10 YEARS CzechGlobe

GLOBAL CHANGE
RESEARCH INSTITUTE CAS

Remote Sensing for monitoring of forest ecosystems

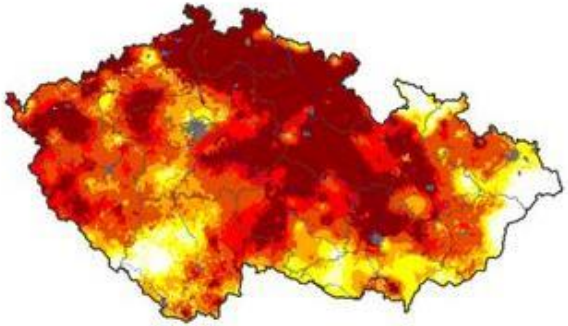
Lucie Homolová and colleagues

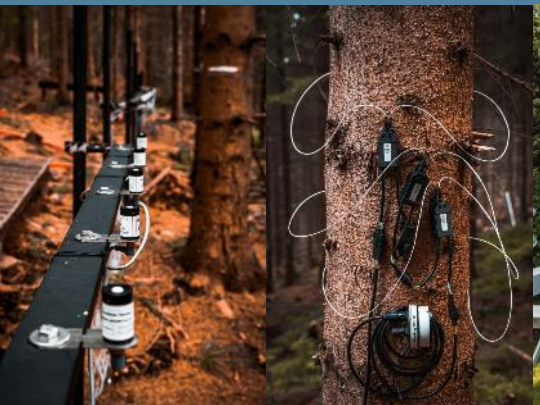
SITOLA Seminar, 09/03/2022

What to expect today

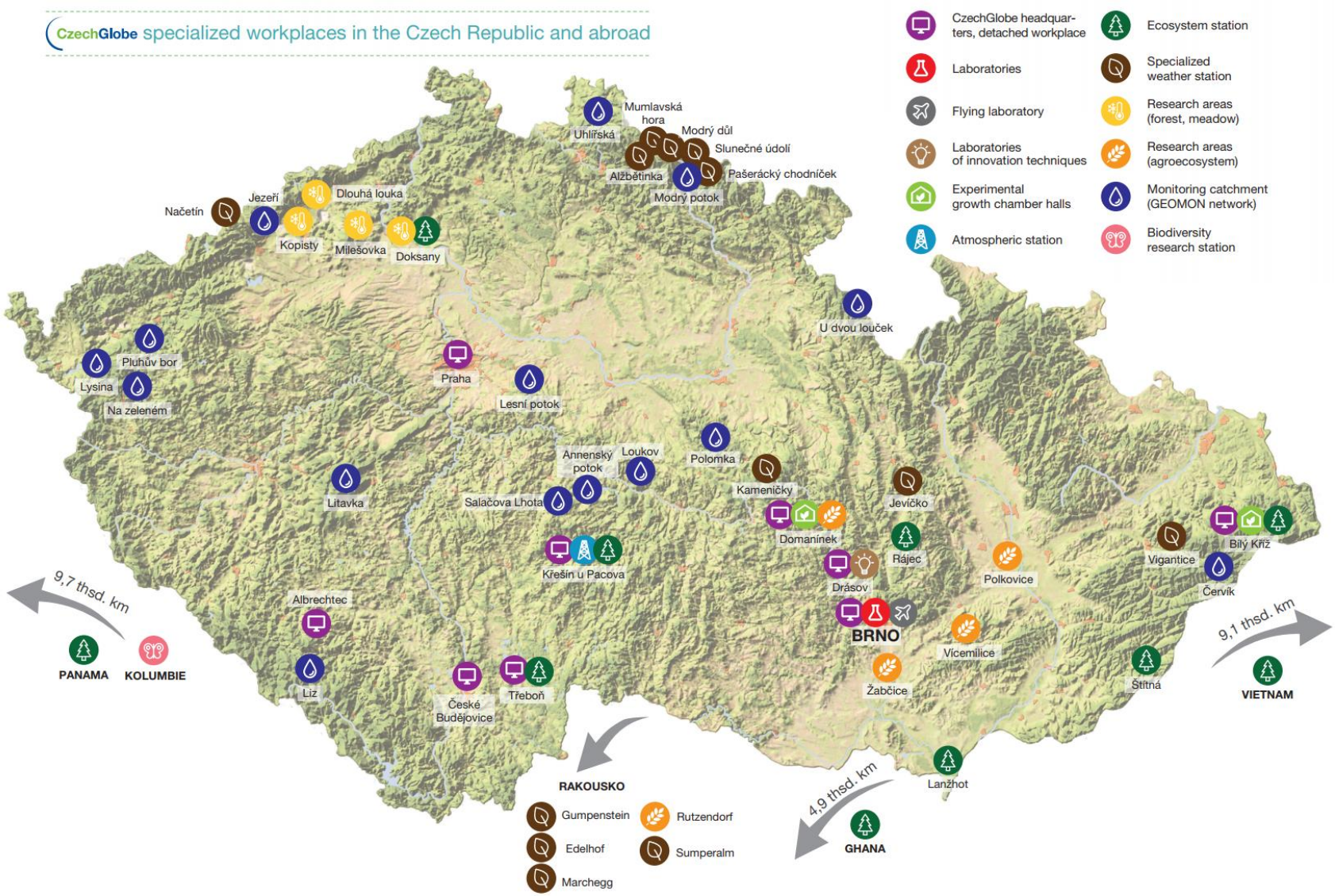
- Short intro to CzechGlobe
- Our remote sensing infrastructure
- Brief theory about remote sensing – what means „hyperspectral“
- How remote sensing technology can be used for forestry

INTERSUCHO





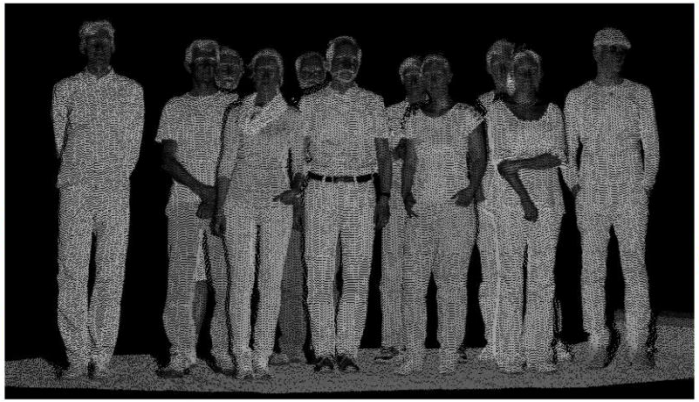
CzechGlobe specialized workplaces in the Czech Republic and abroad



