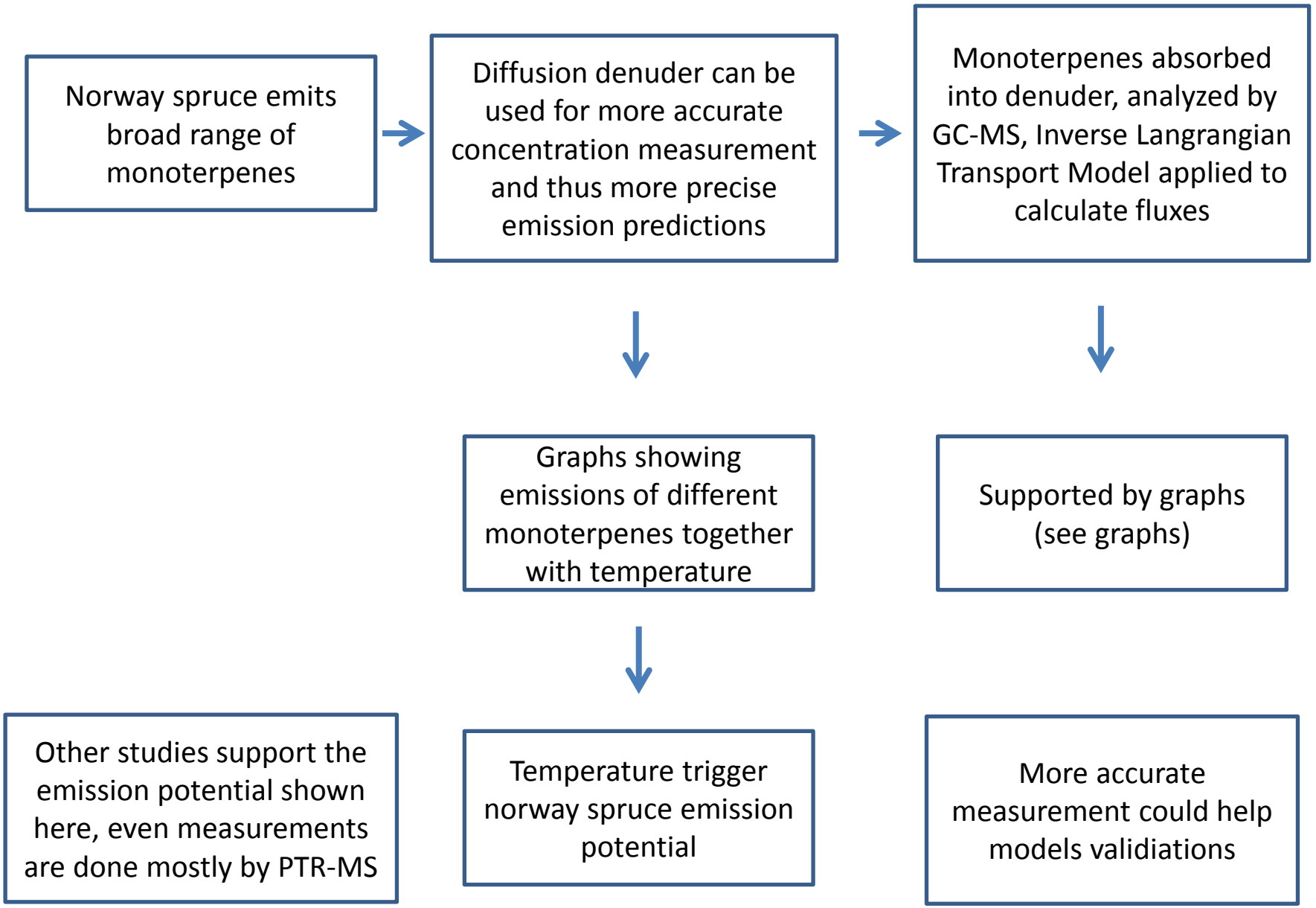
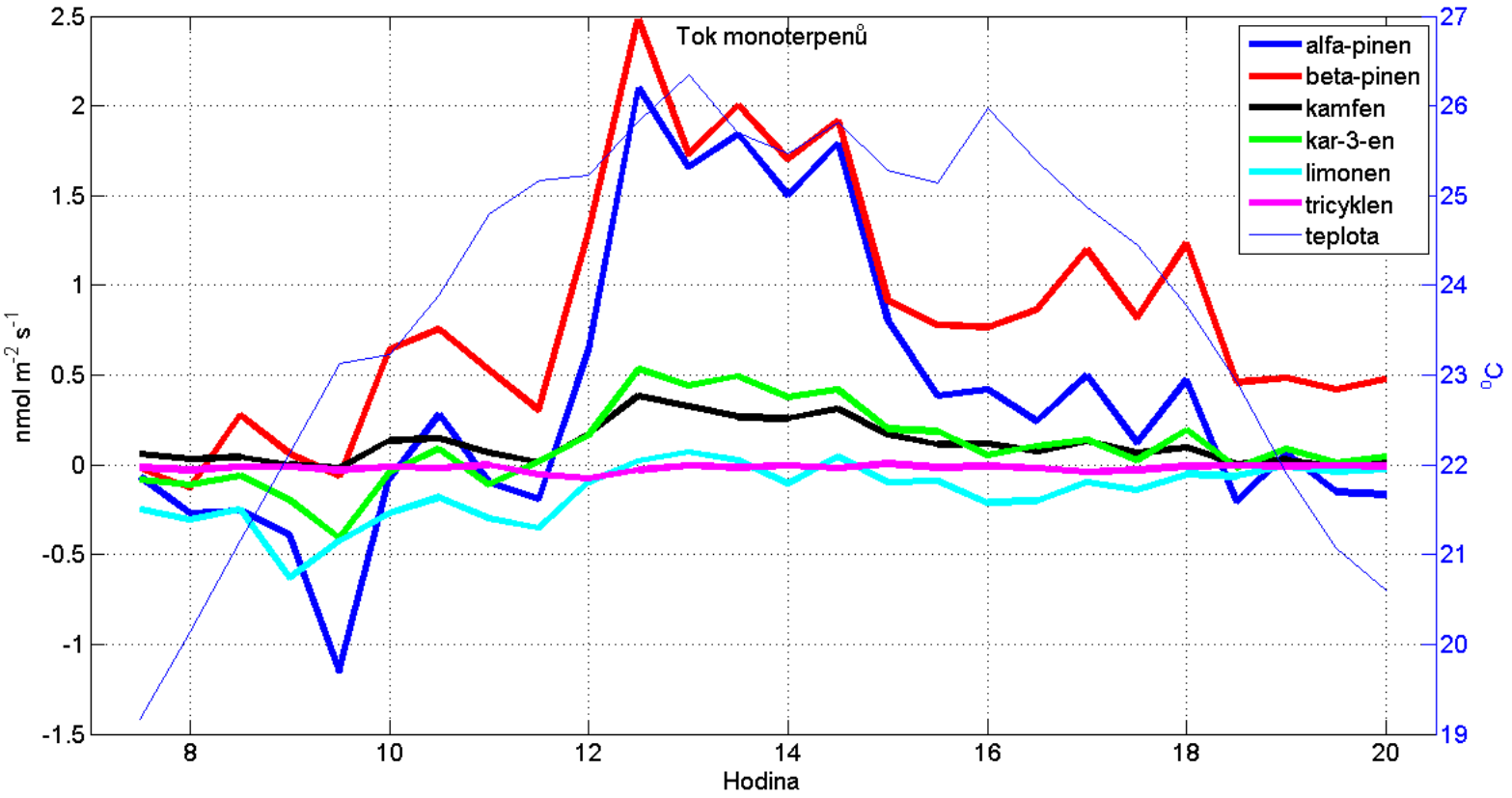
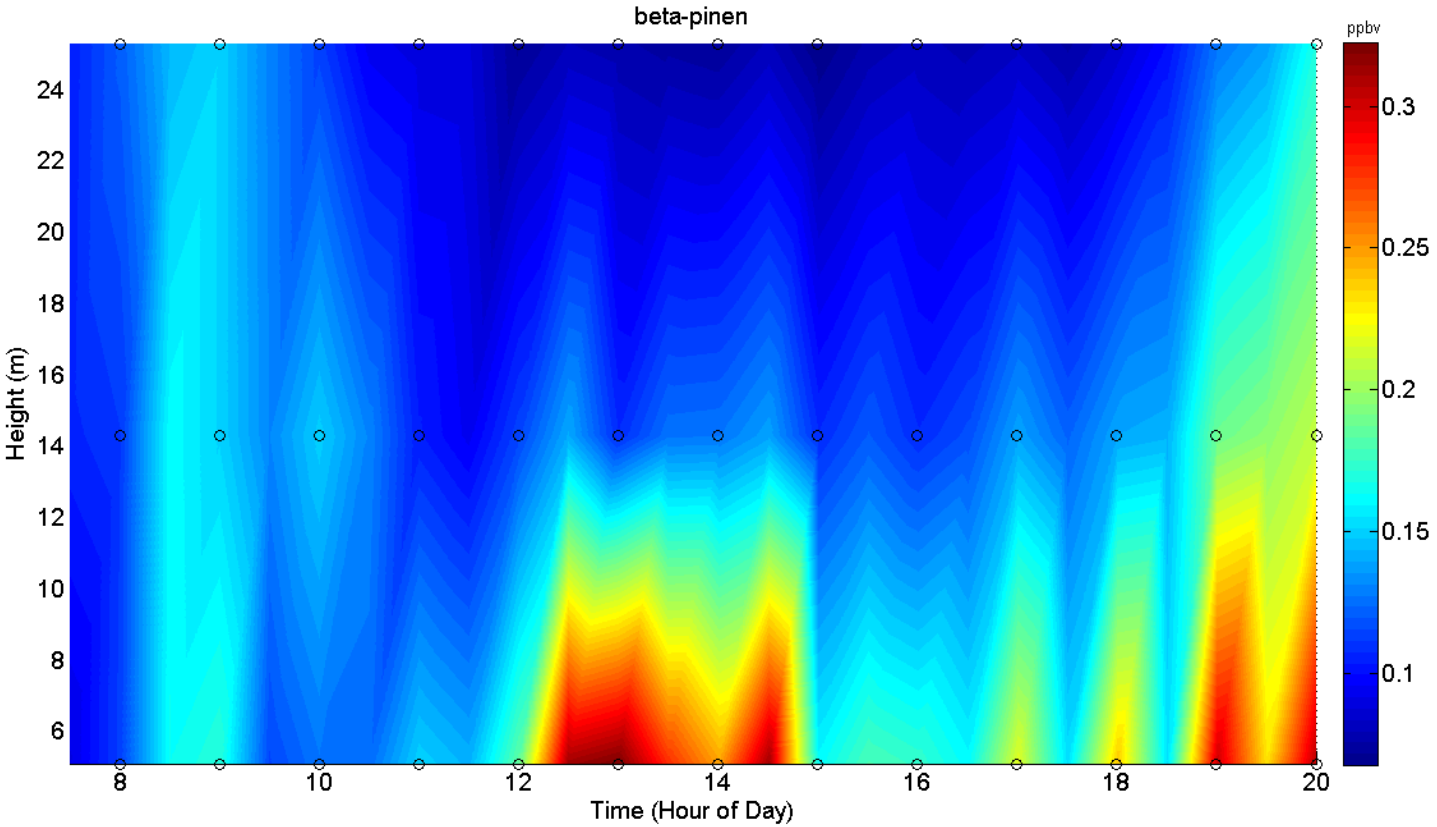
Backbone

