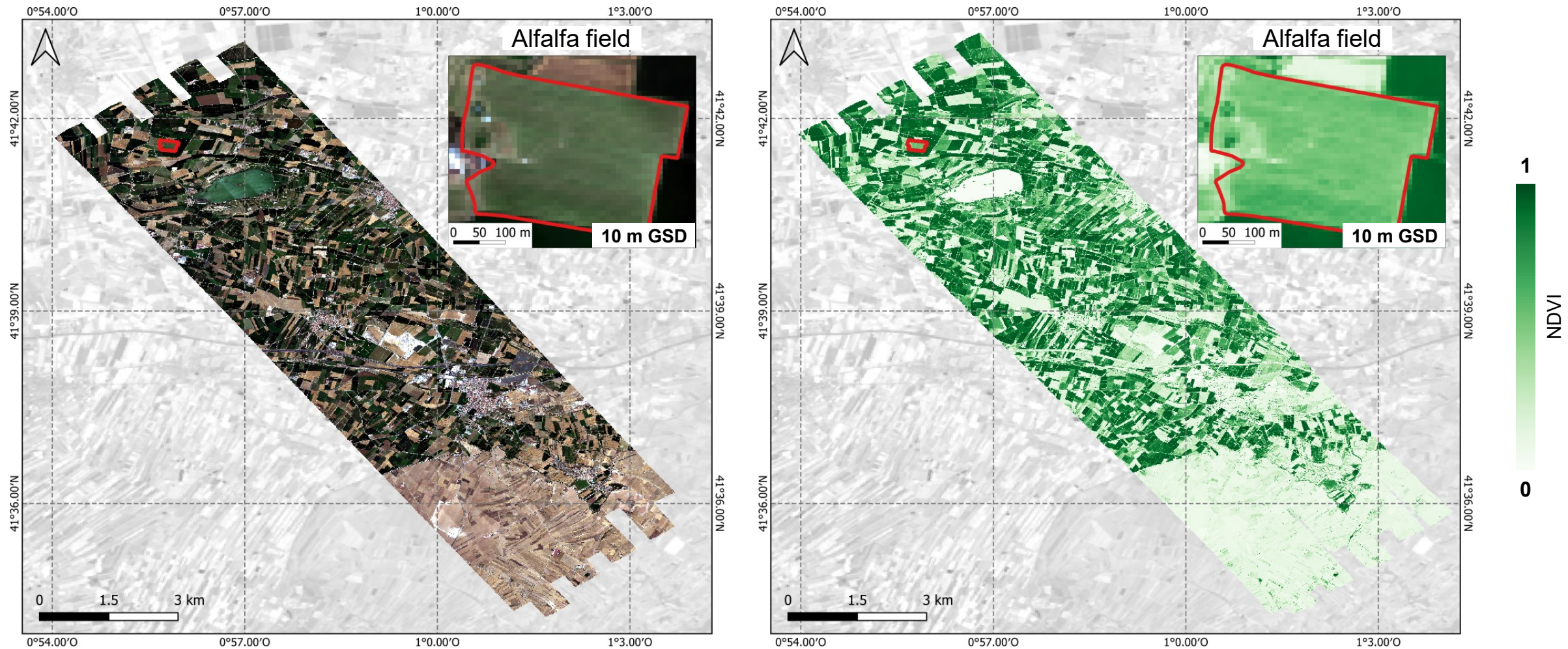
# Measuring SIF from the ATR42 (HyPlant)