Remote Sensing at CzechGlobe

Imaging spectroscopy

Laser scanning



Thermal scanning

Remote Sensing Team & Team of Airborne Activites

Flying Laboratory of Imaging Systems

CESSNA 208B Grand Caravan

Visible and near infra-red imaging spectroscopy

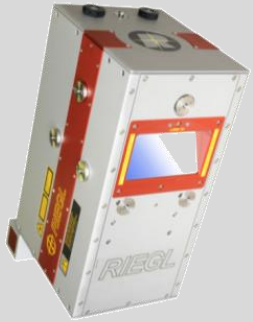
CASI-1500

SASI-600

Thermal imaging spectroscopy

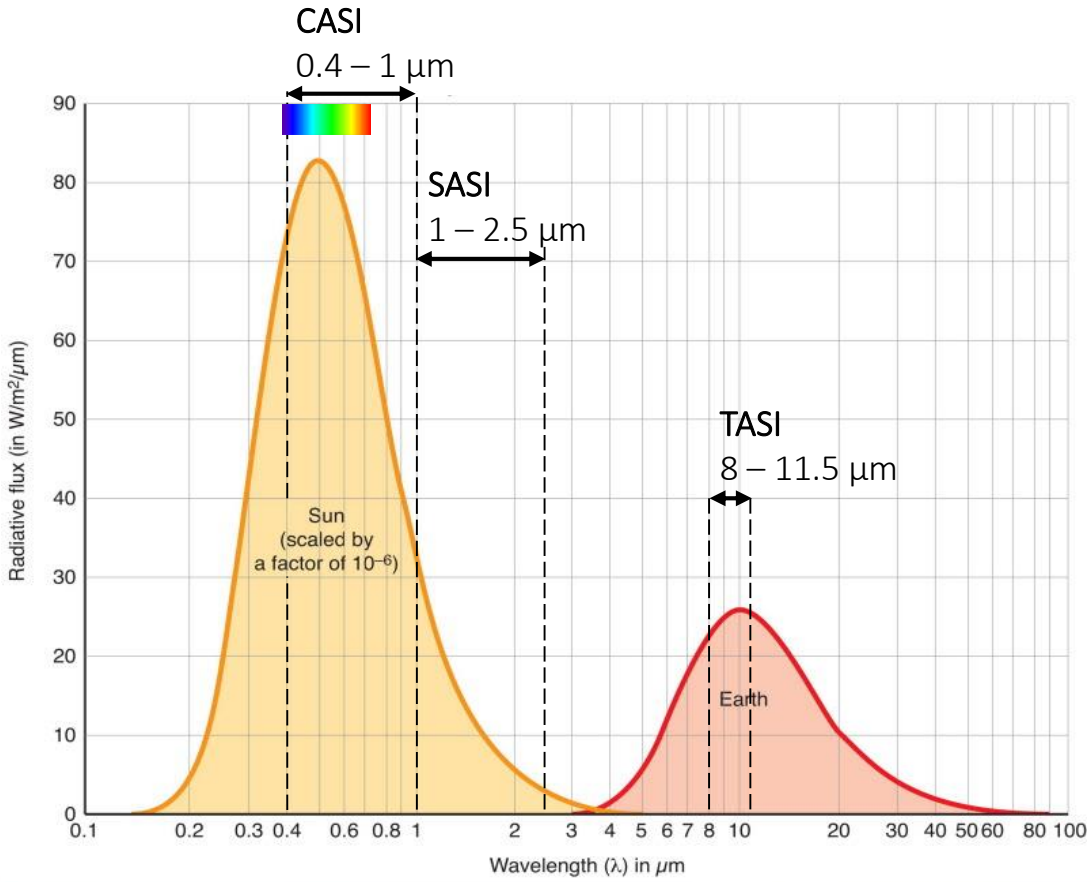
TASI-600

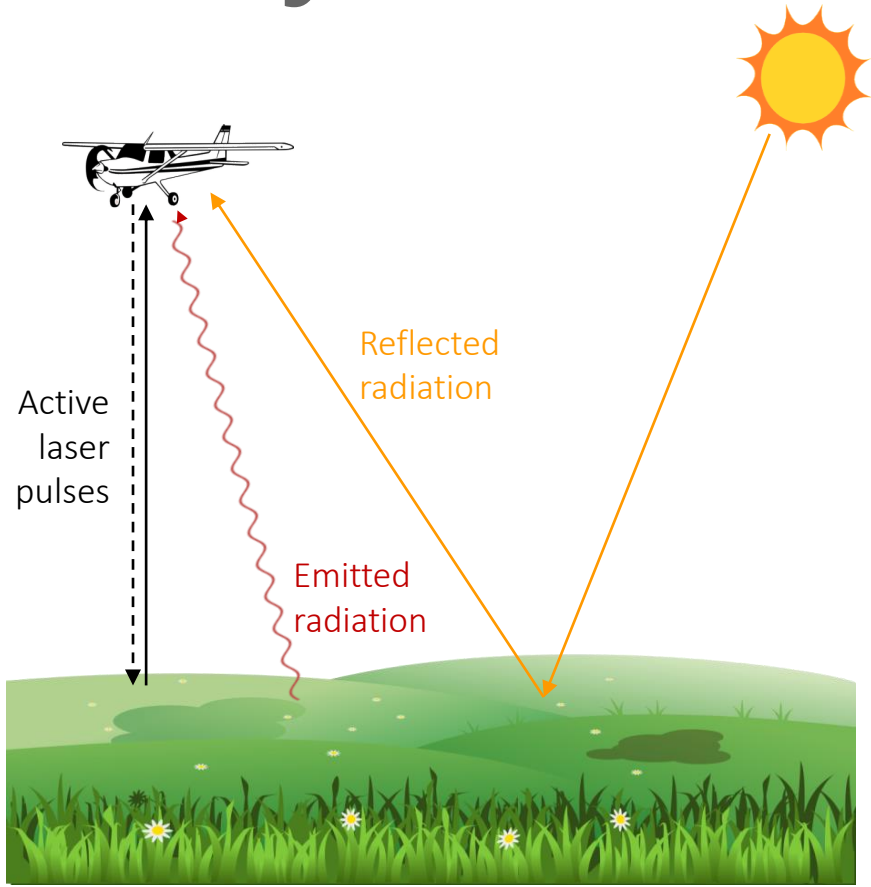
Laser scanning



Riegl LMS – Q780

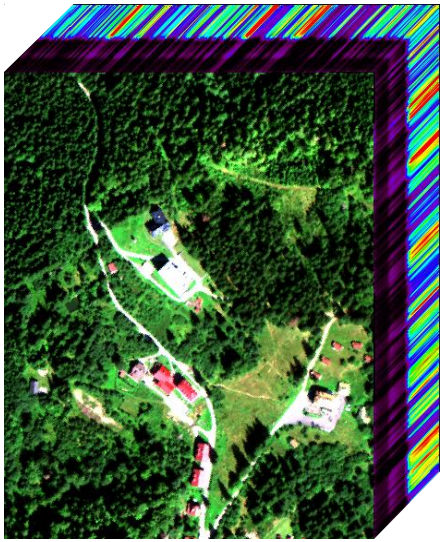
Quick excursion into RS theory



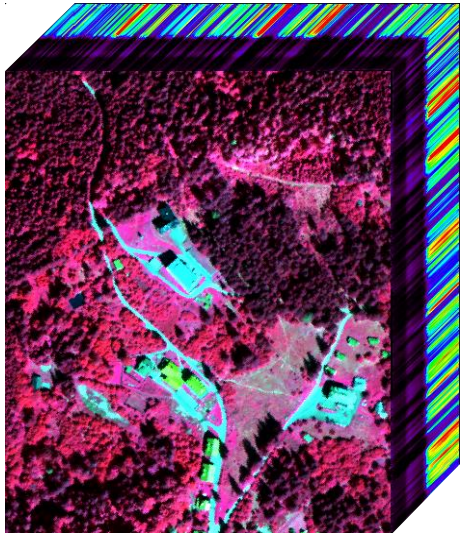


Black body emission curves of the Sun and Earth (*http://eesc.columbia.edu*)