for paper presenting monoterpene data within Norway spruce forest

Stanislav Juráň


Norway spruce emits broad range of monoterpenes
Diffusion denuder can be used for more accurate concentration measurement and thus more precise emission predictions
Monoterpenes absorbed into denuder, analyzed by GC-MS, Inverse Langrangian Transport Model applied to calculate fluxes
Graphs showing emissions of different monoterpenes together with temperature
Supported by graphs (see graphs)
Other studies support the emission potential shown here, even measurements are done mostly by PTR-MS
Temperature trigger norway spruce emission potential
More accurate measurement could help models validiations


Tok monoterpenů
alfa-pinen
beta-pinen
kamfen
kar-3-en
limonen
tricyklen
teplota
nmol m-2 s-1
°C
Hodina
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
27
26
25
24
23
22
21
20
19
8
10
12
14
16
18
20


beta-pinen
ppbv
0.3
0.25
0.2
0.15
0.1
Height (m)
24
22
20
18
16
14
12
10
8
6
8
10
12
14
16
18
20
Time (Hour of Day)

4. Our paper :

Carbon sequestration – commons for mountain regions?

(Adaptive management of Ecosystem Services)

Stanislava Brnkalakova
Institute of Management, Slovak University of Technology

“Training school of scientific publishing and writing”
2.- 4. 2. 2015 Brno

SHROT INTRODUCTION

- **<u>GLOBAL</u> CLIMATE CHANGE** – the need to **decrease** the amount of **CO_2** in the atmosphere is rising

→ the **attention** has been shifted to **<u>mountain ecosystems</u>** (forests, grasslands) **<u>(LOCAL)</u>**

What is already known?

Carbon sequestration and mountain ecosystems

- European mountains – 35% of surface
- Carbon stocks:

Figure 1: World carbon stocks in soil organic matter (Schlessinger, 1999 adopted by Marek, 2014)

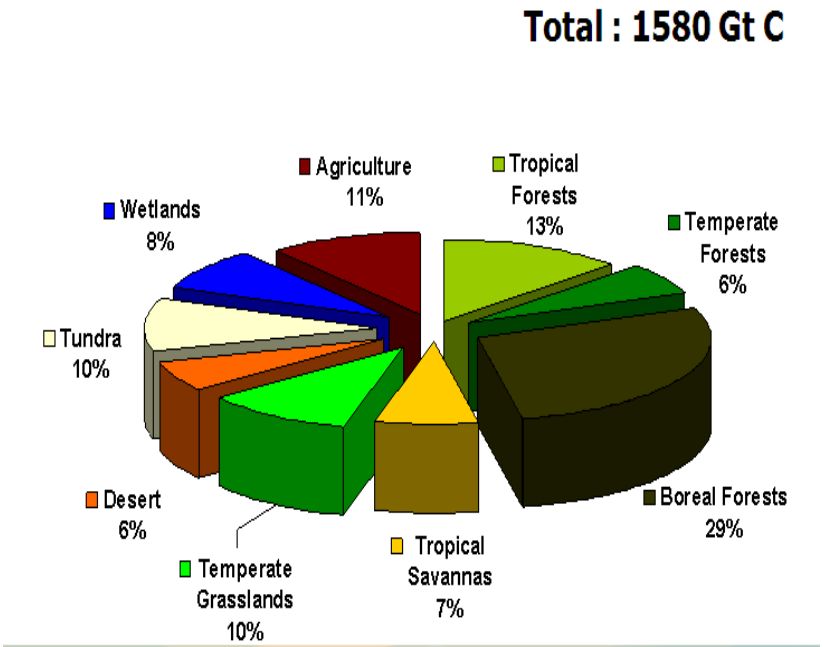
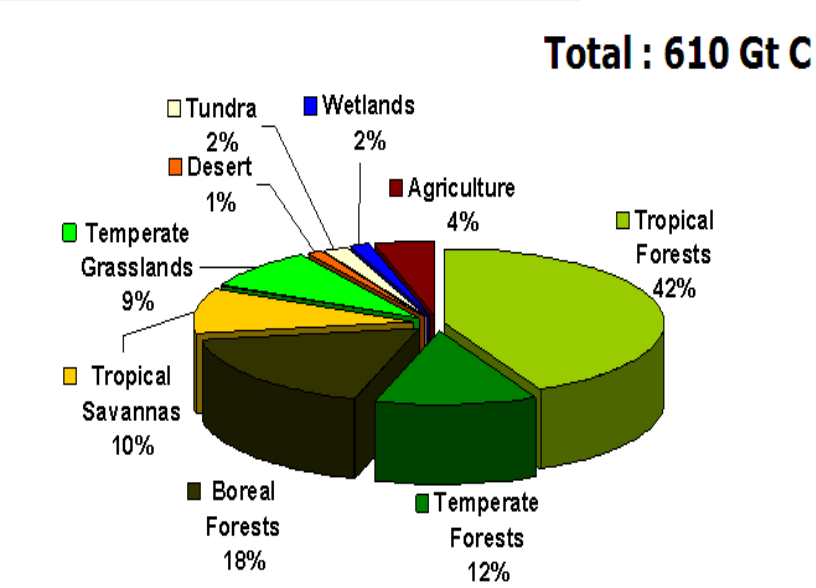


Figure 2: World carbon stocks in terrestrial vegetation (Schlessinger, 1999 adopted by Marek, 2014)



What is already known?

- As the result of unsustainable use, land use change, ineffective sectoral policies (e.g.biodiversity conservation, forestry, agriculture) - degradation of mountains

  e.g. biodiversity conservation focuses on specific species or habitats but not at complex ecosystems and their inter-relationships

- new integrative approaches to govern mountains are required

What is already known?

- as the response to disappointing outcomes of sectoral policies – ***Ecosystem Services Concept (ES Concept)*** has been developed

- ES Concept **provides the potential** to build bridges across the gap between consumers (users) and ecosystems at all scale, from global to local, and to understand the importance of ecosystem functions and processes (complex evaluation)

What is not known?

Scientific knowledge challenges

1.Ecosystem service concept has been developed as a response to disappointing outcomes of biodiversity policies, but little if any attention is paid to ecosystem governance.

2. Numerous examples provide evidence on ineffective implementation of biodiversity policies using regulatory and market approaches (e.g.agri-enviro schemes).

3. For a long time mitigation and adaptation of climate change (CO_2 reduction) has been the centre of research and policy agenda on an international level, but the capacity of mountain regions to provide climate regulation ecosystem service (carbon sequestration) has not been seriously determined so far.

4. Self governance with robust common pool resource regime is seen as a perspective ecosystem service governance mode to address social dilemmas in which short-term interests of individuals are in conflict with long-term interests of the society.

5. The potential of ecosystem service governance to scale down global CO_2 objectives to foster resource management to sustainability is not yet thoroughly examined.

4. Our paper :
Carbon sequestration – commons for mountain regions?

RESEARCH QUESTIONS

Main RQ: How can ecosystem services governance enhance behavioural change to sustainability (the case of European mountain regions)?

The main objective is to contribute to long-term quality of mountain ecosystems as contributor to the human well-being

SRQ1:*What is the role of carbon sequestration in mitigation of CO_2 in the atmosphere?* *(theoretical review)*

SRQ2: *What is the potential of CPR regime in carbon forestry?* *(theoretical review)*

SRQ3: *How can carbon forestry CPR regime enhance behavioural change to sustainability?* *(novel approach in sustainable mountain development)*

4. Our paper :
Carbon sequestration – commons for mountain regions?

METHODS and EXPERIMENTS

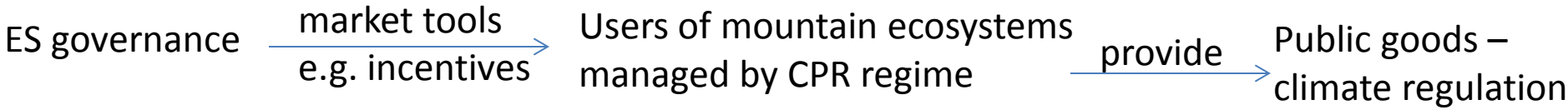
- Desk research
- Case study method Jánska dolina (state forest), Hybe (common forest) – qualitative and quantitave changed of forests and pastures in time
- Behavioural Experiments (are capable of testing a replicated decision making situation and the effect of institutional innovations on behaviour under a controlled situation)

CENTRAL GRAPHS – the results of behavioural experiments and maps of qualitative and quantitative changes in forests and pastures

4. Our paper :
Carbon sequestration – commons for mountain regions?

- **TAKE HOME MESSAGE**

  - collective action (cooperation at all scales) is important in the long-term interests of society (providing climate regulation)



Thank you!

