WP-2140: Land validation over temperate and tropical forest

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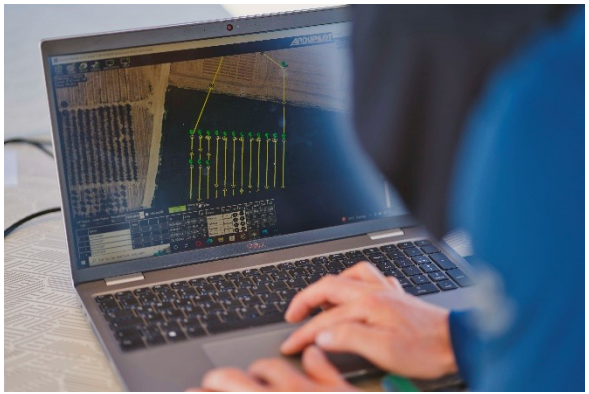
Overview

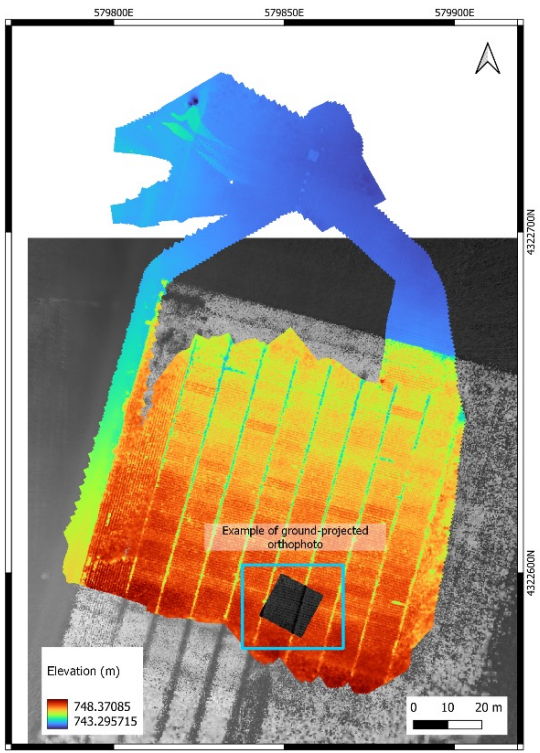
- Support to SRIX4VEG
- StrucNet
  - Lidar component
  - Optical component
  - Demmin site
  - Exploration: Ghana
- Future activities

SRIX4VEG

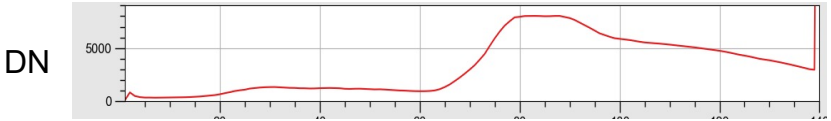


SRIX4VEG

- Implementation of prototype processing pipeline with Cubert Firefleye 185 hyperspectral snapshot images:
  - No standard workflow available
- Geometric processing of Cubert Firefleye 185 hyperspectral snapshot images based on Structure-from-Motion software plus GCPs
- Extraction of relevant image sections (VZA + RAA)
- Radiometry based on empirical line with calibration panels (ongoing)



Digital surface model



Hyperspectral orthomosaic: 900 nm (red), 600 nm (green), 550 nm (blue)

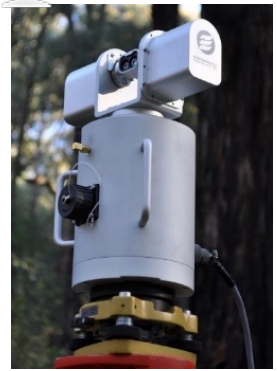
StrucNet

- Initiative between GFZ (Martin Herold, Benjamin Brede) & Uni Ghent (Kim Calders)

- Network for monitoring of vegetation structure
  - LAI/PAI, PAVD (plant area volume density = LAI in 3D)
  - Phenology