## ➤ HyPlant 3

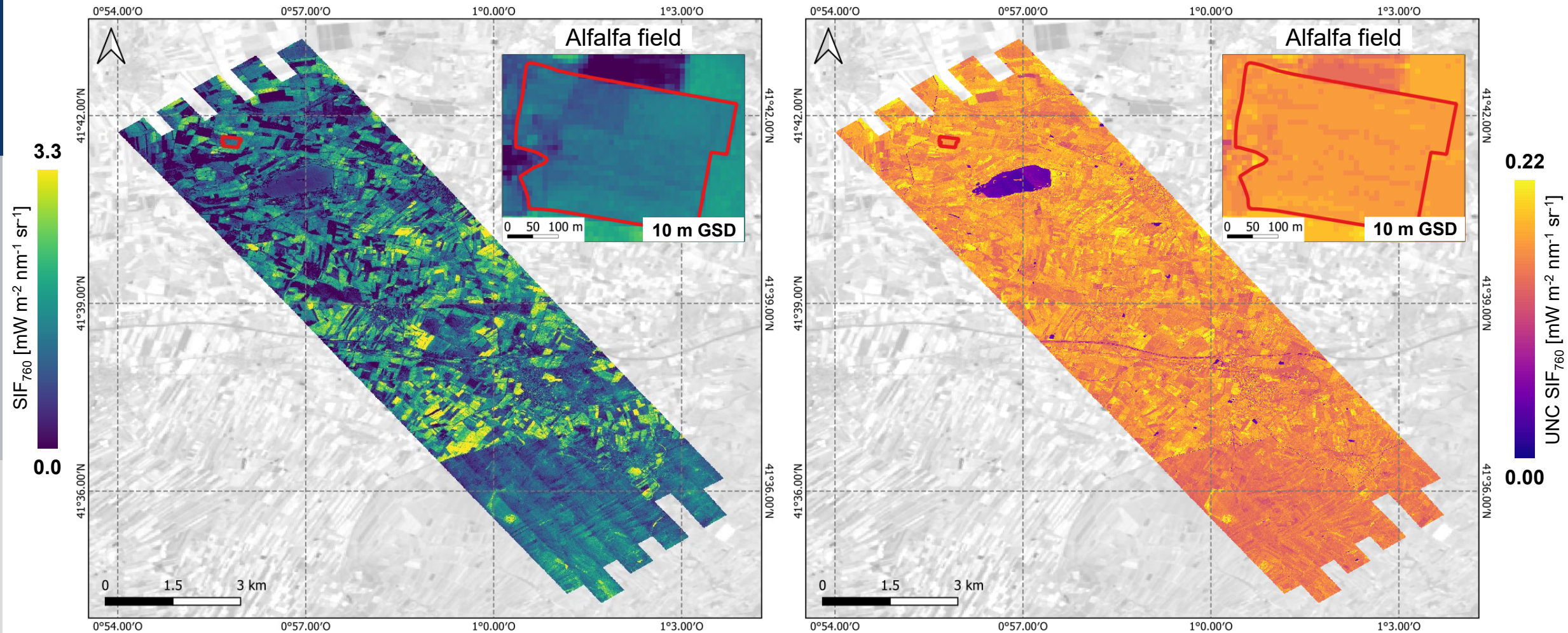
- DUAL module (380 – 2500 nm)  
VIS/NIR: 3-4 nm FWHM, 1.7 nm SSI  
SWIR: 13 nm FWHM, 5.5 nm SSI
- FLUO module (670 – 780 nm)  
0.25 nm FWHM, 0.11 nm SSI