Different harvesting intensity and soil CO_2 efflux in sessile oak coppice forests

Eva DAŘENOVÁ

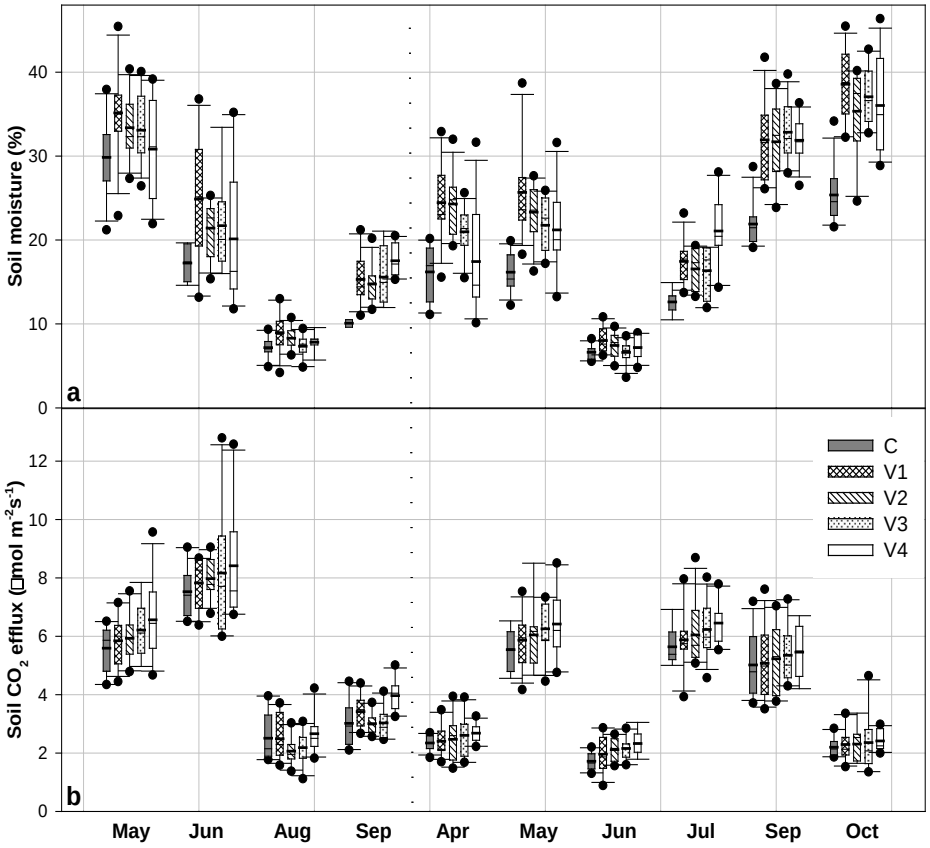
We measured soil CO2 efflux and soil parameters (temperature, moisture) in unmanaged forest and harvested plots with different intensity of harvesting during the 5th and 6th year after harvest.

We expected

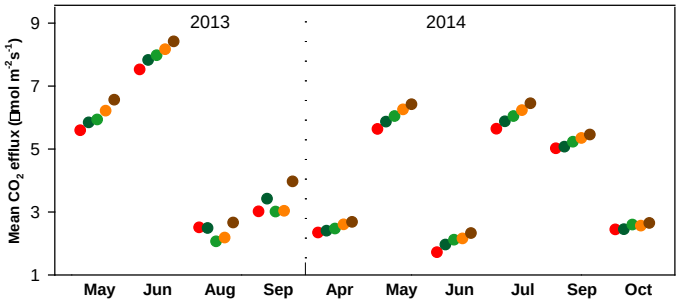
difference in CO2 efflux and soil parameters between unmanaged forest and harvested plots

effect of different harvesting intensity

We found significantly **lower soil moisture** in unmanaged forest than in the harvested plot
Soil CO2 efflux did not significantly differed between individual variants but it had an **increasing trend** from unmanaged forest through plot with the lowest harvesting intensity to the plot with the highest harvesting intensity (clear-cut). Moreover, the **slope** of this increase declined from 2013 to 2014 (5th and 6th year after harvest)



Coppicing **increased soil moisture**
Soil **CO_2 efflux increased** with harvesting intensity
The decline of the slope we can assume that in about ten years after harvesting, the soil carbon dynamics of the coppiced stand would reach the balance stage of the non-harvested stand.



Regulatory mechanisms of photosynthesis and iWUE in wheat genotypes with different ploidy levels during the drought stress

Petra Dreveňáková

3. 2. 2015

Restricted g_s impairs photosynthetic rate during the conditions of water stress.

g_m is nowadays also considered to be important limitation of photosynthesis in many species and correlates to photosynthesis capacity.

It is a lack of experiments and studies about natural variation in g_m/g_s ratio and its influence on higher maintenance of iWUE during the drought conditions.

In wheat species are evolutionary causes of forming mesophyll conductance changes for CO2 and resistance characteristics against drought for photosynthetic necessities.

Central graph comparing iWUE to ratio of mesophyll and stomatal conductance for CO2.

It was found out different mechanisms of photosynthetic maintenance and iWUE regulation during the drought stress in different wheat species, where prevailing gm was more advantageous for plants.

Description of plant experiment design, gas exchange measurements, plant water status and statistic methods.

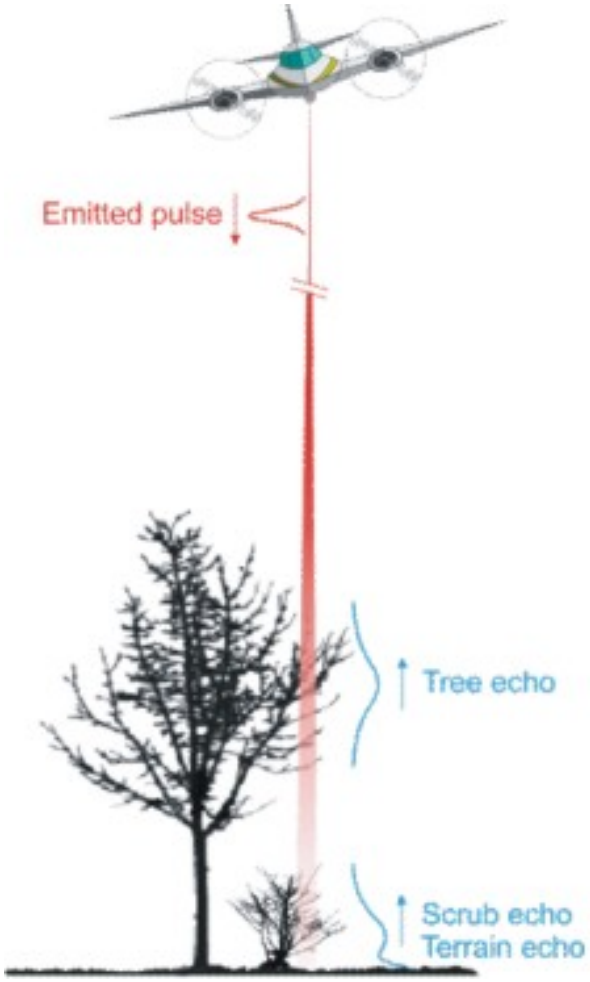
Supporting graphs: Relation between CO2 drawing off from ambient atmosphere to intercelular air spaces and stomatal conductance

Relation between CO2 drawing off from intercellular air spaces to chloroplasts and mesophyll conductance

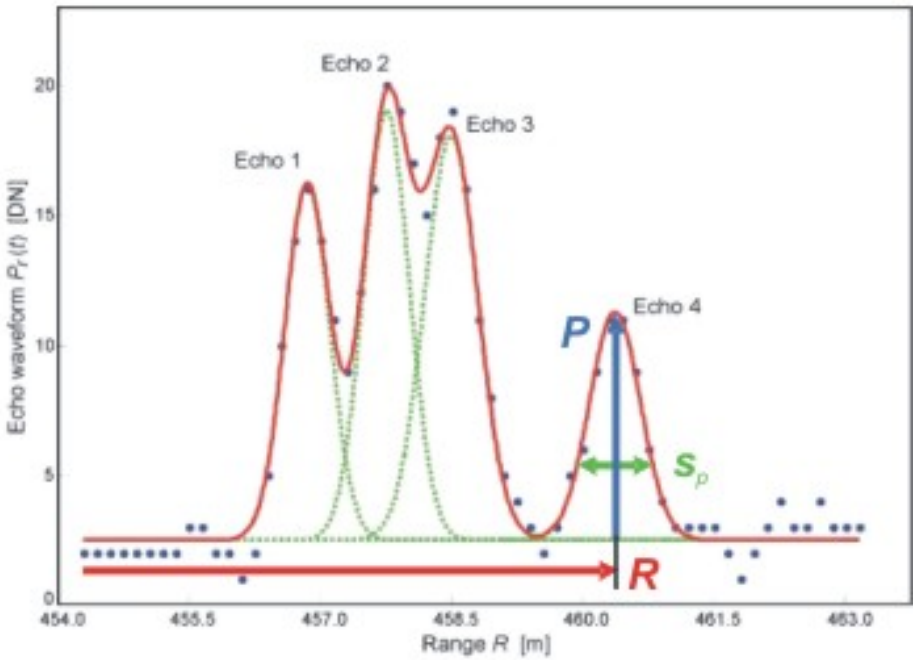
Identifications of evolutionary changes of photosynthetic apparatus and characterization of susceptible and tolerant traits, which can be used for breeding proces.