- Main instrumentation
  - LEAF (Laser Enabled Assessment of Forest) = monitoring Lidar
  - TreeTalker = tree parameters (wood moisture, sap flux, radial growth) + 12 band spectrometer (450 nm – 860 nm)
  - Campaigns: TLS, UAV lidar & hyperspectral

- Cal/val for new space-borne missions, e.g. GEDI, BIOMASS



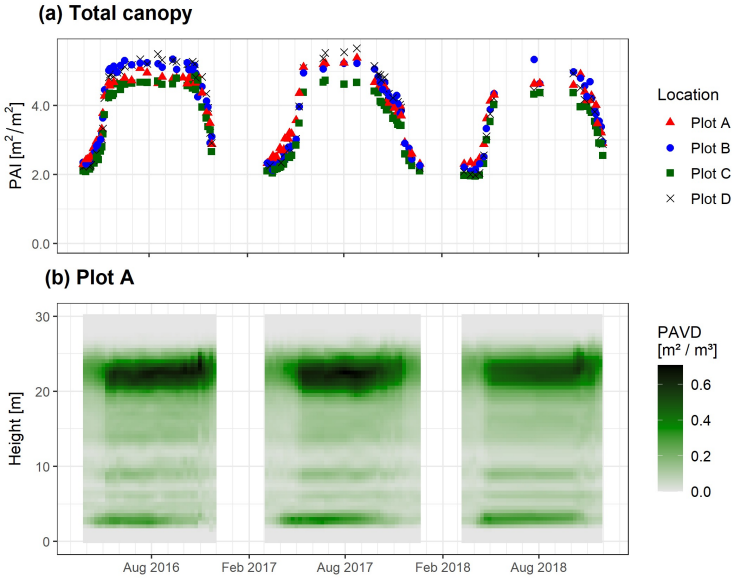
LEAF MkI

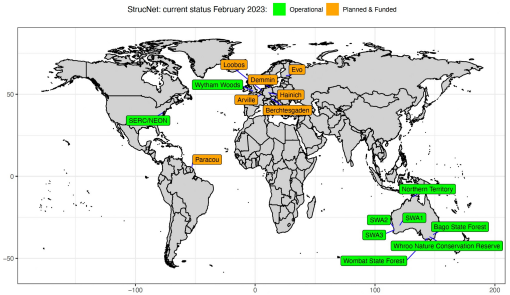
TreeTalker TT+3.3

StrucNet – proximal Lidar

- Need for (inter)calibration of LAD based on lidar (Brede et al., 2022, Vincent et al., 2023)
- Standardised product development

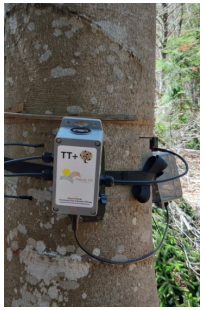
- 1st StrucNet User Workshop: May 30 – June 1 @ GFZ





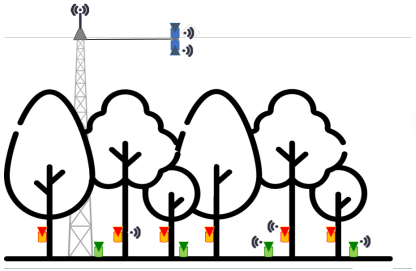
StrucNet: LEAF implementation status (Calders et al., in review)