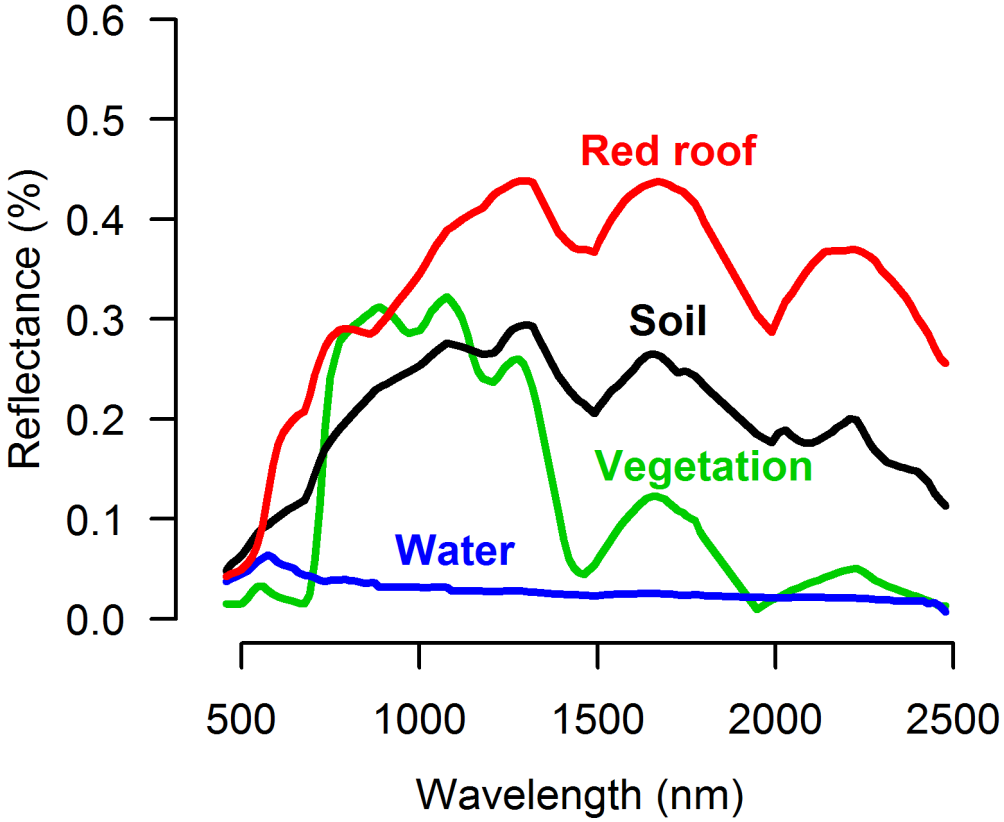
Quick excursion into RS theory



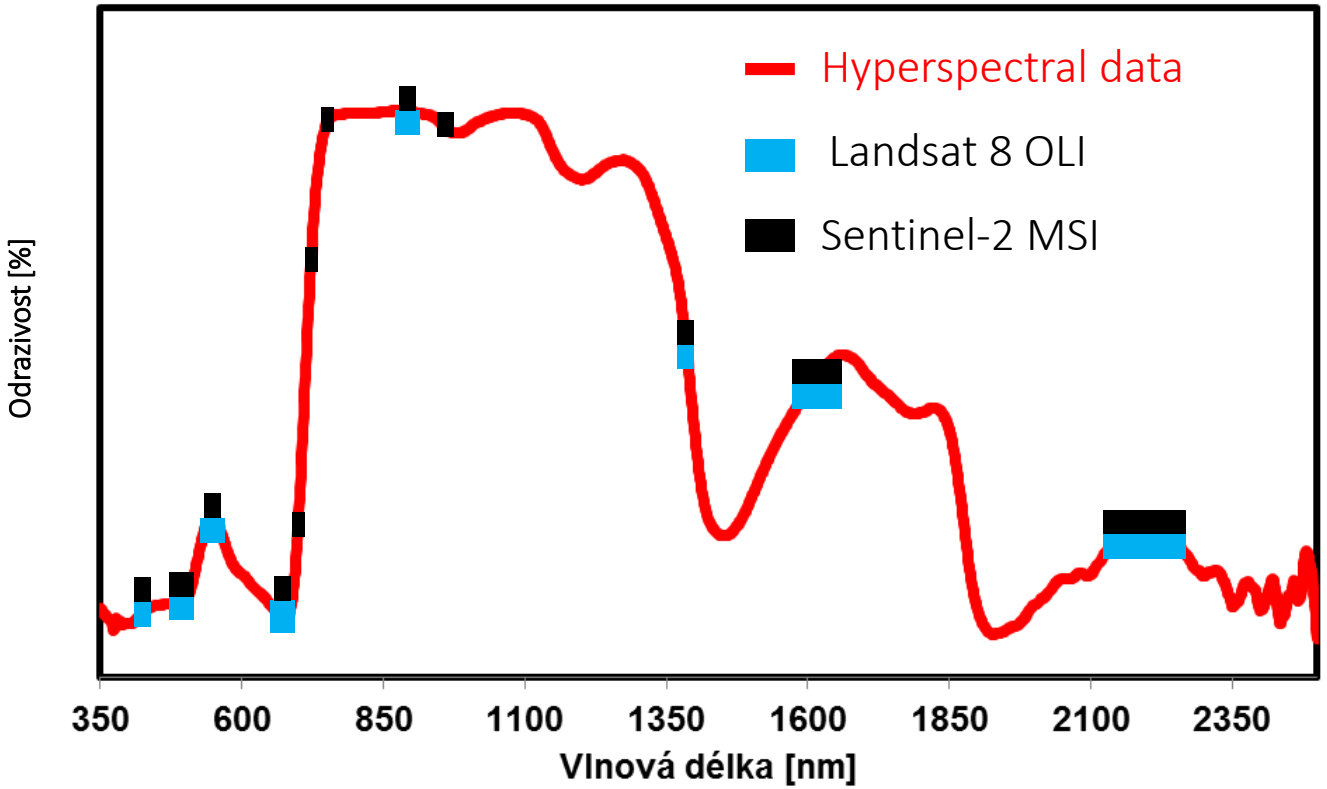
R-675nm G-552nm B-458nm



R-817nm G-675nm B-552nm



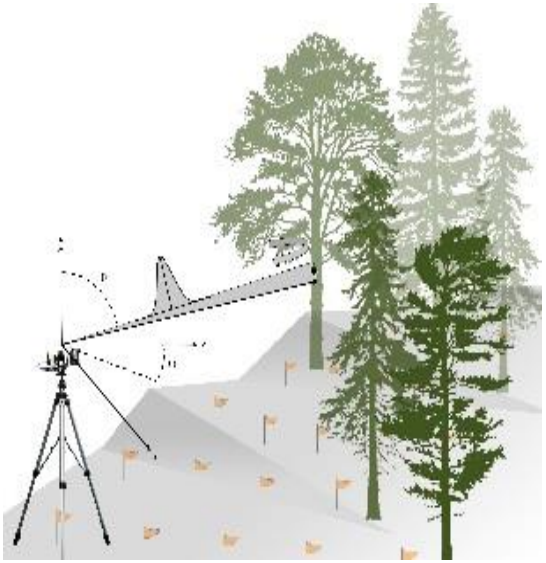
Quick excursion into RS theory



Applications for forestry

3D forest modelling

MSc. thesis of P. Sloup



terrestrial laser scanning

tree separation from a point cloud

separation of woody elements