Fullwaveform LiDAR – promissing tool for assessement of grassland biomass

Miroslav Pikl



Echo waveform

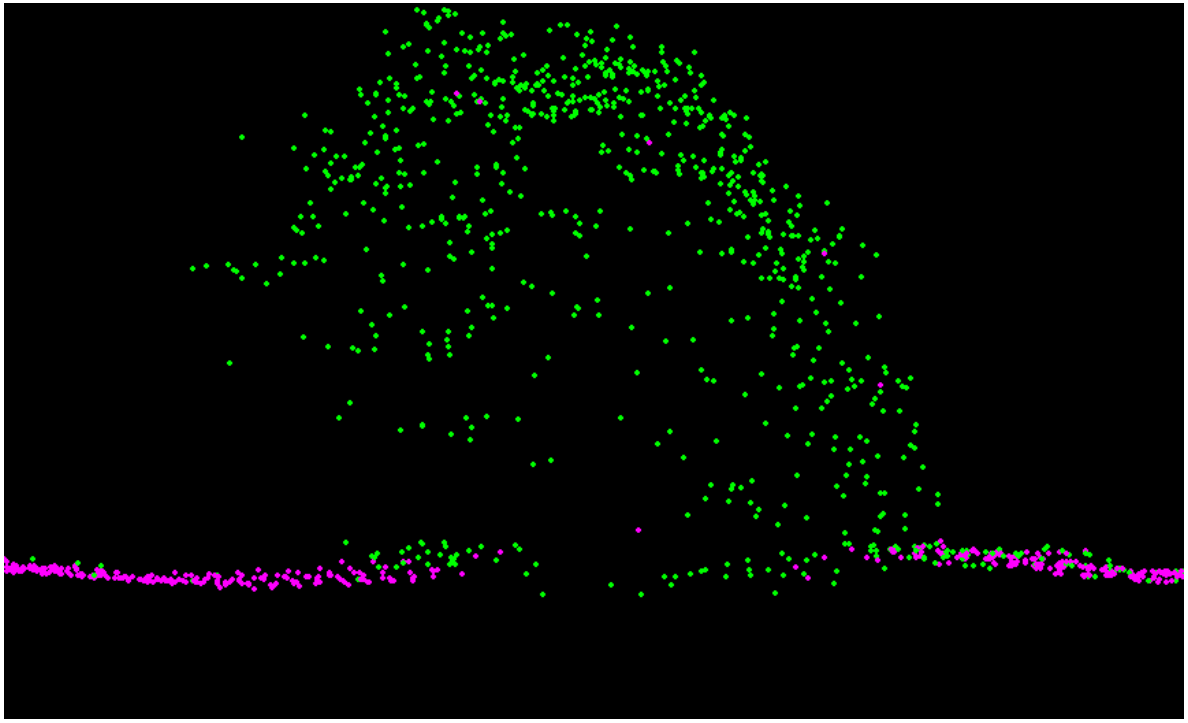


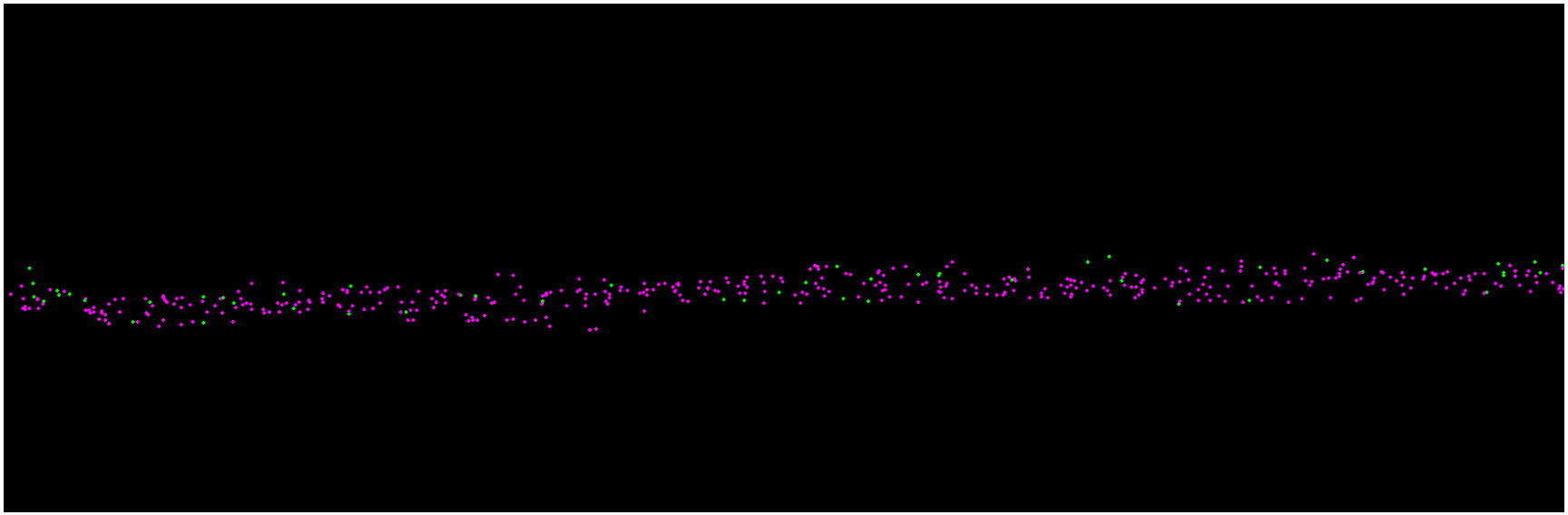
Information per echo:

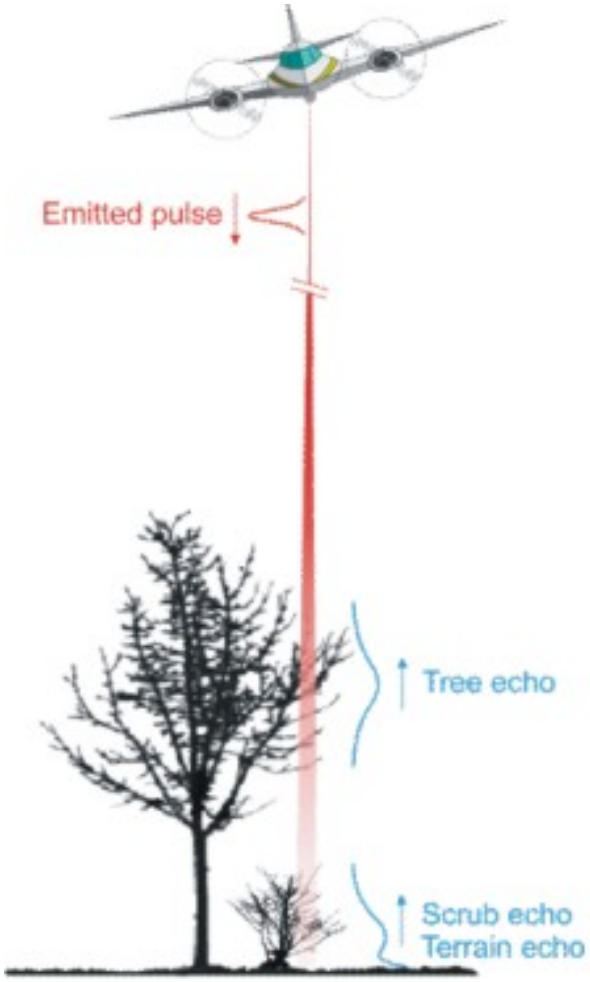
Amplitude (Intensity): P [DN]
Range: R [m]
Echo width: sp [ns]

Data sources

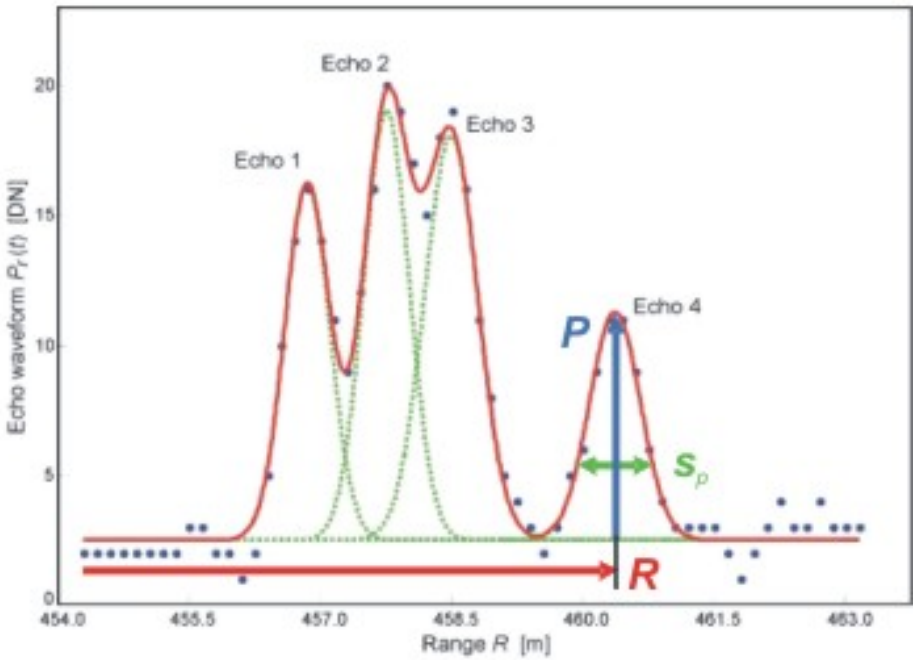
- LiDAR data (x,y,z, EW)
- Ground measurements of biomass height (m)
- Biomass samples (g m^{-2})