# HyPlant Mosaic – GLORI mapping – 17 July 2021



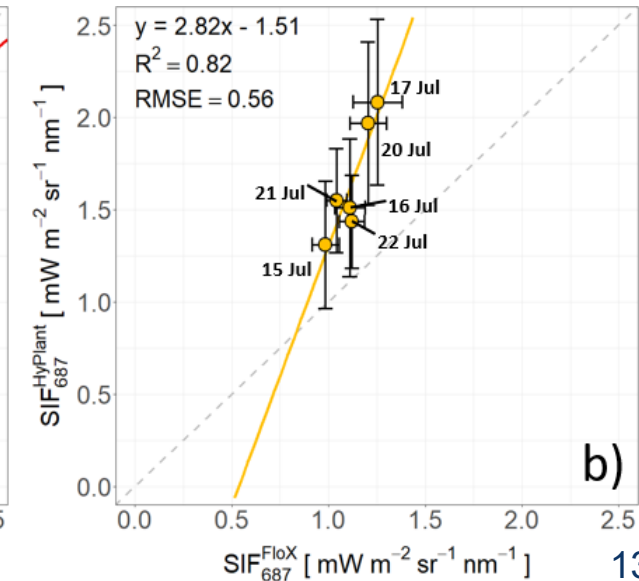
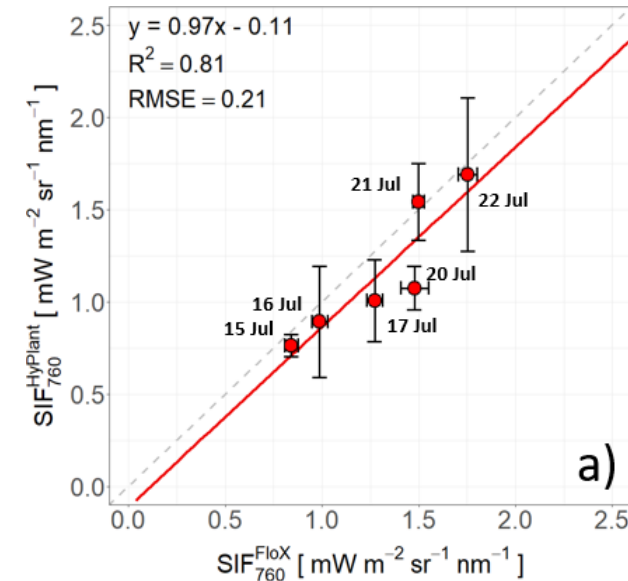
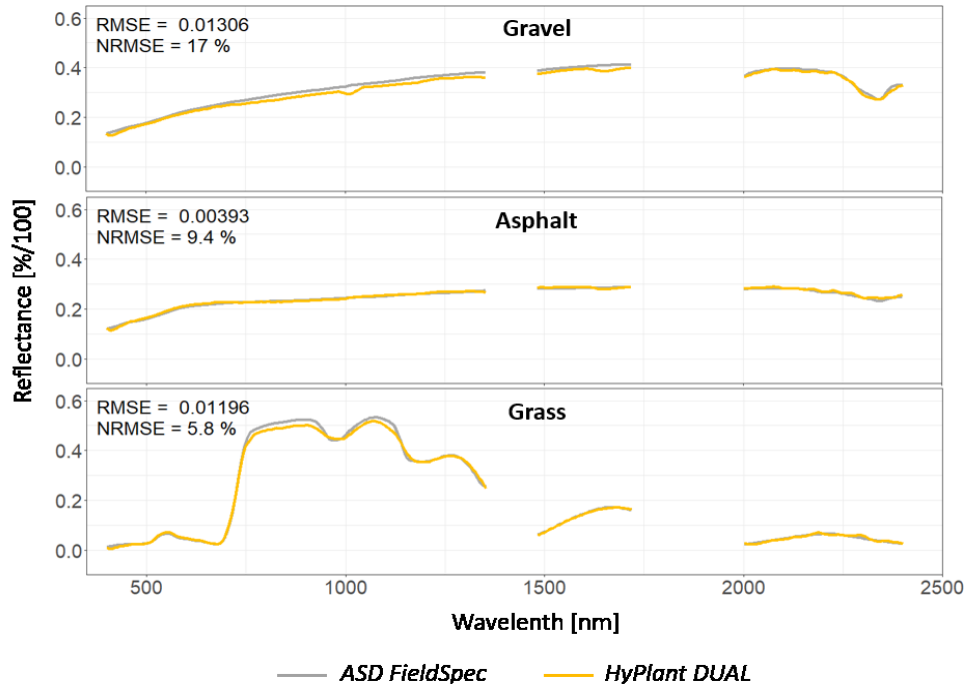
- 7(8) flight days = 200 flight lines = 400 data sets (both sensors)
  - Each flight day → GLORI mapping, FULL mapping, VERDU flight line

# HyPlant Mosaic – GLORI mapping – 17 July 2021



- 7(8) flight days = 200 flight lines = 400 data sets (both sensors)
  - Each flight day → GLORI mapping, FULL mapping, VERDU flight line

# Quality of HyPlant top-of-canopy reflectance and SIF data



# Which data is available in the LIAISE consortium?

- Land use/cover mapping of the investigated area
- In-situ and airborne information on soil moisture
- GPP from eddy tower at La Cendrosa and maps of forward GPP models
- Maps of plant biomass and/or LAI
- Maps of evapotranspiration (model outputs)
- Atmospheric data (e.g., AOT, pressure, water vapor) for HyPlant atmospheric correction