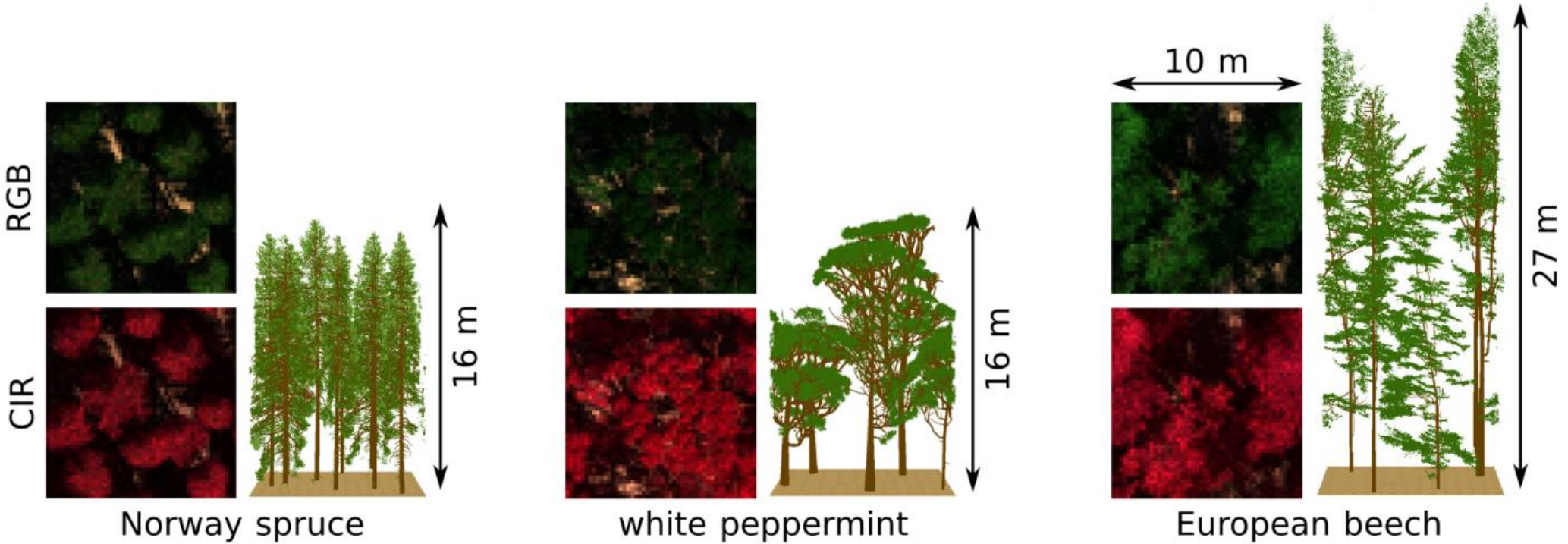
reconstructed woody skeleton

overlay with foliage point cloud

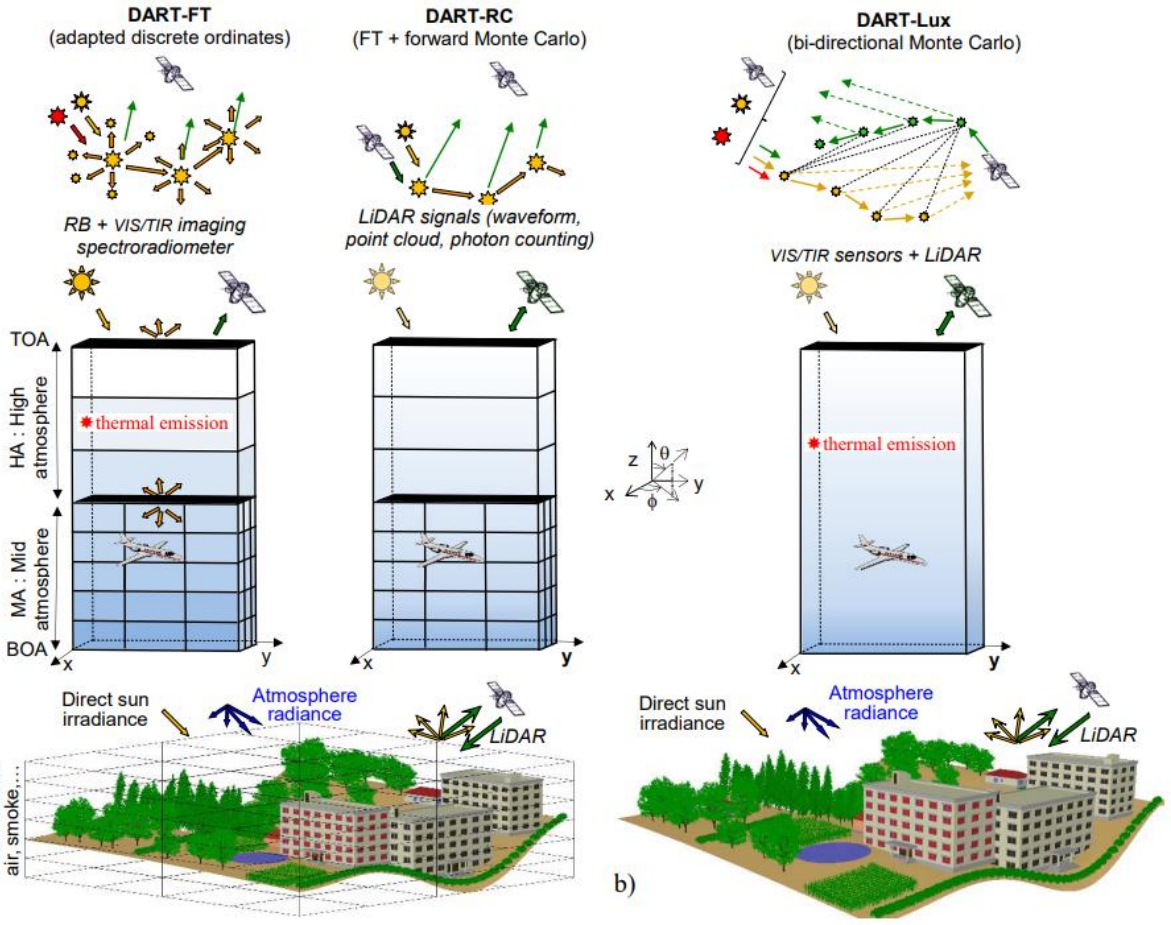
3D tree model with shoots

Janoutová et al. (2019, 2021; https://doi.org/10.1093/insilicoplants/diab026)

3D forest modelling

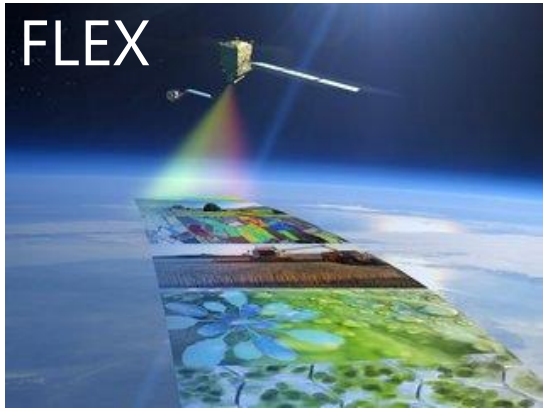


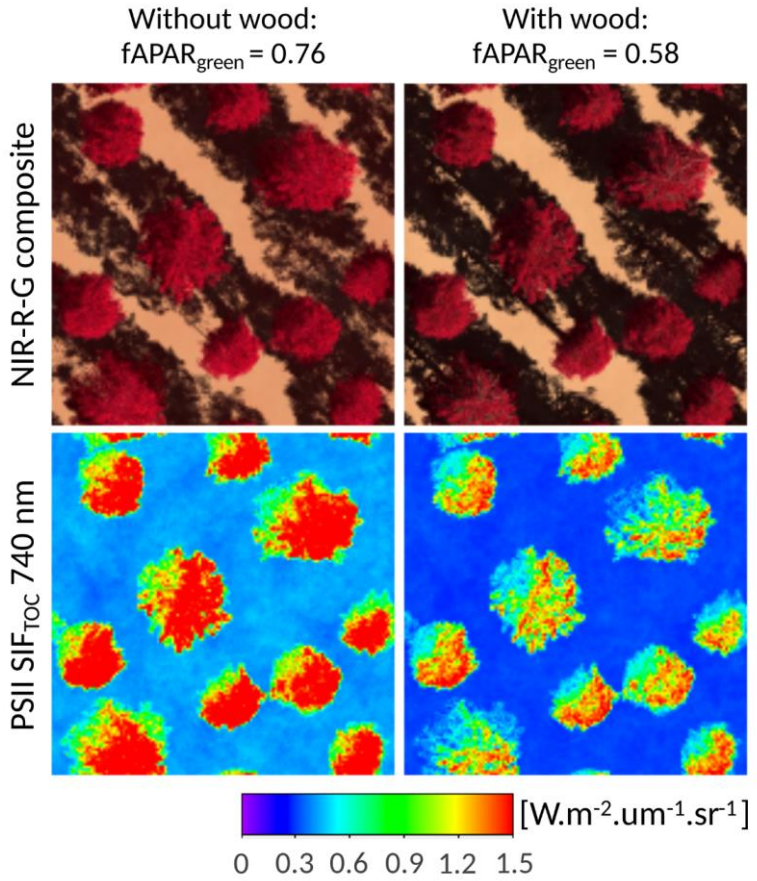
Radiative budget modelling and sensitivity analysis



