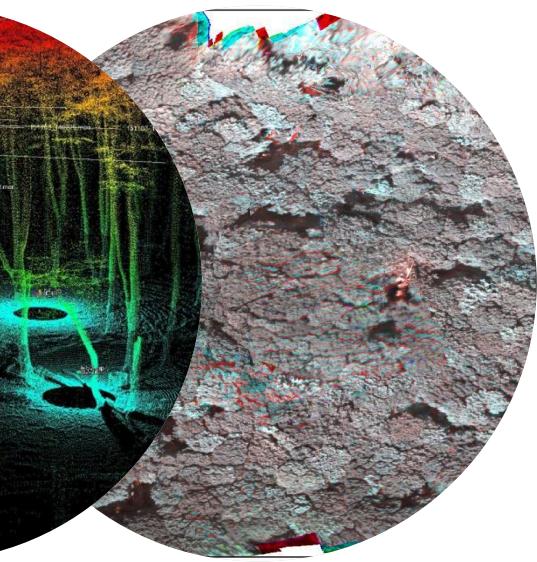


Calibration and Validation of Sentinel-2 and Landsat Time Series Data for Forest Monitoring

2016-07-06

Benjamin Brede, Jan Clevers, Jan Verbesselt, Martin Herold

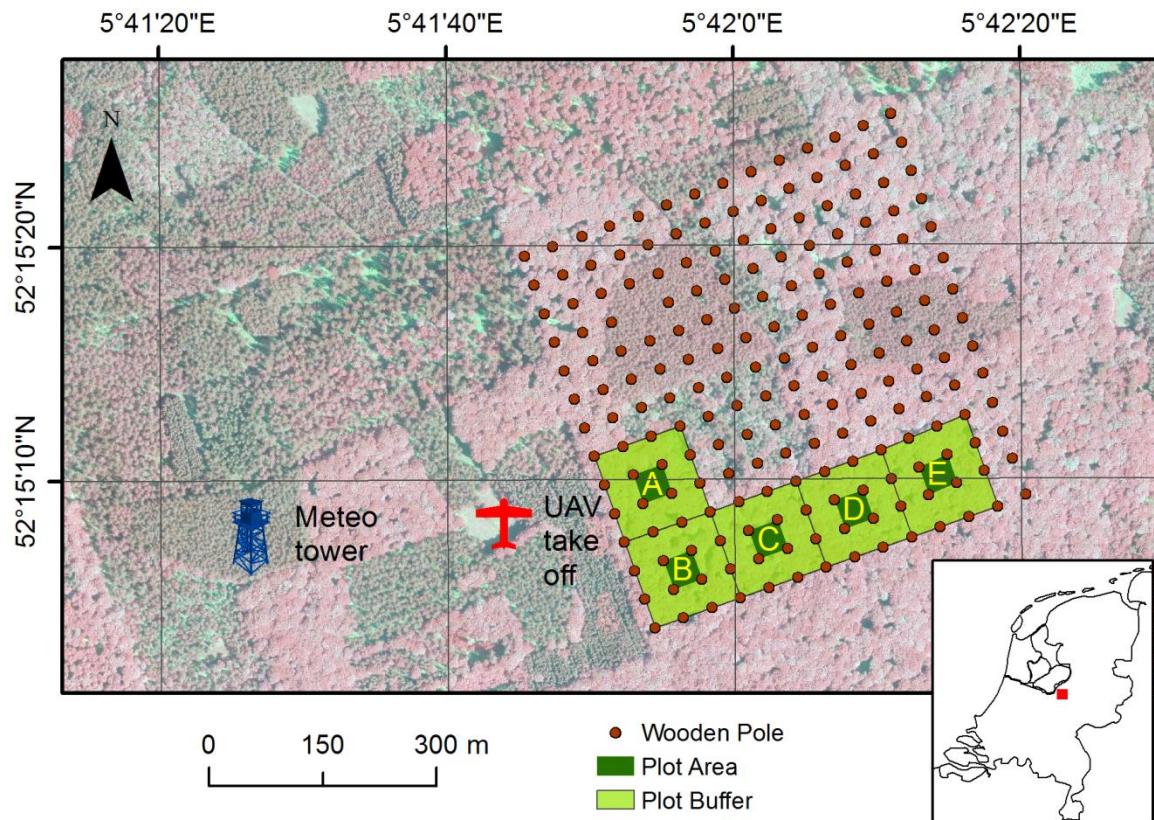


Motivation

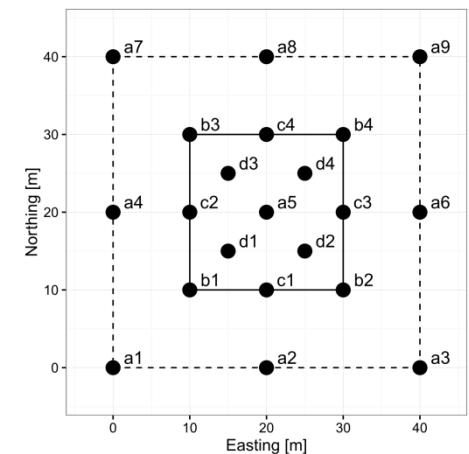
- Missing cal/val sites for high density time series (>1 week) over dynamic vegetation (S2 MAG)
- Forest ecosystems: largest discrepancies between LAI datasets, and impact of dynamics and changes
- New sensing opportunities: UAVs, terrestrial lasers, passive sensors etc.
- Objectives of project:
 - Establish IDEAS+ reference site monitoring concept (Speulderbos, NL)
 - Radiometric comparison UAV – S2A
 - Multi-Mission Time Series Fusion

WP1 Speulderbos Reference Site

Site map



Sampling design



WP1 Speulderbos IDEAS+ Reference Site

Data Streams – ground & airborne

Instrument	Plots	Temporal density
Nikon DSLR with Sigma circular fisheye	A to E	1 x week
Riegl VZ-400	A to E	1 x week
PASTIS 57	A to E	2 min
Vegnet lidar	A & B	2 x day
Rikola @ Altura	A & B	1 x week
HYMSY @ Altura		