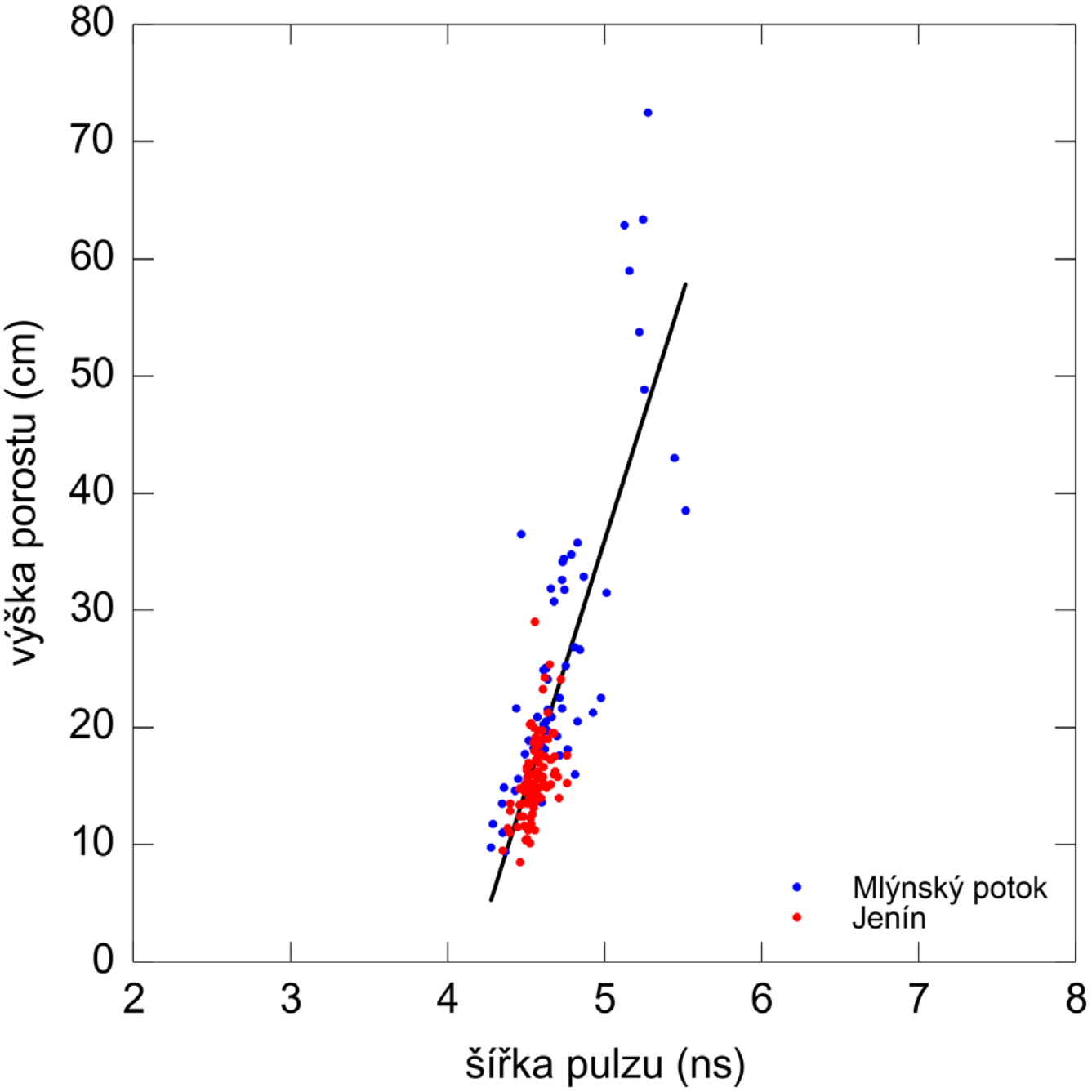


Echo waveform

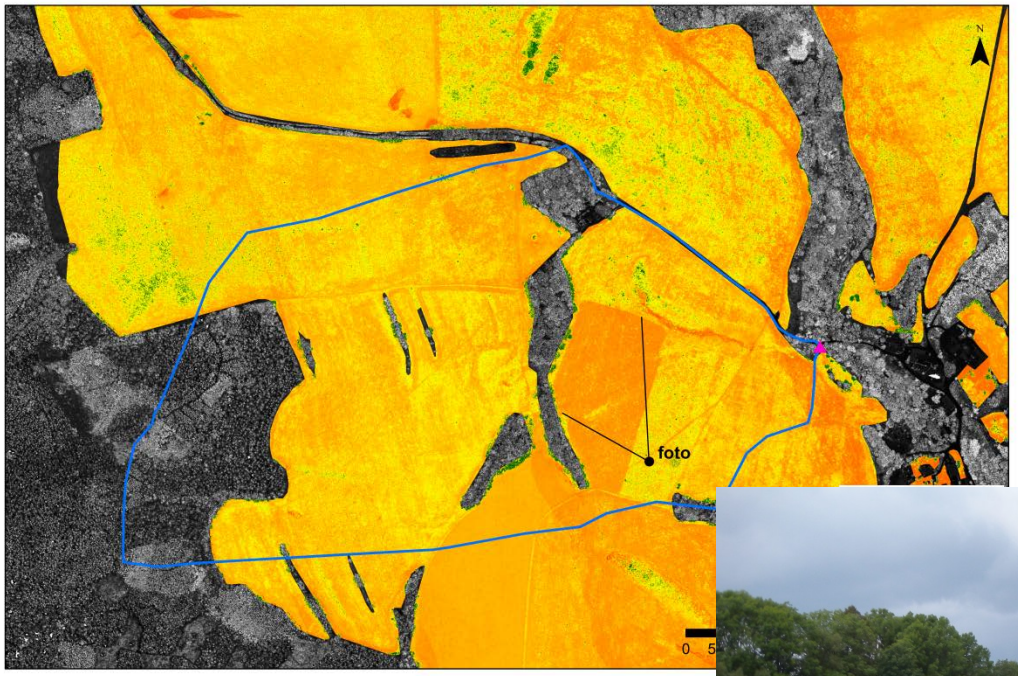


Information per echo:

Amplitude (Intensity): P [DN]
Range: R [m]
Echo width: sp [ns]


80
70
60
50
40
30
20
10
0
2
3
4
5
6
7
8
výška porostu (cm)
šířka pulzu (ns)
Mlýnský potok
Jenín

Množství biomasy mikropovodí Jenín J2, 2014



Footprint study of forest Rajec Jestrebi

Kateřina HAVRÁNKOVÁ

Main question

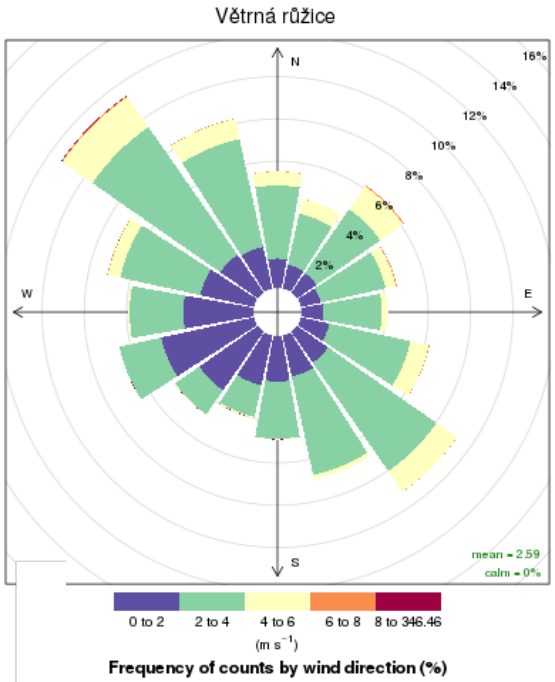
Is this site of Mendelu University good for EC measurements?