Radiative budget modelling and sensitivity analysis

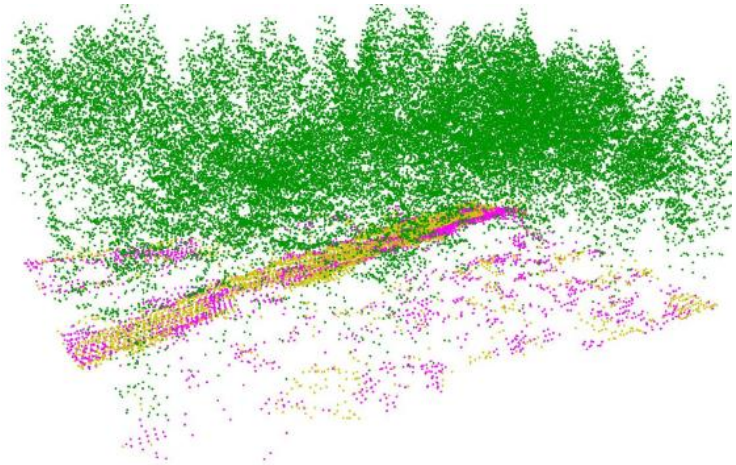
Sensitivity of sun-induced chlorophyll fluorescence signal



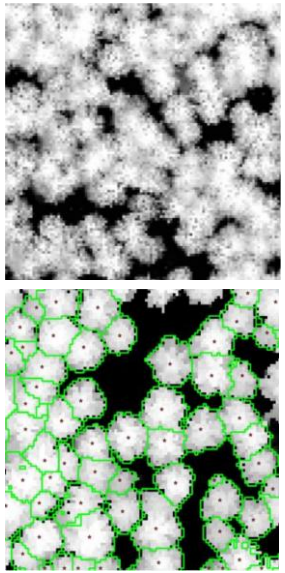


3D reconstruction of larger forest scenes

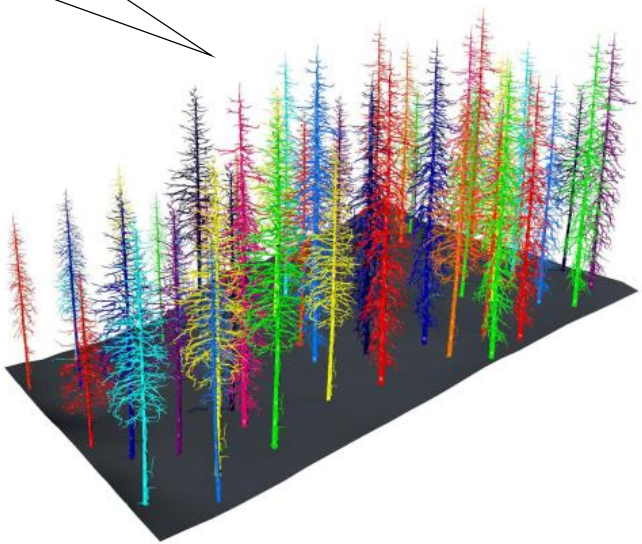
Airborne laser scanning data



Tree detection



MSc. thesis of
A. Jurík

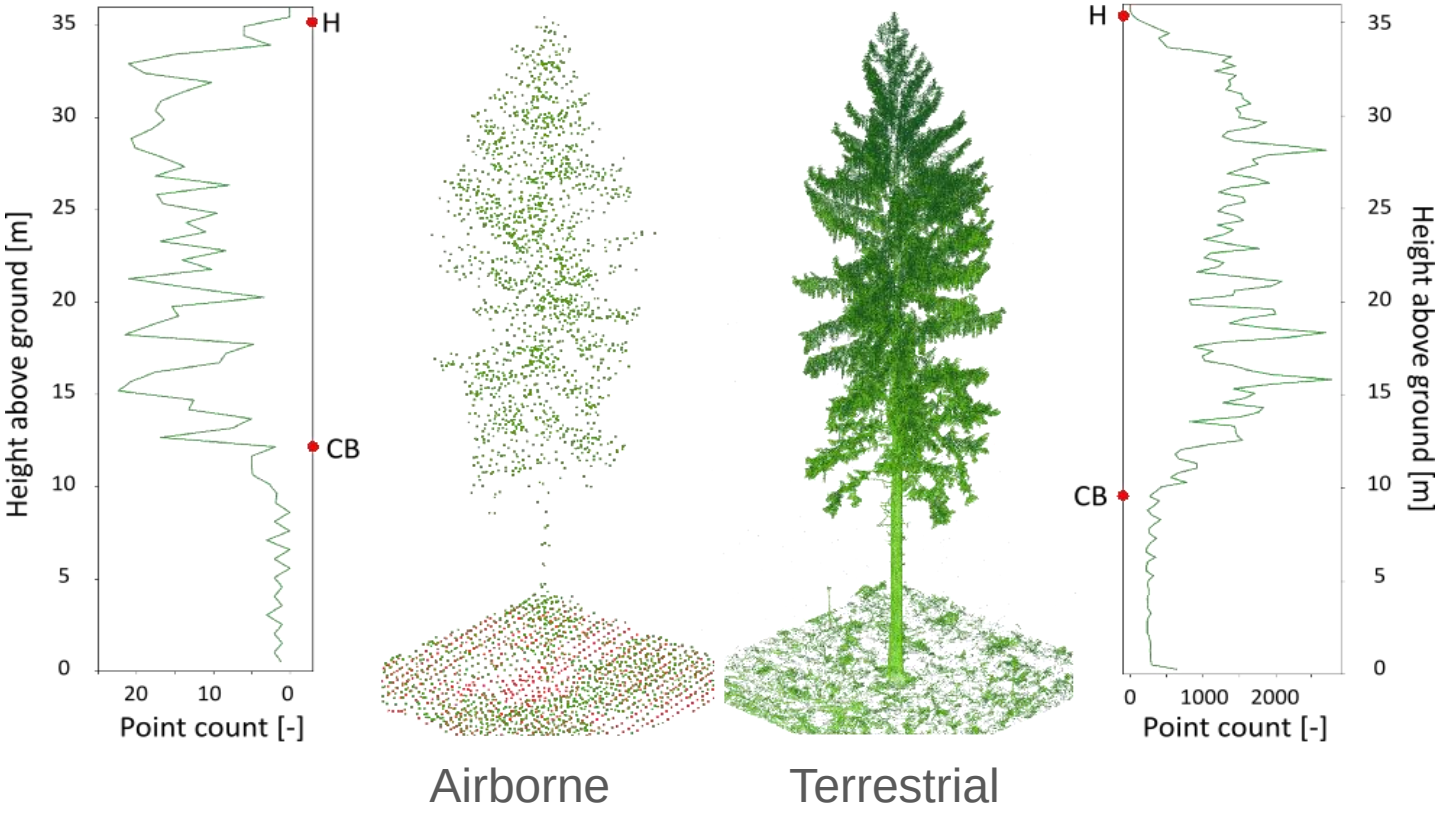


Scaling and positioning of individual tree models

Forest inventory

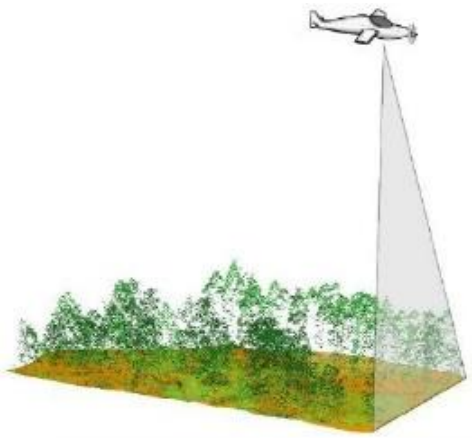
- Tree identification
- Tree species classification
- Tree parameters (height, crown diameter, DBH, biomass)
- Tree biochemical traits (leaf chlorophyll, water content)