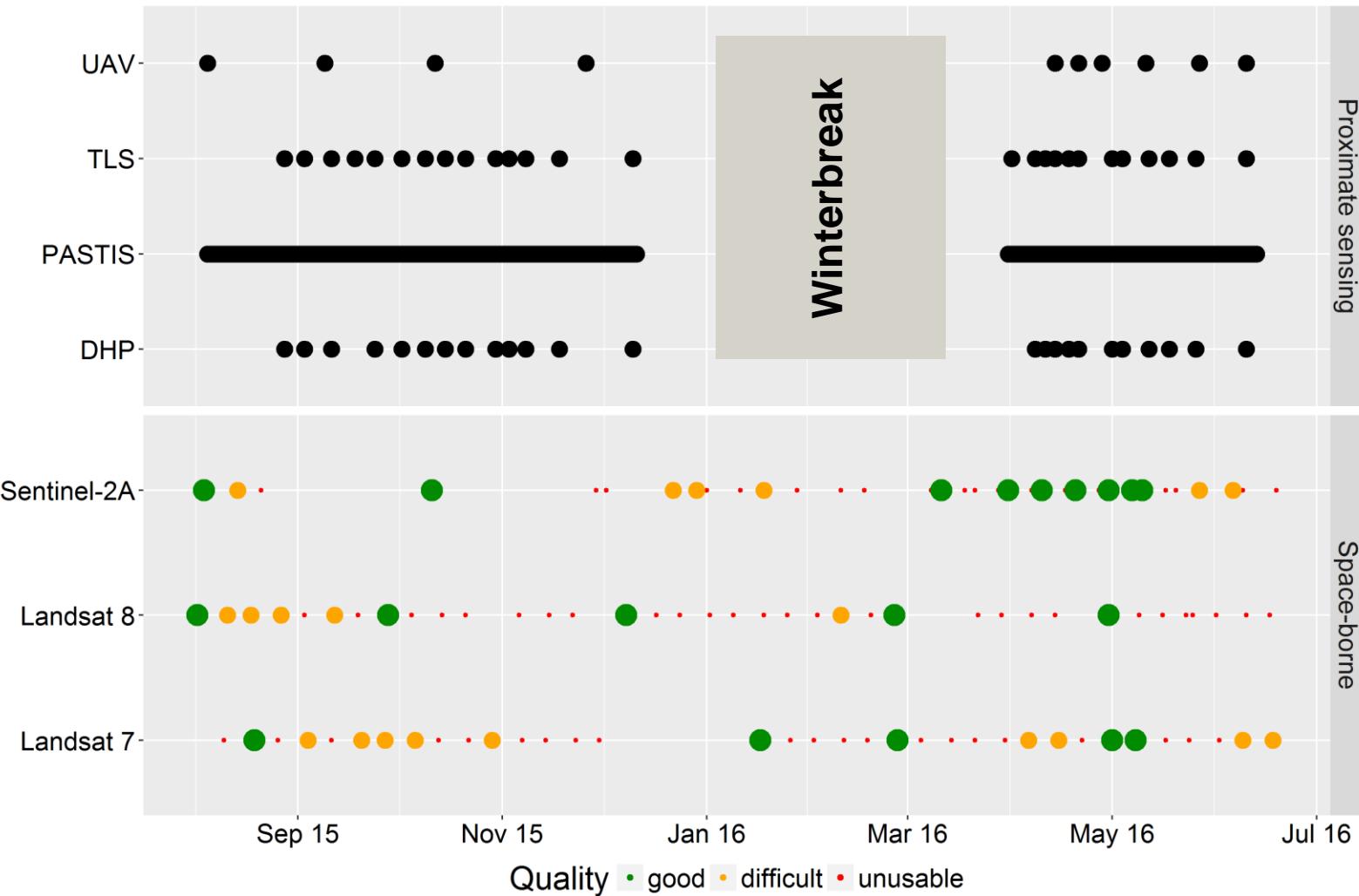


WU UAV Facility (<http://wageningenur.nl/uarsf>)
WU Lidar Facility (<http://wageningenur.nl/lidar>)

WP1 Speulderbos Reference Site



WP1 Speulderbos Site – sampling density



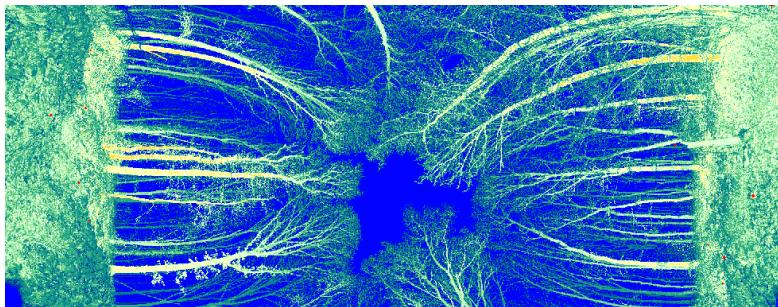
Monitoring leaf development with TLS

DHP

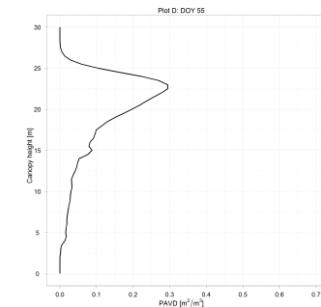
24/02



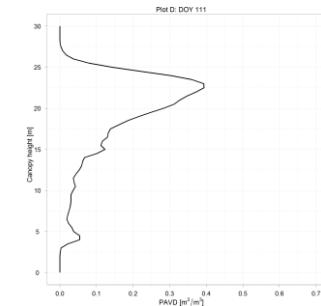
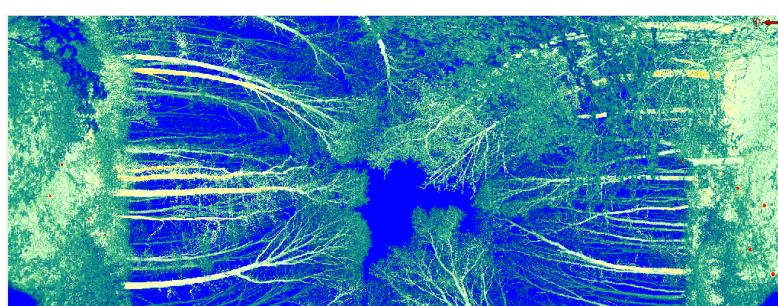
Terrestrial laser (TLS)



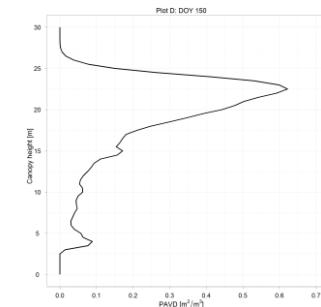
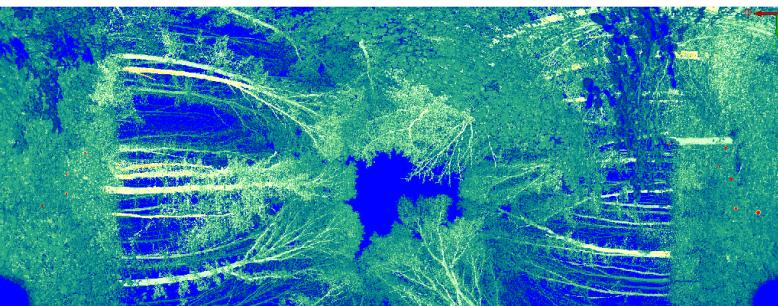
TLS profile