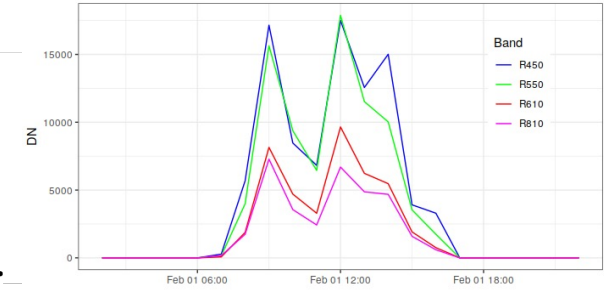
StrucNet – proximal optical

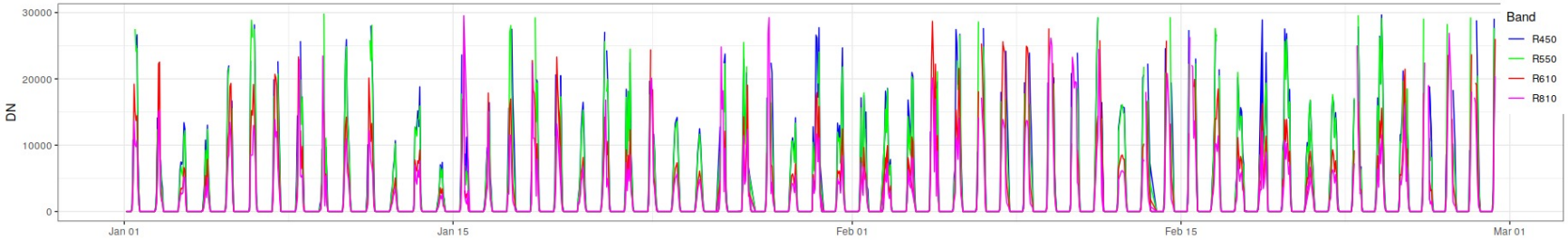


- TreeTalker:
  - IoT technology > NRT applications
  - tree physiological parameters (wood moisture, sap flux, radial growth)
  - 12 band spectrometer VNIR between 450 – 860 nm

Example: Loobos (ICOS site, NL)

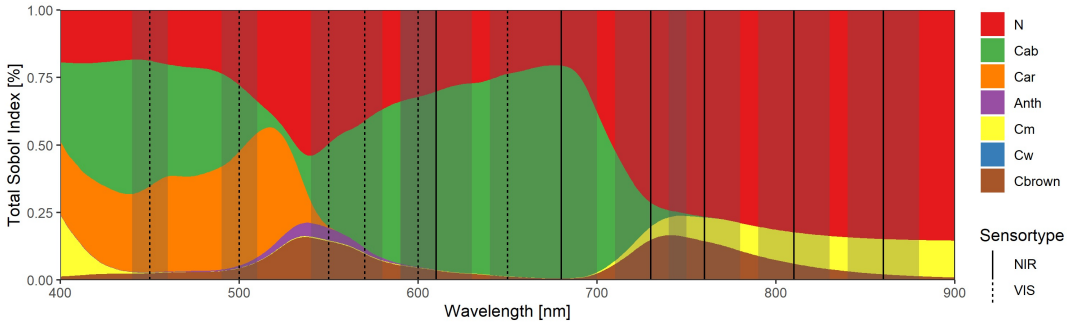




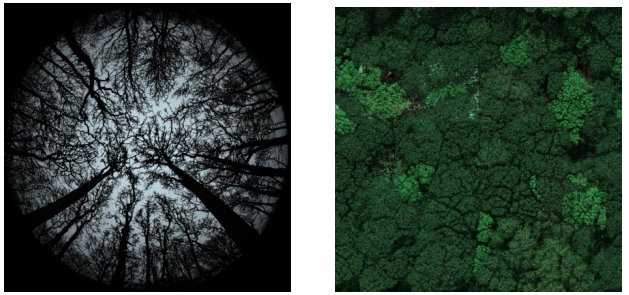


StrucNet – optical component

- Biophysical/-chemical parameter retrieval, i.e. LAI, Chl_{ab}
- Exploit lidar-optical synergies for inversion



Sensitivity of PROSPECT leaf model to biochemistry



Realistic forest model from TLS (Calders et al., 2018)