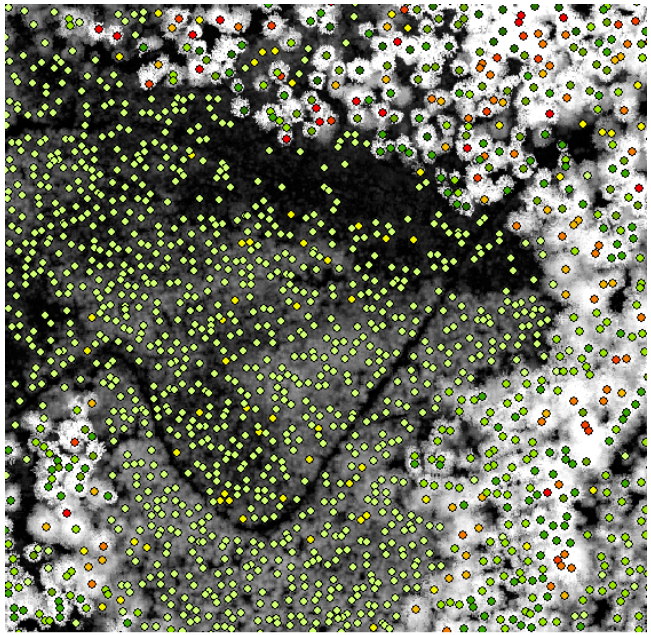
Laser scanning -> tree parameters



- Height
- DBH = f(H)
- Crown base
- Crown diameter
- Biomass = f(DBH)

Forest biomass



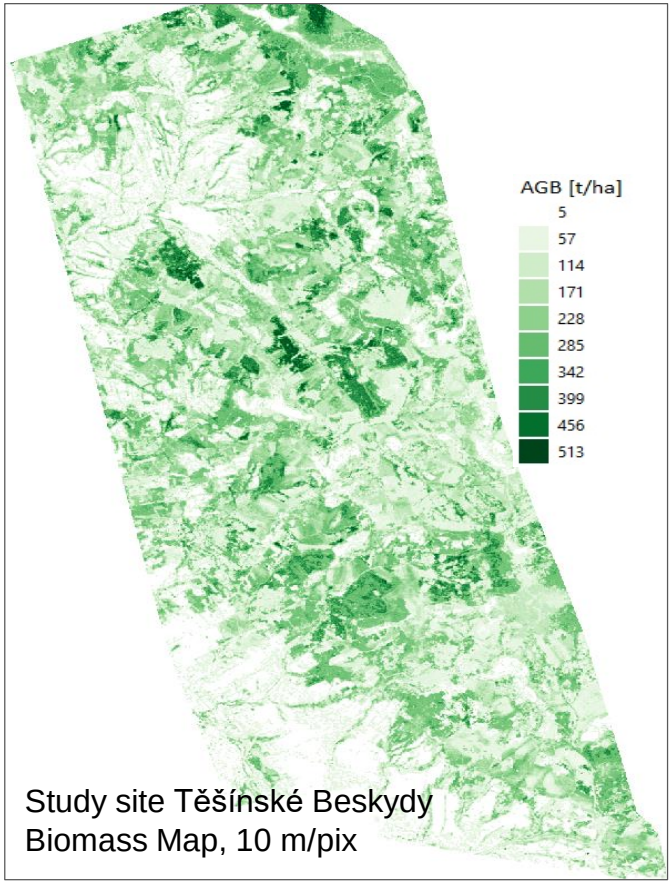


AGB_spruce, t/tree

- 0.01 - 0.3
- 0.3 - 0.8
- 0.8 - 1.4
- 1.4 - 2.3
- 2.3 - 3.7

AGB_beech, t/tree

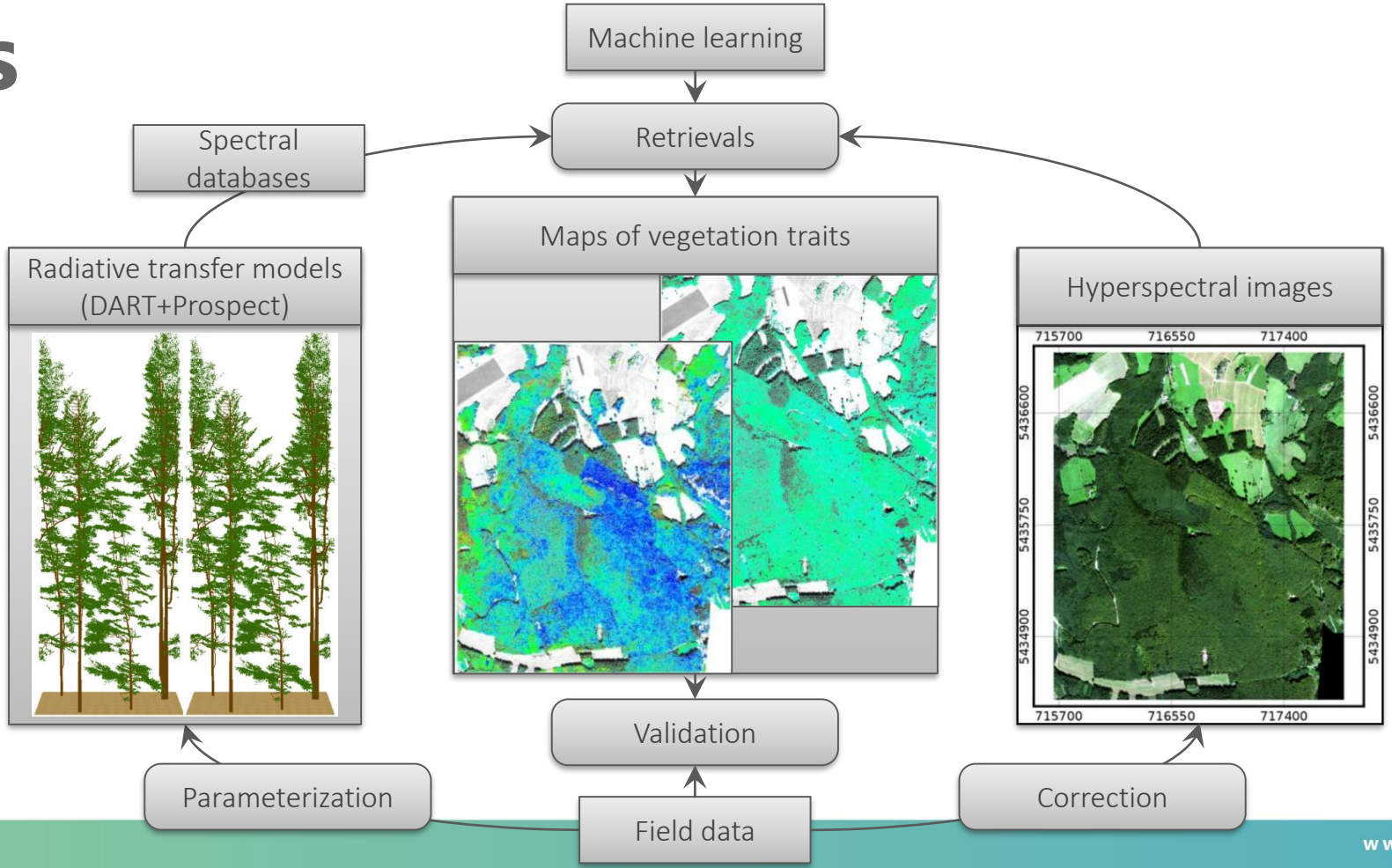
- 0.01 - 0.3
- 0.3 - 0.8
- 0.8 - 1.3
- 1.3 - 2.1
- 2.1 - 3.1



Study site Těšínské Beskydy
Biomass Map, 10 m/pix

Brovkina et al. (2016 & 2020), Novotný et al. (2021, 2022)