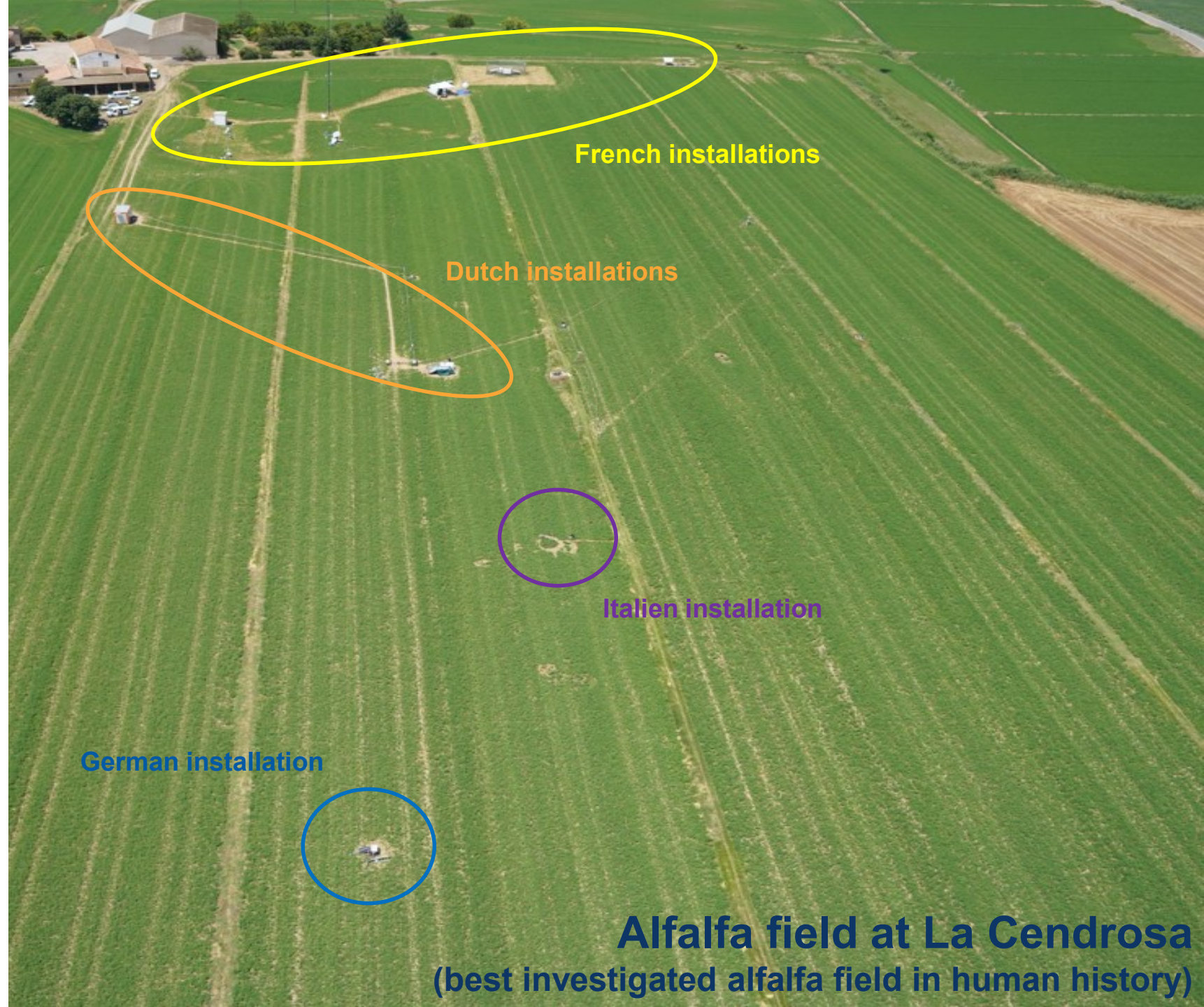
**Thanks for  
your attention!**

**Dr. Bastian Siegmann**

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**French installations**

**Dutch installations**

**Italian installation**

**German installation**

**Alfalfa field at La Cendrosa  
(best investigated alfalfa field in human history)**