StrucNet – UAV component

Velosv3

- Payload to 10 kg
- Endurance 30-40 min @ 8 kg payload

Mjolnir VS-620

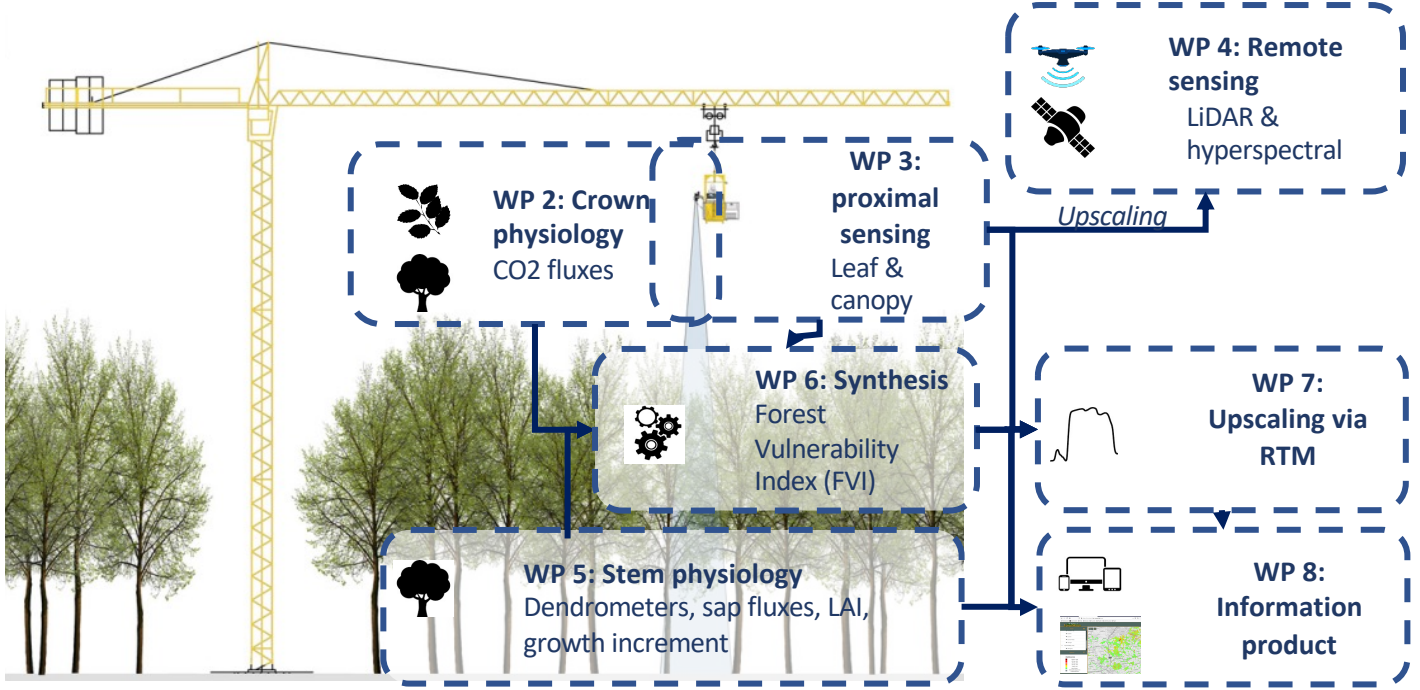
HySpex by neo

- VNIR-SWIR coaligned
- System weight ~8 kg (incl. IMU, gimbal)
- 400 – 2500 nm

RIEGL VUX-120

- System weight ~4.5 kg
- Max operating height 440 m (ρ > 20%), 720 m (ρ > 60%)

StrucNet –Demmin site



StrucNet – Scouting Ghana

Forestry Research Institute of Ghana
Fumesua, Ashanti Region

Laser scanning campaign across savanna – forest gradient (~500 km)
Re-measurements and new Strucnet sites

Kogaye - savanna

Bobiri – seasonal dry

Ankasa – wet tropical

Future (possible) activities

- Support to SRIX4VEG
  - Processing surface reflectance
  - Project meeting #2: October 2023

- StrucNet
  - Expansion of network (ICOS sites in Europe)
  - LEAF (inter)calibration procedure & basic products
  - TreeTalker spectral characterisation (NPL?)
  - Baseline & synergistic algorithms for biophysical/-chemical retrieval (i.e. Chl_{ab}, LAI)

- Preparation for CHIME
  - UAV hyperspectral:
    - error budget + sensor characterisation (NPL?)
    - Hyperspectral sensor synergies with lidar and radar
  - Hypernets: extension of network
  - Airborne hyperspectral & multi-sensor campaigns (+ lidar, hyperspectral LW)