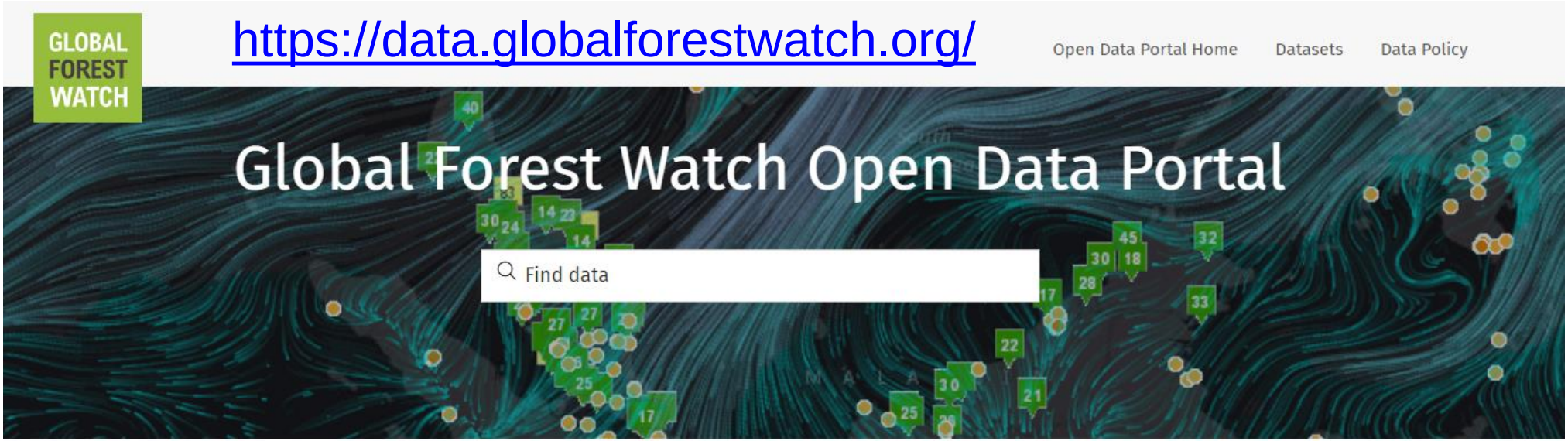
Forest biochemical traits



Forests from space (satellite data)

- Global Forest Watch
- Time series analysis, examples from ČR

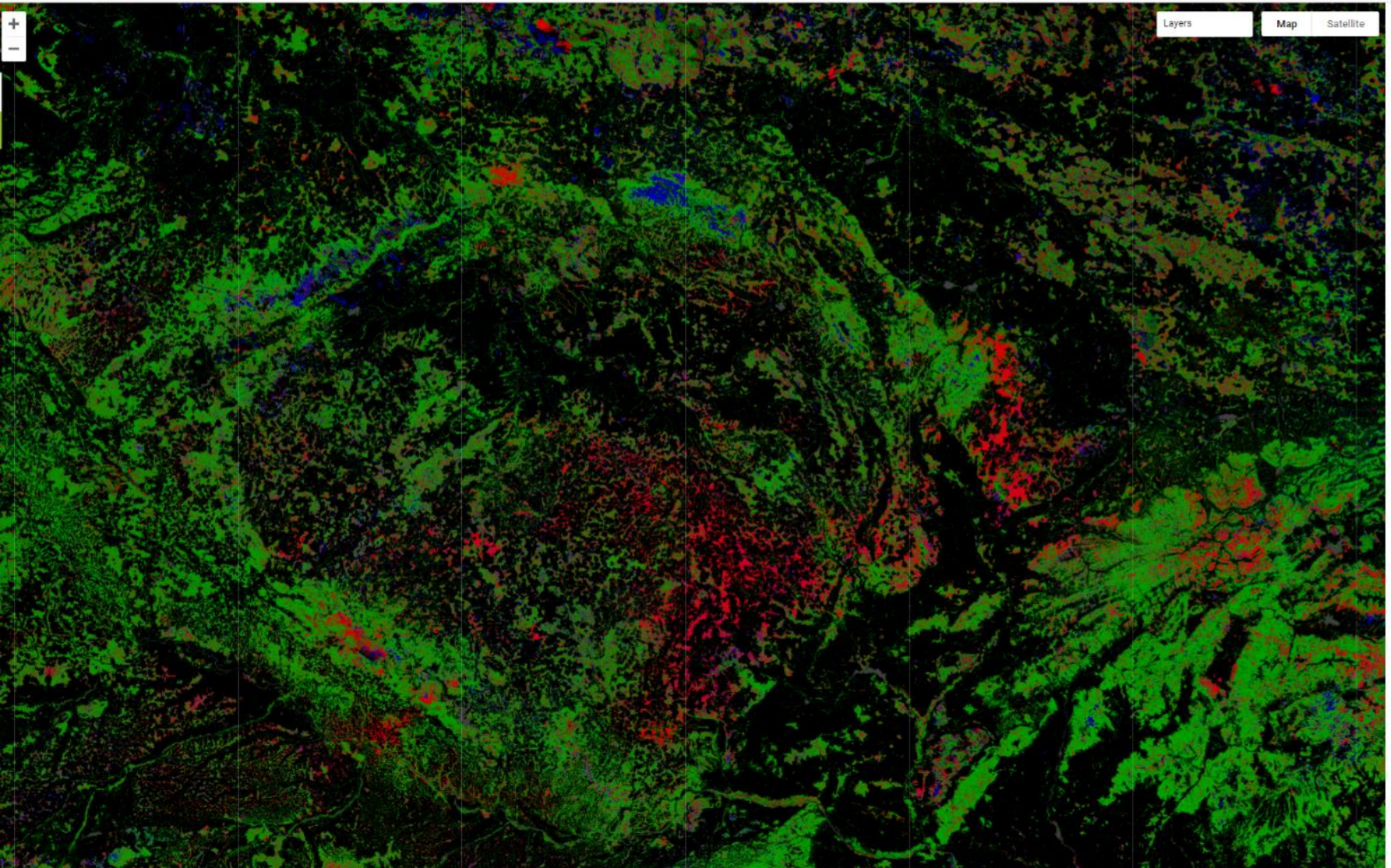
Global products of forest cover loss and gain



Landsat data processed in Google Earth Engine

16-day revisit
30 m pixel size
6 bands

GLOBAL FOREST WATCH



Global Forest Change

Published by Hansen, Potapov, Moore, Hancher et al.

University of Maryland

Department of Geographical Sciences

Results from time-series analysis of Landsat images characterizing forest extent and change.

Trees are defined as vegetation taller than 5m in height and are expressed as a percentage per output grid cell as '2000 Percent Tree Cover'. 'Forest Cover Loss' is defined as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000–2020. 'Forest Cover Gain' is defined as the inverse of loss, or a non-forest to forest change entirely within the period 2000–2012. 'Forest Loss Year' is a disaggregation of total 'Forest Loss' to annual time scales.

Reference 2000 and 2019 imagery are median observations from a set of quality assessment-passed growing season observations.

To share location copy URL.

Download the data.

☑ Data Products

Loss/Extent/Gain (Red/Green/Blue)

- Forest Loss 2000–2020
- Forest Gain 2000–2012
- Both Loss and Gain
- Forest Extent