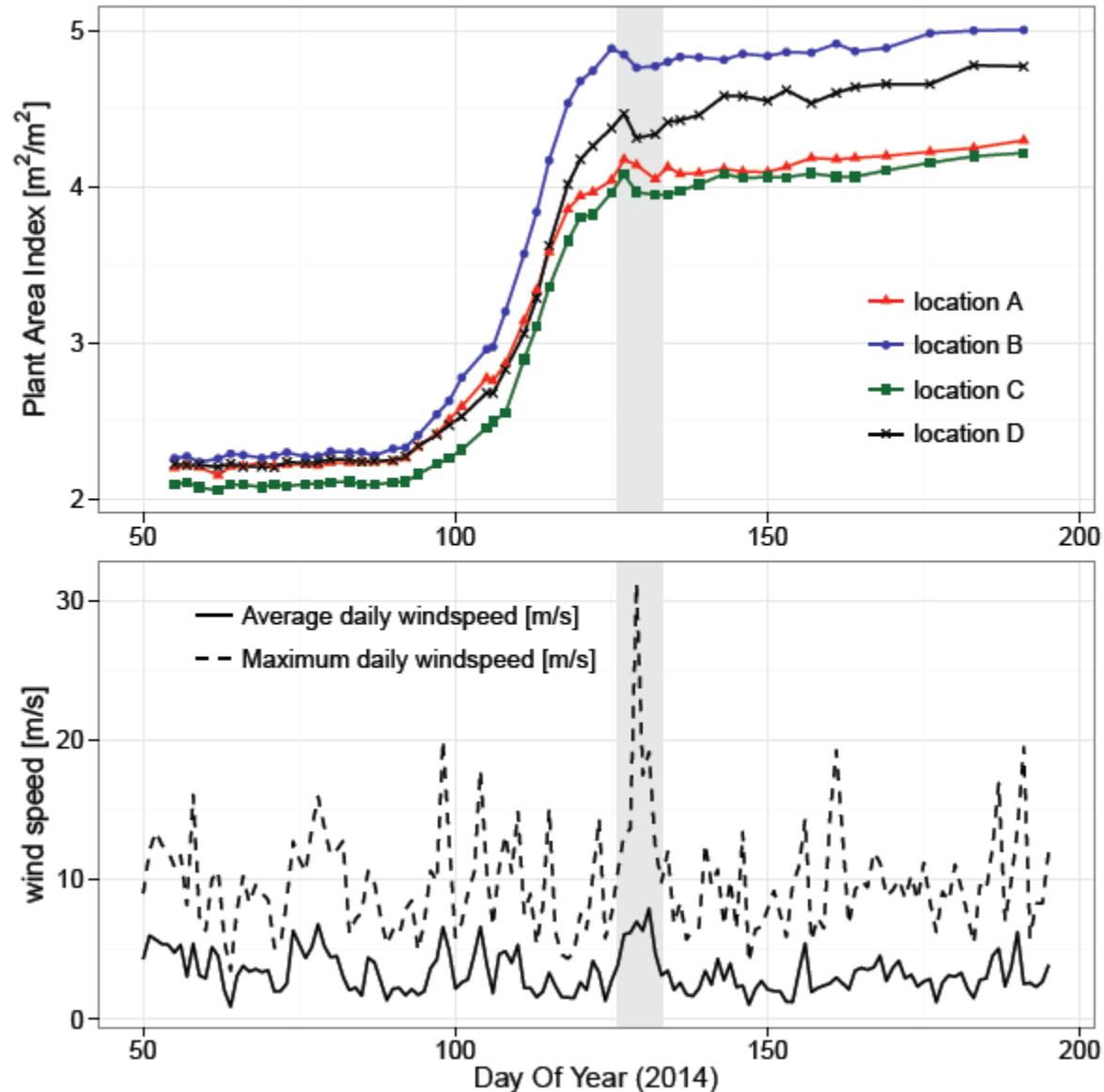
21/04



30/05



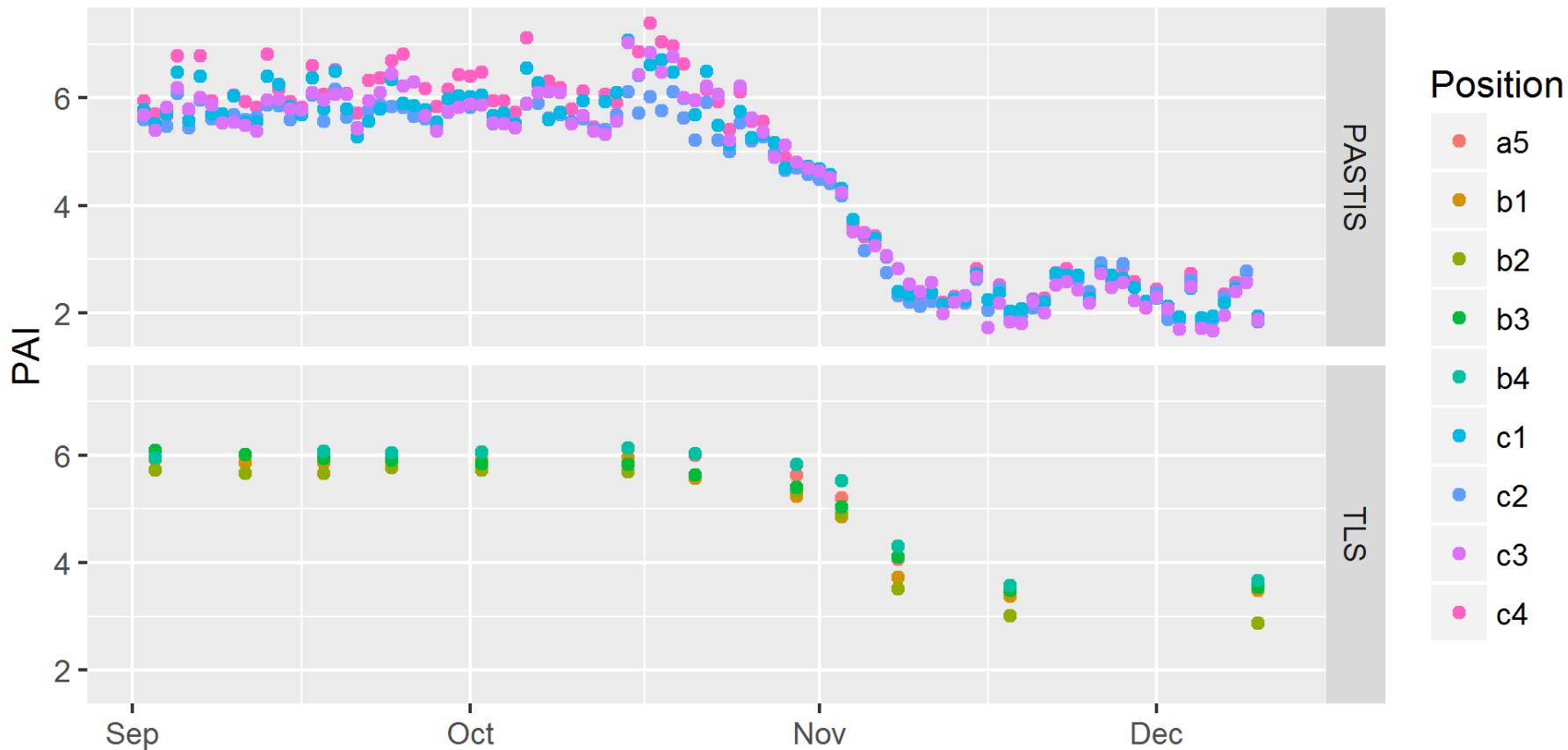
Monitoring canopy development



Calders et al. 2015.
Agricultural & Forest
Meteorology

WP1 Speulderbos Reference Site

First results plot B, autumn campaign



WP2 Radiometric Comparison UAV – S2A

Approach

1. Preparation S2A-MSI

- a) L1C → L2A (sen2cor)
- b) Fine co-registration to airborne imagery
- c) Extraction reflectance factors for plot A & B