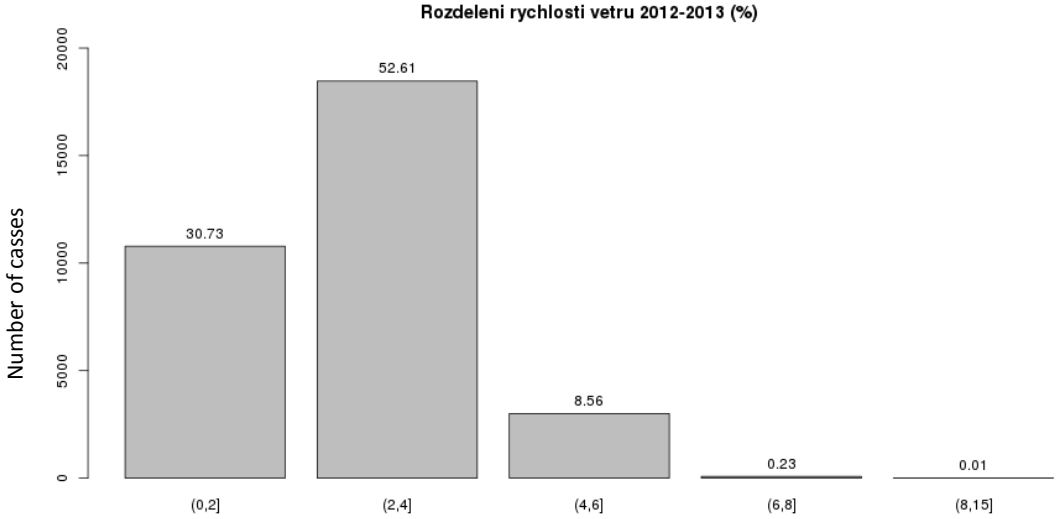
To evaluate if this is a good site

Approaches

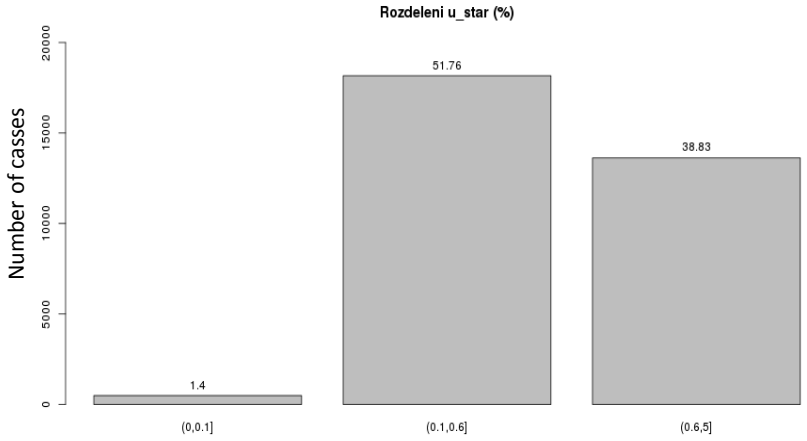
Wind analysis

Footprint analysis

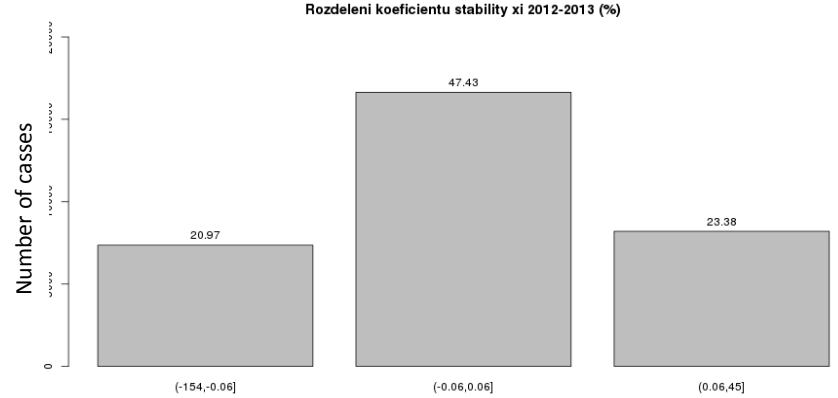




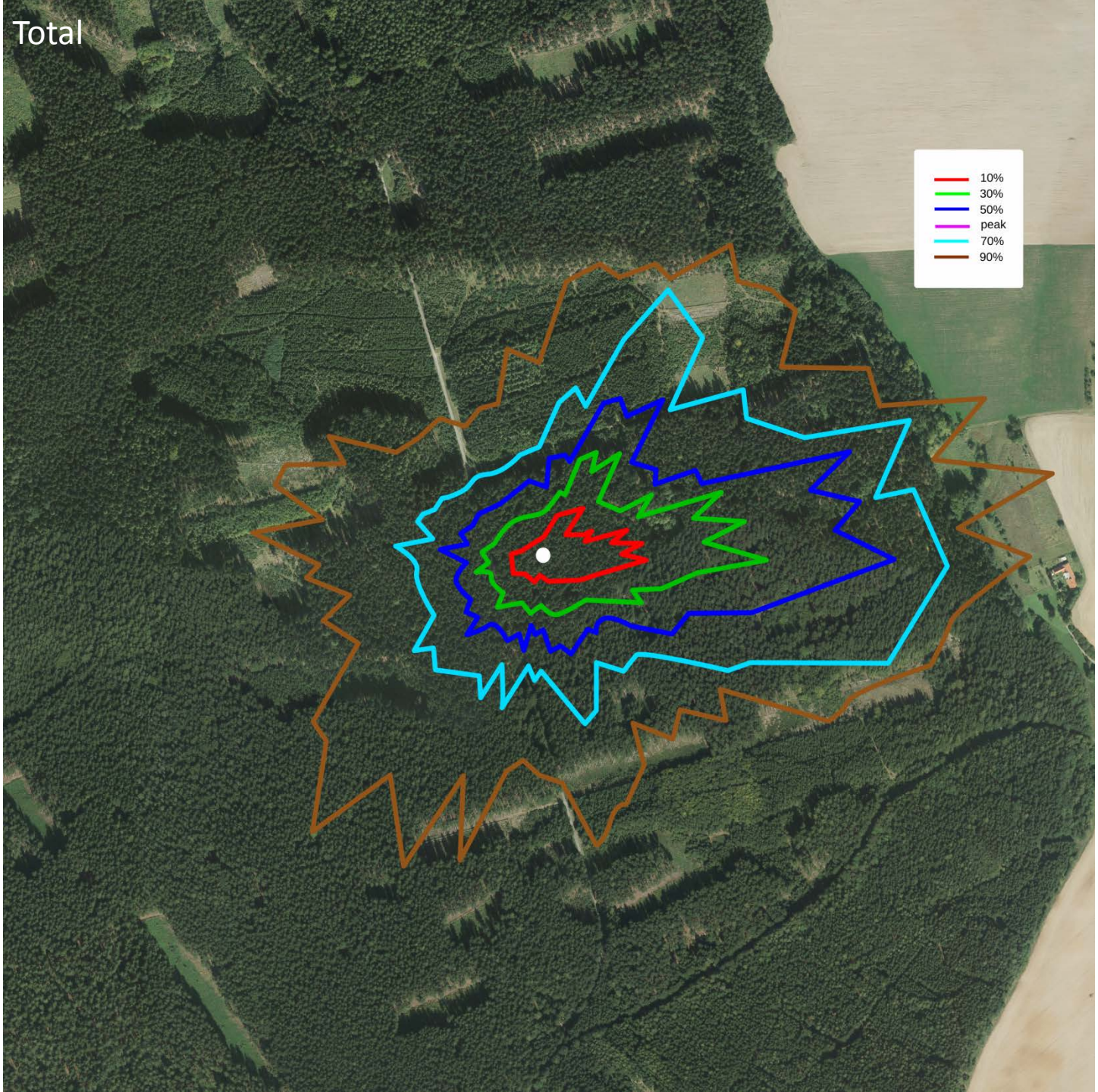
Wind speed distribution

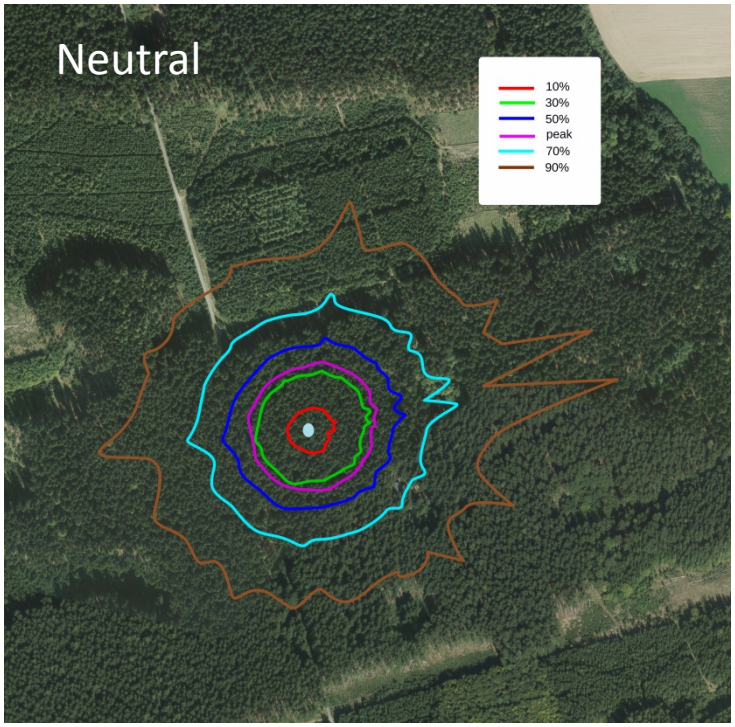


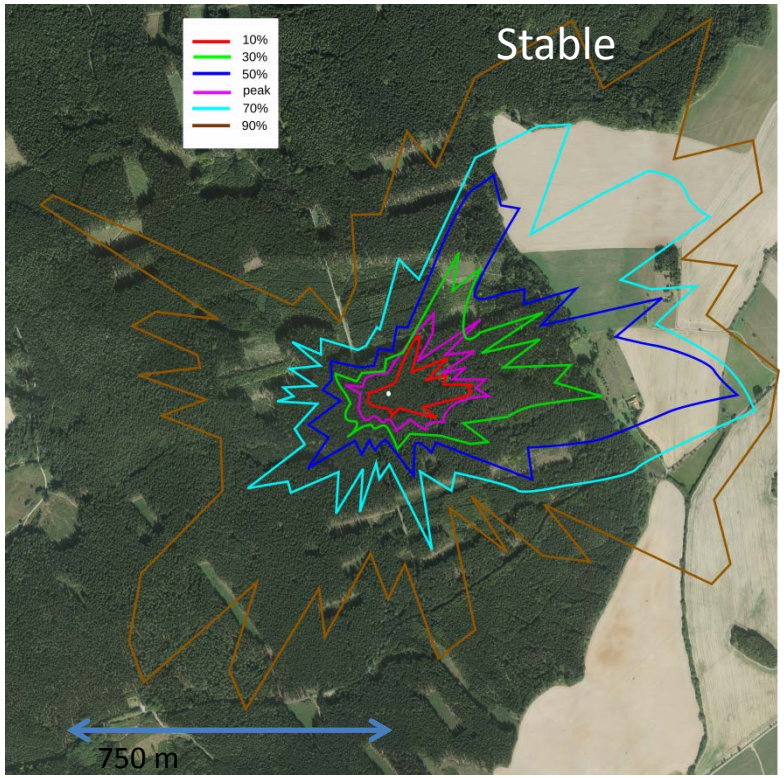
Friction velocity distribution

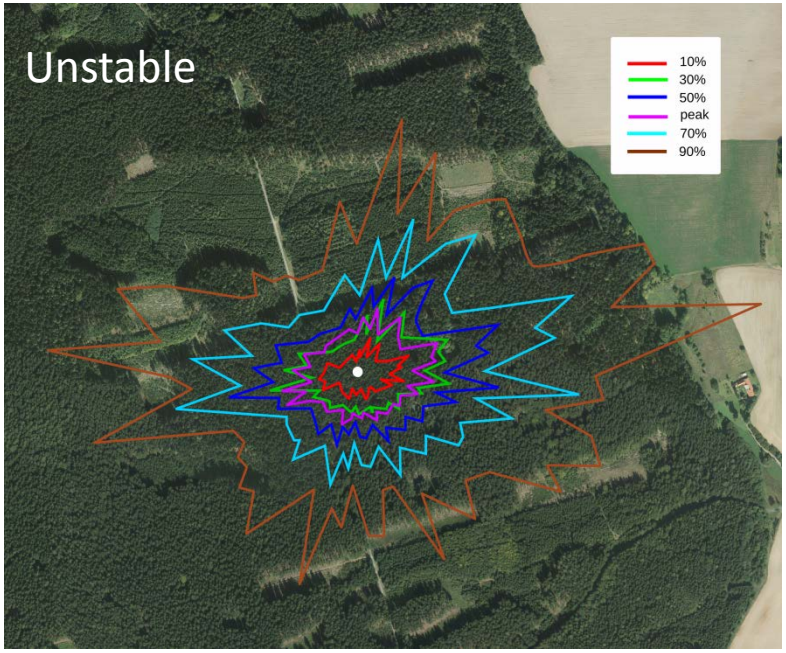


Parameter of stability distribution


Total
10%
30%
50%
peak
70%
90%


Neutral
10%
30%
50%
peak
70%
90%


Stable
10%
30%
50%
peak
70%
90%
750 m


Unstable
10%
30%
50%
peak
70%
90%

Journal of Forest Research (Japan)

- Subject area: Environmental sciences
- Field: Site evaluation and classification

What are emissions of biogenic volatile organic compounds from leaves of three tree species?

- Question 1: What BVOC are emitted from different tree species (*Picea abies* (L.) Karsten, *Quercus petraea* (Matt.) Liebl., hybrid poplar *Populus nigra* L. × *Populus maximowiczii* A. Henry)?
- Question 2: Does BVOC emission correlate with the CO_2 assimilation rate?