☐ Other Data Layers

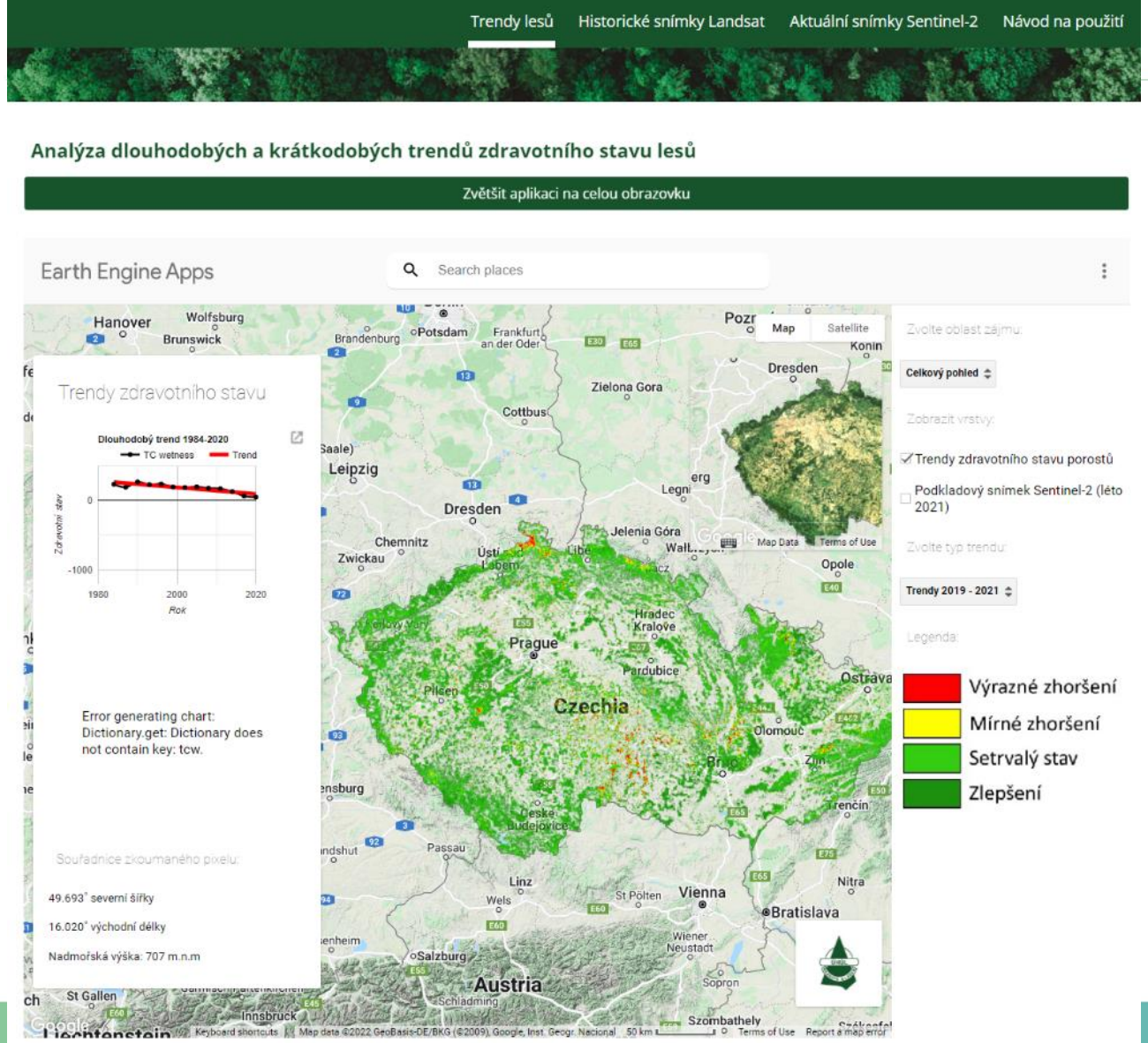
2000 Percent Tree Cover

☐ Background Imagery

Year 2000 Bands 5/3/4

Example Locations

Forestry and Tornado in Alabama

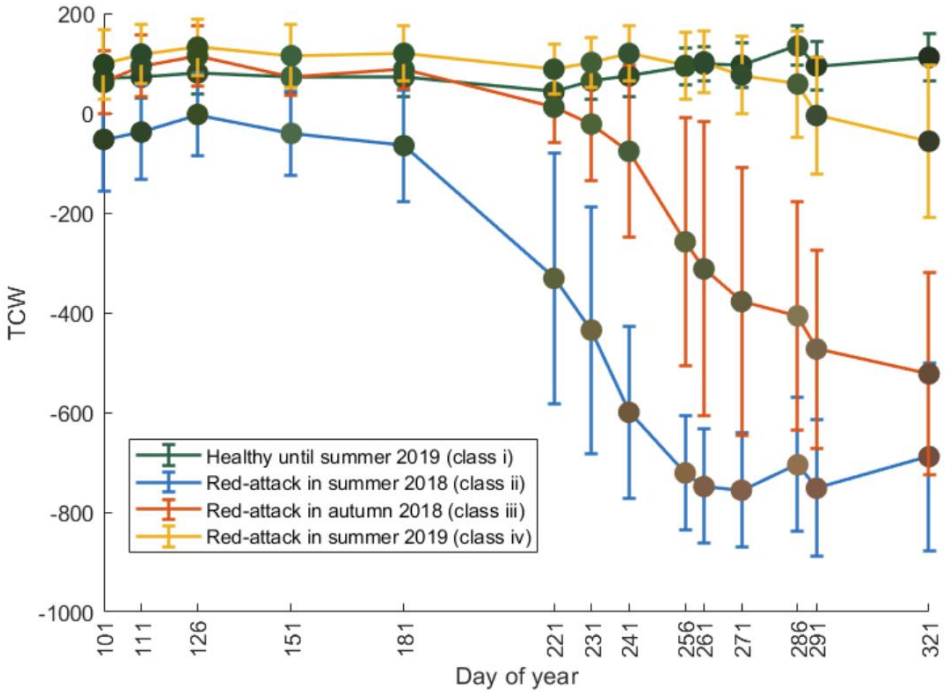


Trends from Landsat 1984 – 2020

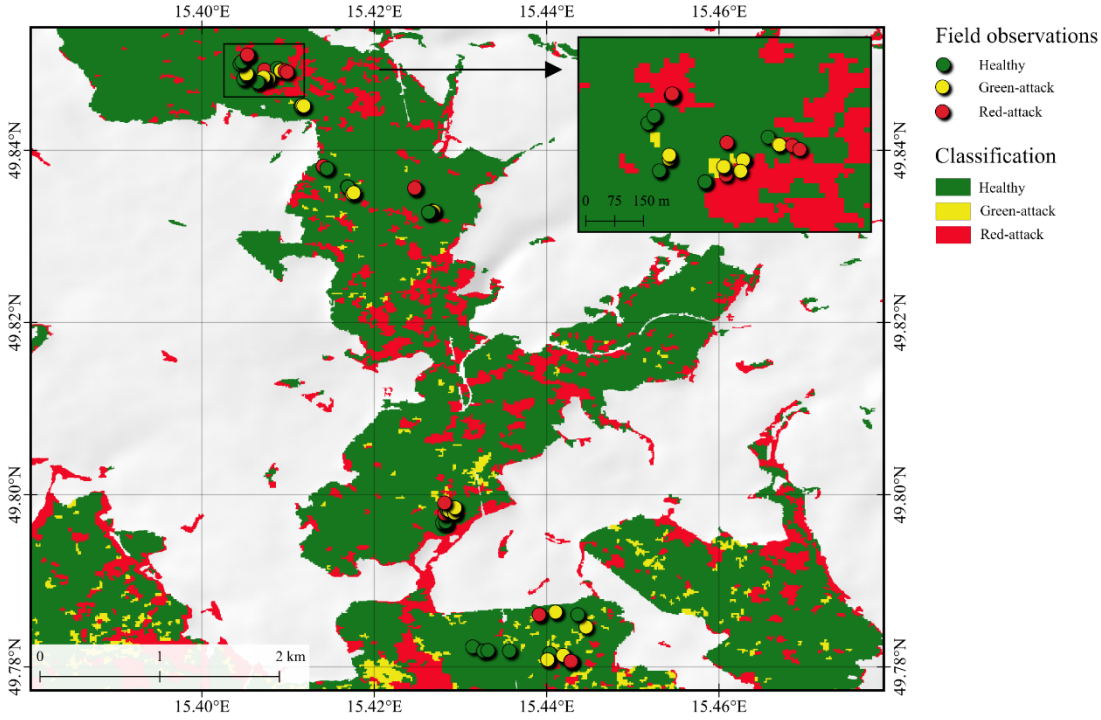
Short-term trends from Sentinel-2 2015 - 2021

Bark beetle infestation mapping

Seasonal trajectory of wetness vegetation



Map of bark beetle infestation stages in autumn 2019 derived from Sentinel-2



Bárta et al. (2021)

ENVISION

CzechGlobe MUNI ICS Institute of Computer Science

BSc. thesis of K. Gutič and V. Lazárik

SERVER NOTICE

12/11/2021 : 01:26:39

THIS IS TESTING SERVER, ISSUES AND INSTABILITY ARE PRESENT BUT SO ARE NEW FEATURES ;)

10 : 35 : 53

Good Morning

jeronimo

Odhlásit se

Contacts:

ICS MU contact person:
rebok@ics.muni.cz
Czechglobe contact person:
homolova.l@czechglobe.cz

Lucie Homolová
homolova.l@czechglobe.cz

https://czechglobe.cz/dpz
https://olc.czechglobe.cz/
Twitter @RS_CzechGlobe