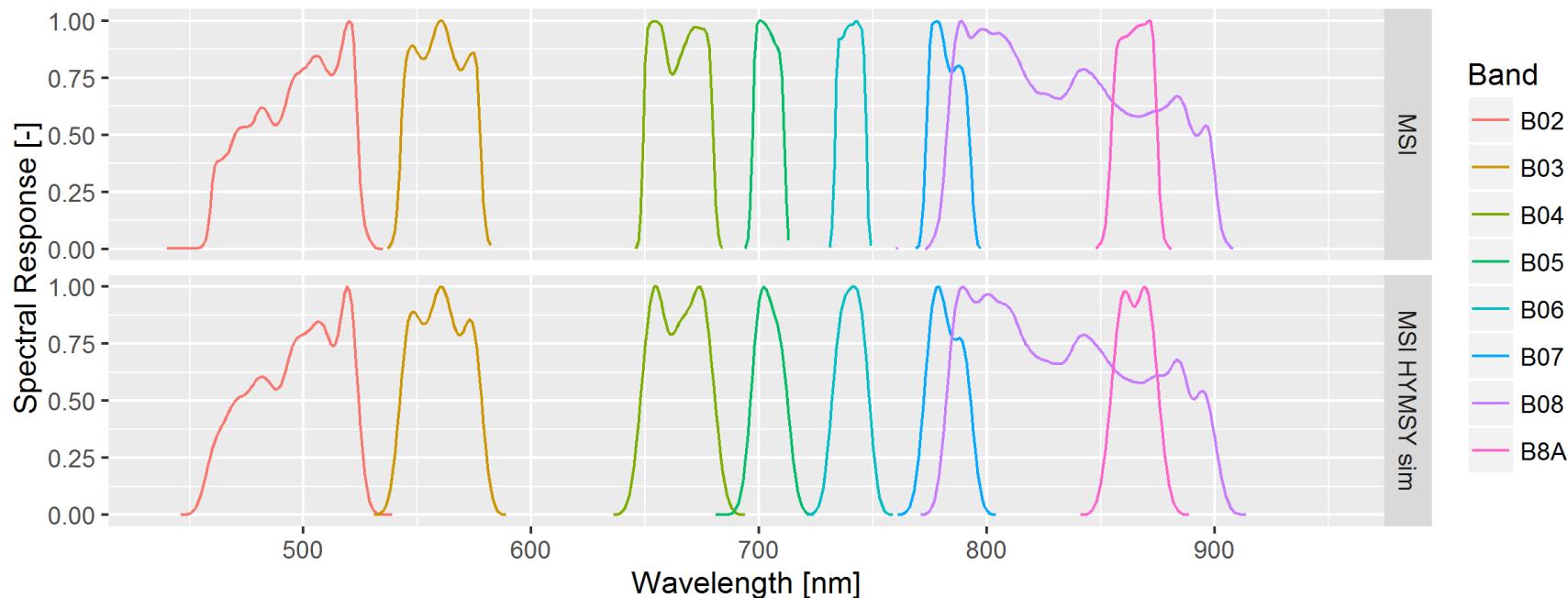
2. Preparation HYMSY

- a) Raw → TOC (Suomalainen et al., 2014)
based on Spectralon Reflectance Panel (50% grey)
- b) Spectral simulation HYMSY > MSI (B02-B8A)
- c) Fine co-registration to airborne imagery
- d) Extraction reflectance factors for plot A & B