Petra Holišová 3. 2. 2015

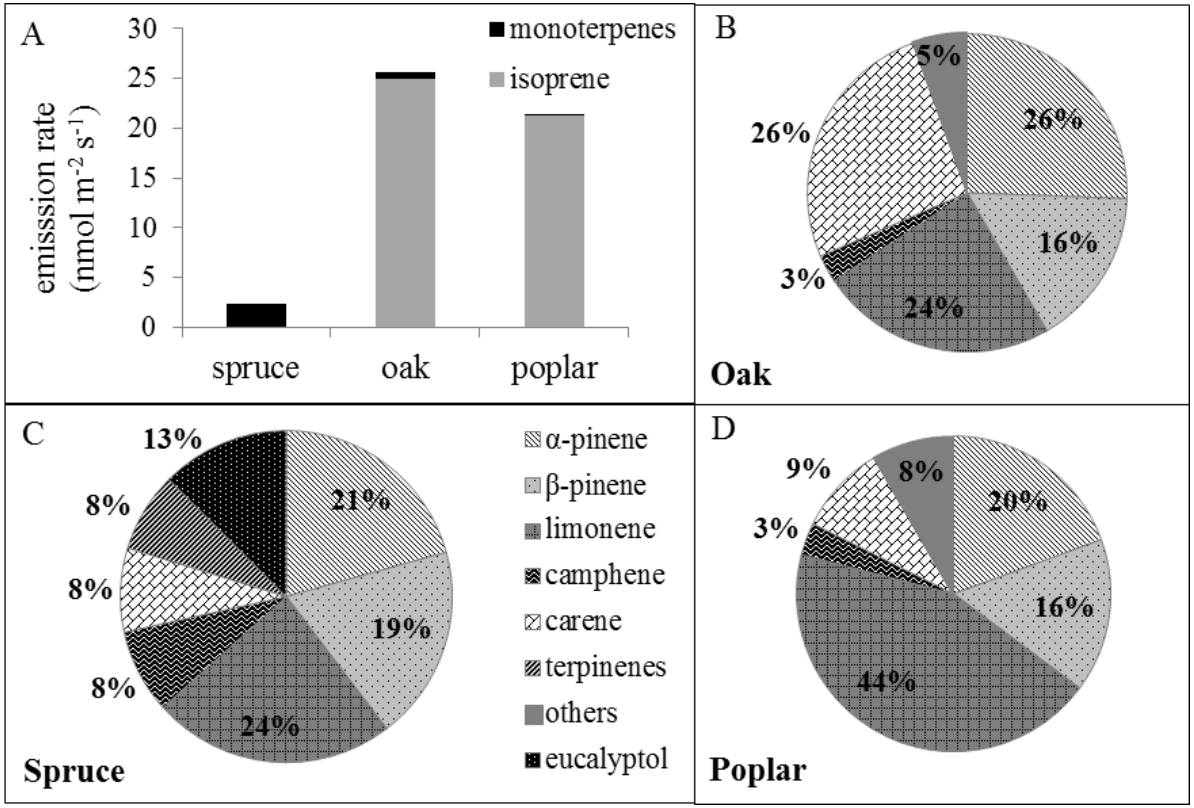


Fig. 1: Mean values of BVOC emission rate from leaves of Norway spruce, sessile oak and hybrid poplar (*Populus nigra* × *Populus maximowiczii*, A) and composition of emitted monoterpenes (B – D).

- The BVOC emissions rate per leaf area were 2.32 ± 0.21 for spruce, 25.67 ± 7.52 for oak and 21.41 ± 6.40 for poplar.
- Isoprene composed 97% and 99% of the BVOC emissions from oak and poplar, respectively.
- Spruce emitted particularly monoterpenes.
- The main monoterpenes were limonene, α-pinene and β-pinene in all species studied.

The thermostability of photosystem II photochemistry is related to the maintenance of the thylakoid membranes organization

Karlický, V.[1,2,*], Kurasová, I.[1,2], Špunda, V.[1,2]

[1] *Global Change Research Centre, Belidla 4a, 603 00 Brno, CZ*

[2]Department of Physics, Faculty of Science, Ostrava University, 30. dubna 22, 701 03 Ostrava, CZ

RATIONALE

- an elevated temperature can cause direct negative effects on photosynthetic assimilation
- photosystem II (PSII) is considered as the most heat sensitive
- spruce revealed higher thermostability of PSII photochemistry in comparison with of control plants such as Arabidopsis or barley (Špunda et al., in preparation)
- missing information about thermal stability of macro-organization of pigment-protein complexes (PPCs) in spruce thylakoid membranes

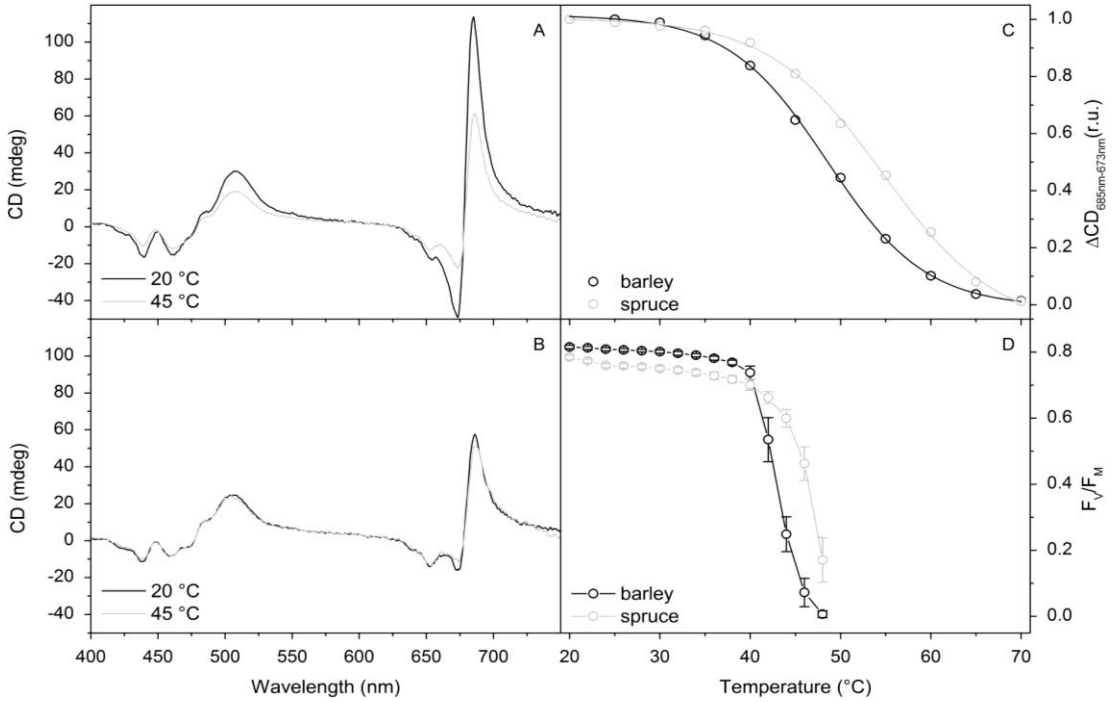
HYPOTHESIS

- High PPCs organization in thylakoid membranes organization is necessary to PSII photochemistry

MATERIAL AND METHODS

- spruce × Arabipopsis, barley; high × low light; young × mature
- PAM fluorimetry - Fv/Fm
- circular dichroism spectroscopy

CENTRAL GRAPH



- thermal stability of PPCs macro-organization in spruce thylakoid membranes is higher (about 5 ° C) in comparison to Arabidopsis or barley

TAKE HOME MESSAGE

- the thermostability of PSII photochemistry is related to the maintenance of the thylakoid membranes organization

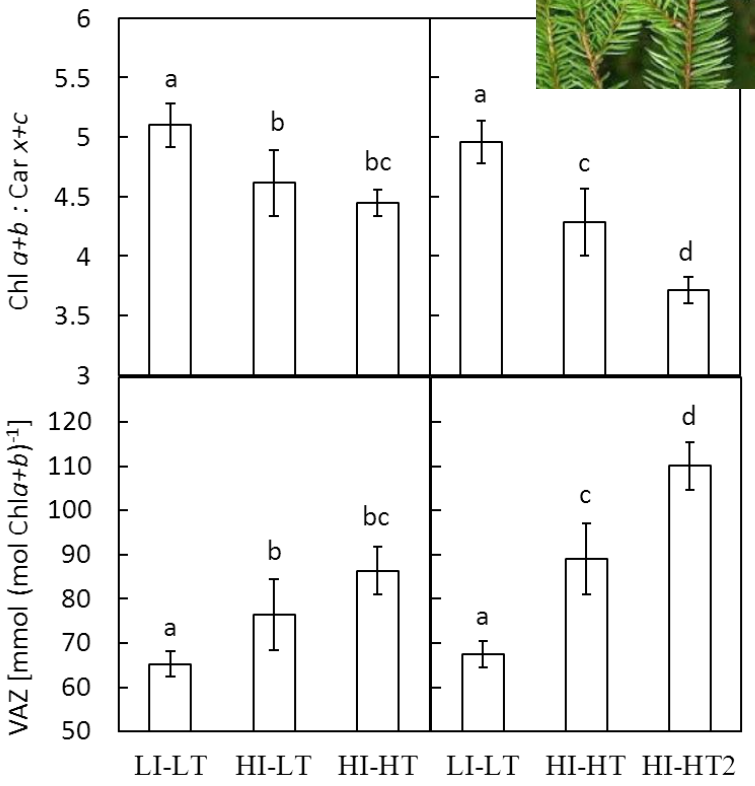
Reflectance continuum removal spectral index tracking the xanthophyll cycle photoprotective reactions in Norway spruce needles

Functional Plant Biology Volume: 39 Issue: 12 Pages: 987-998 (2012)
DOI: 10.1071/FP12107

Measurements conducted on spruce plants acclimated to various irradiance – temperature regimes inside of growth chambers

- To investigate responses to stress in reflectance of spruce needles

Different Chl *a+b* / Car *x+c* found in needles acclimated to different regimes (t-test, P<0.05, n=5).



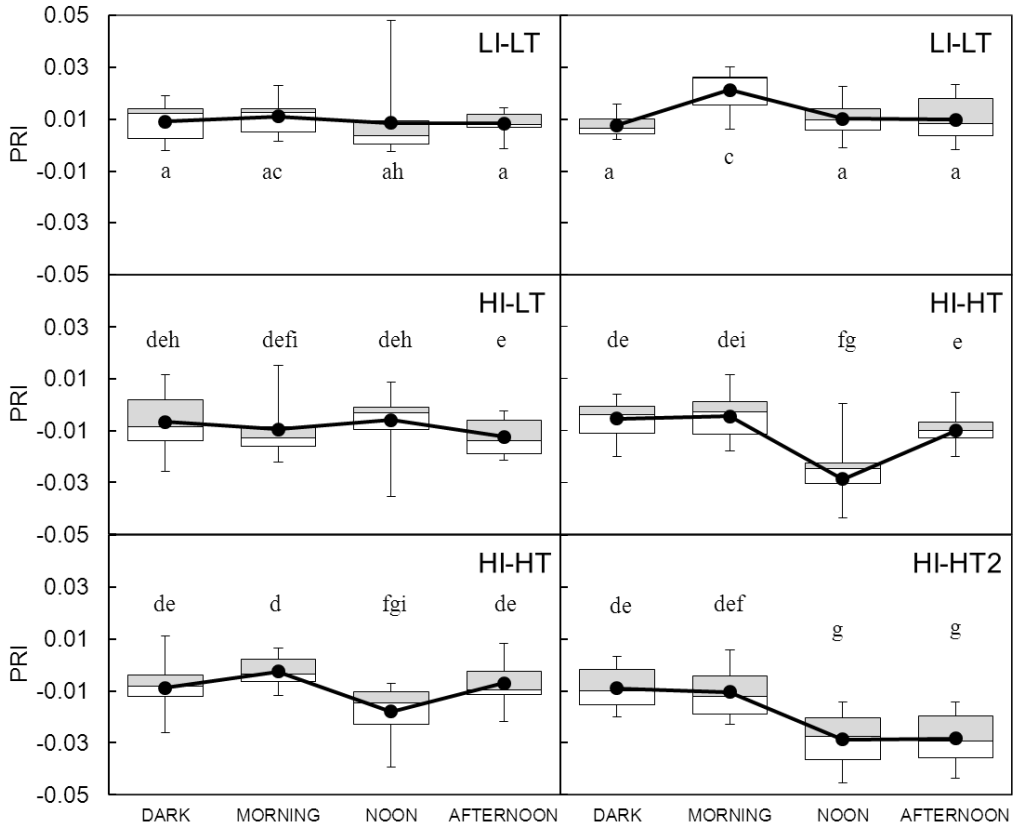
LI ~ max 300 µmol m^{-2} s^{-1}; HI ~ 1000