WP2 Radiometric Comparison UAV – S2A

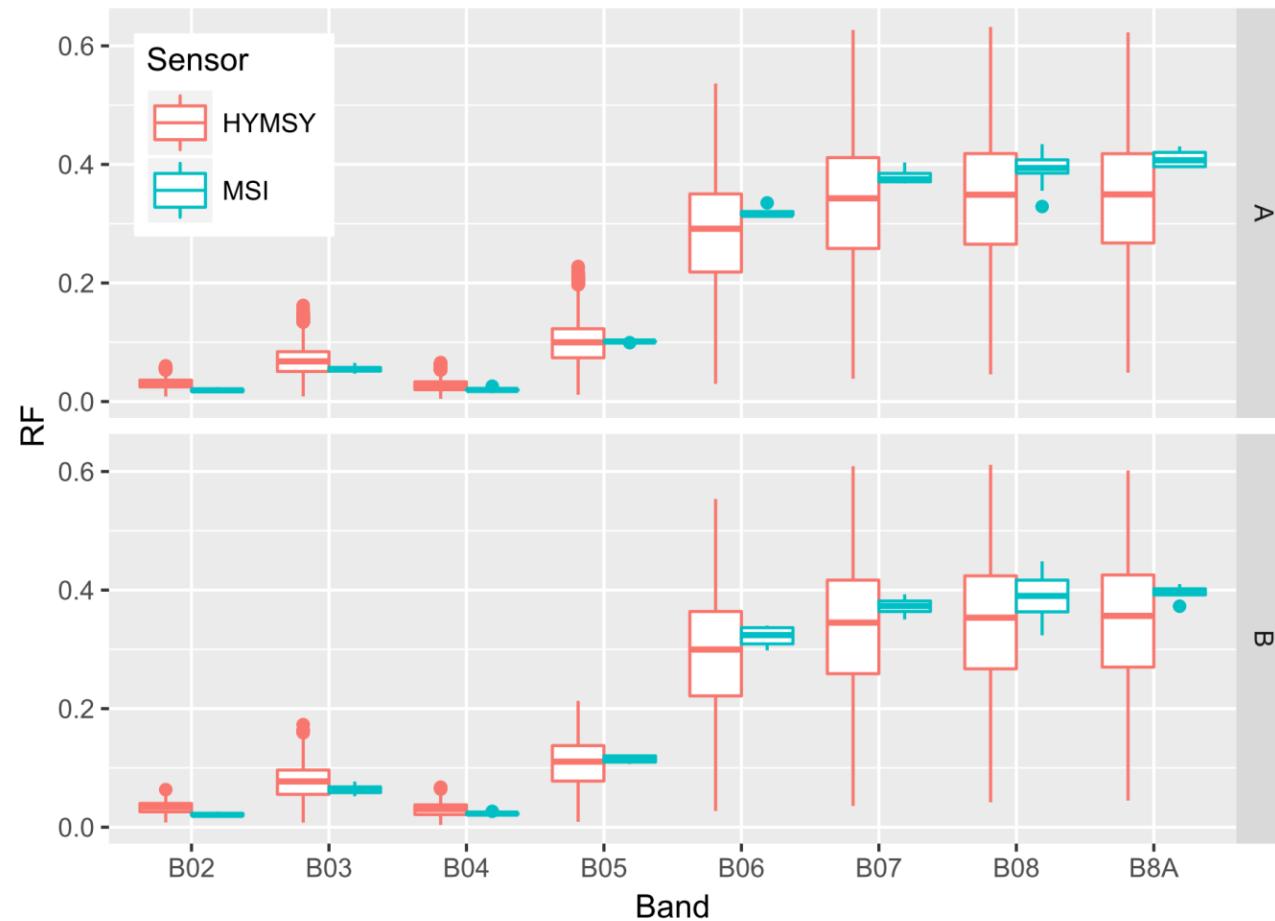
Spectral simulation

- HYMSY: 400 – 950nm, 101 bands à 9 nm (FWHM)
 - > find weights for bands by minimizing RMSE with general-purpose optimizer



WP2 Radiometric Comparison UAV – S2A

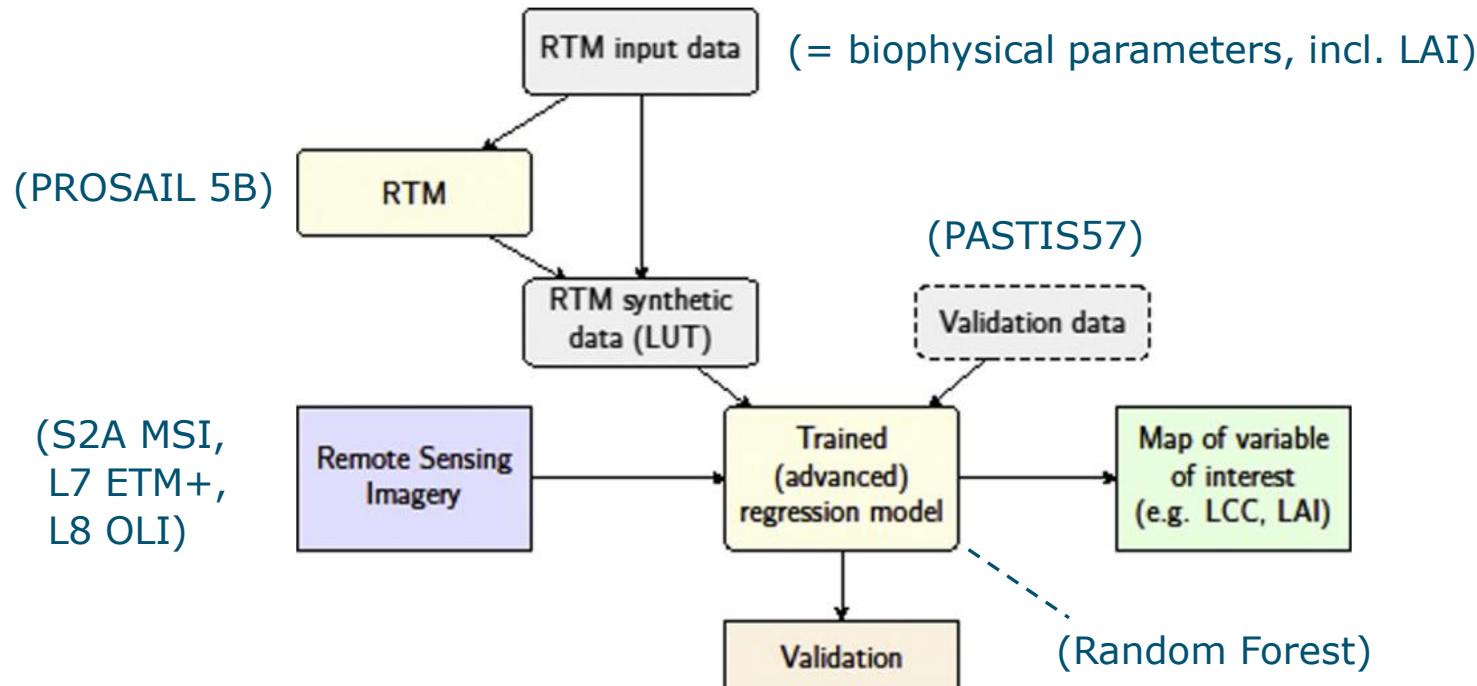
Results



case
2016-05-11
MSI:
~12:50 CEST
HYMSY:
11:05 CEST

WP3 Multi-Mission Time Series Fusion

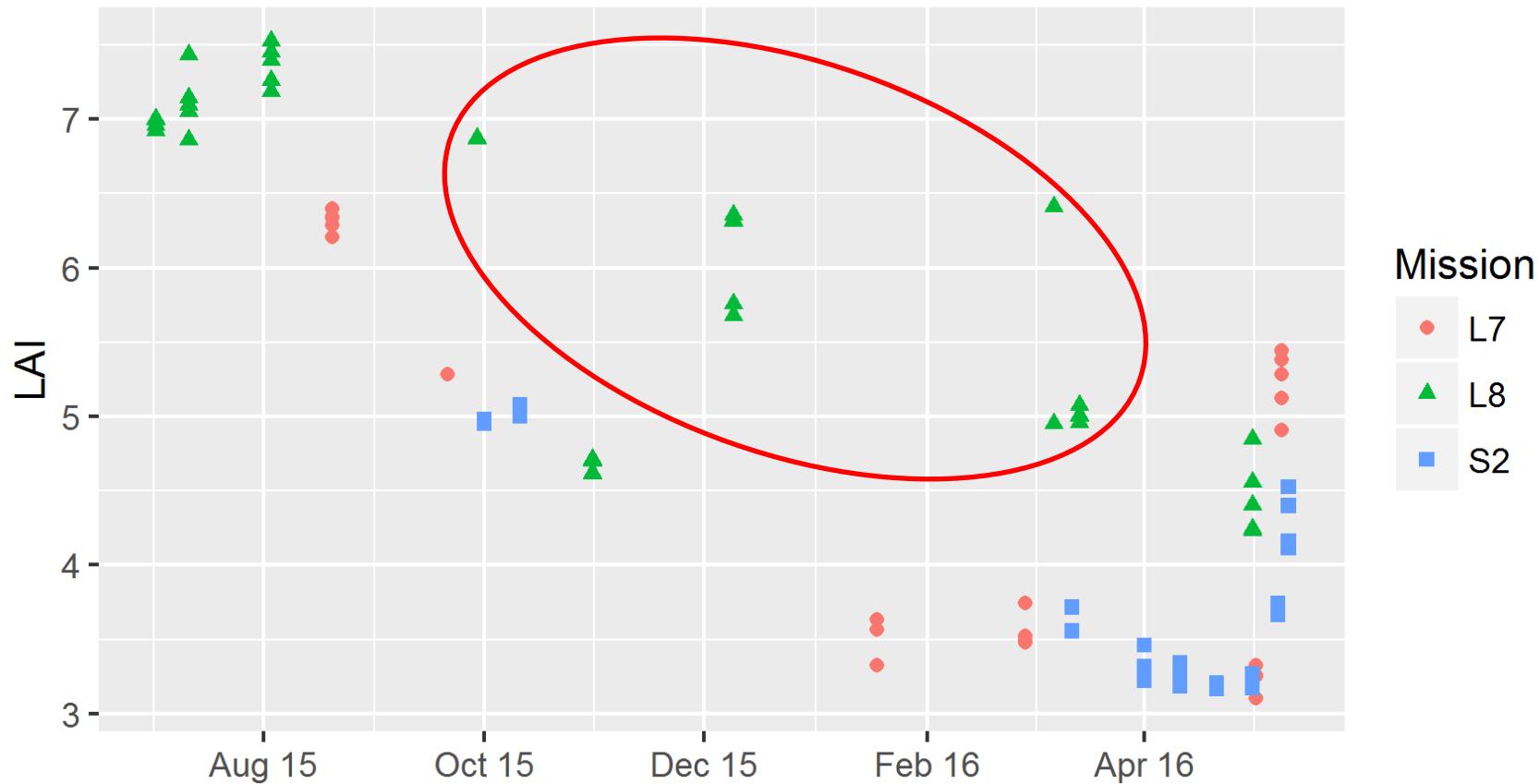
- On product level (in this case LAI)
 - > same target variable for all missions
- Hybrid approach (Verrelst et al., 2015)



Verrelst et al., 2015: Optical remote sensing and the retrieval of terrestrial vegetation biogeophysical properties - A review, ISPRS J. Photogramm. Remote Sens. 108, 273-290.
DOI:10.1016/j.isprsjprs.2015.05.005

WP3 Multi-Mission Time Series Fusion

First results



Outlook for phase 2

1. Consolidate monitoring concept and continue campaign 2016-2017:
 - <http://www.wageningenur.nl/fbprv>
 - Data will be freely available
2. More focus on validation with high temporal resolution (PASTIS & Vegnet)
3. Potential to include more missions into time series fusion:
 - Sentinel-2B, SPOT 6, DMC, Deimos-1, others
4. Exploring to extend to other missions:
 - Spatial extend (S3, FLEX)
 - Fluorescence measurements from UAV

Acknowledgements



WU UAV Facility
(<http://wageningenur.nl/uarsf>)

WU Lidar Facility
(<http://wageningenur.nl/lidar>)

 Staatsbosbeheer
for granting
access to the site