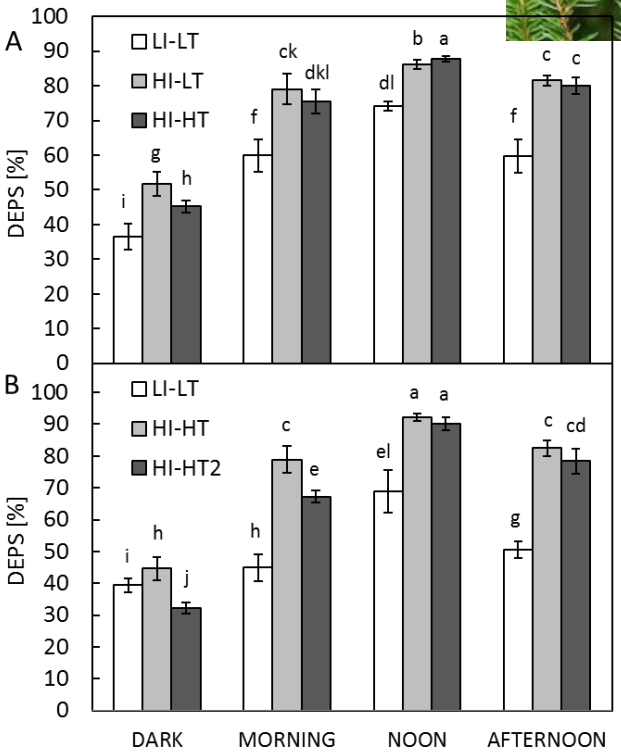
LT ~ max 25°C; HT ~ 35°C; HT2 ~ 40°C

Functional Plant Biology (2012)

… and responsiveness of PRI to DEPS has been found poor.

(Mann-Whitney U-test, P<0.05, n=7-10)





Functional Plant Biology (2012)

Seeking parameter able to follow DEPS changes and remaining insensitive to Chl *a+b* / Car *x+c* ratio.

- Data processing scripts (R software, freeware)

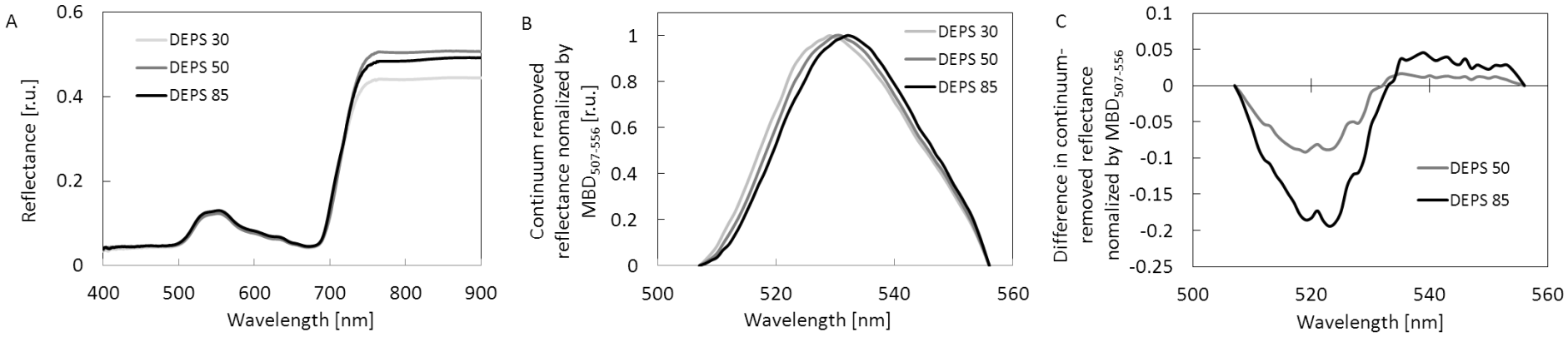
```
U <- read.table("C:/RRR/spec.txt", header=FALSE, sep="\t", na.strings="NA", dec=",", strip.white=TRUE)

o <- 50; dimm <- nrow(U); k <- dimm-o+1; d <- o-1
retv <- matrix(nrow=dimm-1,ncol=NCOL(U))
for (ii in (1:NCOL(U))) {
                y <- (U[o:dimm,ii]-U[1:k,ii])/d
                m<-matrix(nrow=dimm-1, ncol=o)
                for (j in 1:dimm-1) {
                                m[j,] <- U[j,ii] + (0:d)*(y[j]) - U[j:(o+j-1),ii]
                }
                mm <- abs(m)
                sum <- apply(mm,1,sum)
                max <- apply(mm,1,max)
                retv[,ii] <- sum/max
}
INDEXY <- retv
write.table(INDEXY, file = "INDEXY49.txt", row.names=FALSE, col.names=FALSE, dec=',', sep='\t')
```

Computing parameter ANMB in multiple intervals, rows and columns in spectral data matrix

Functional Plant Biology (2012)

Seeking parameter that wold be able to follow DEPS changes and remain insensitive to Chl *a+b* / Car *x+c* ratio in due process.

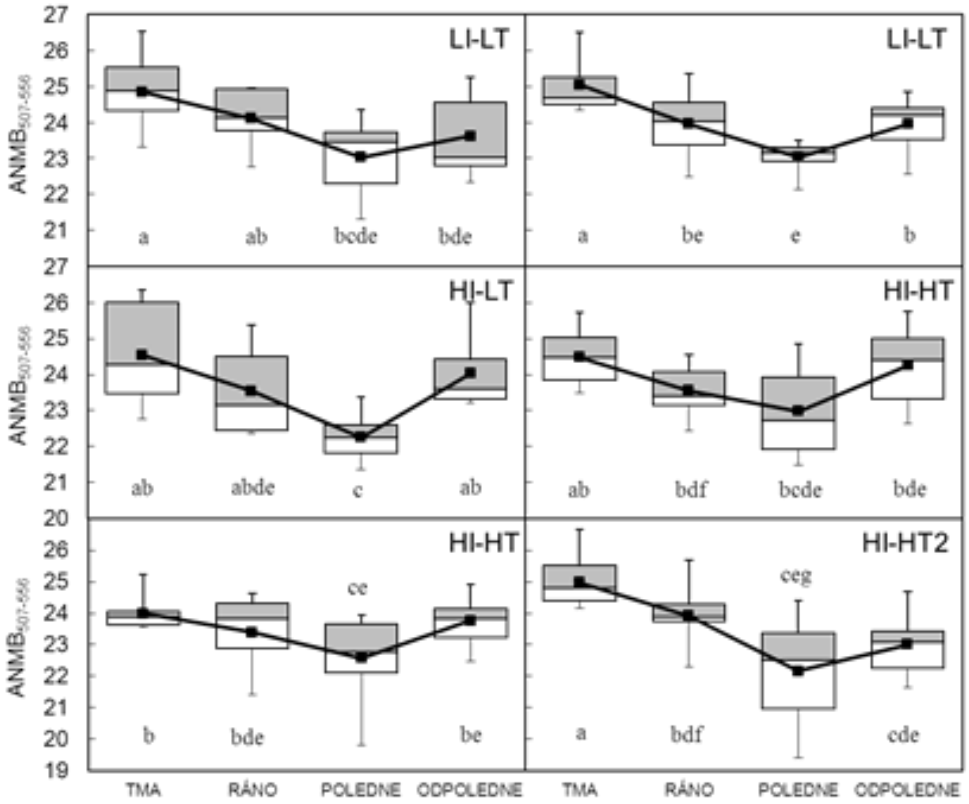
- The best overall result reached with parameter that counts area under normalized curve between 507 and 556 nm which is divided by the depth of the field ($ANMB_{507-556}$)

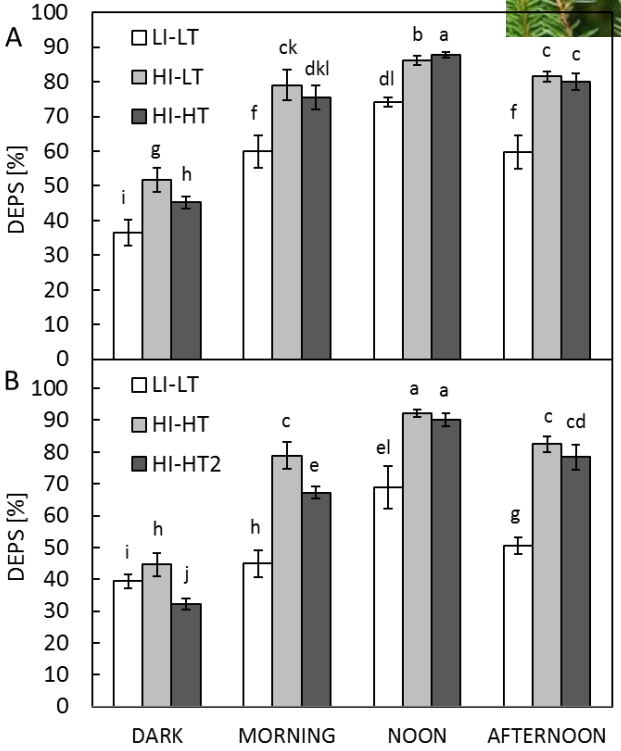


Functional Plant Biology (2012)

$ANMB_{507-556}$ corresponds with DEPS

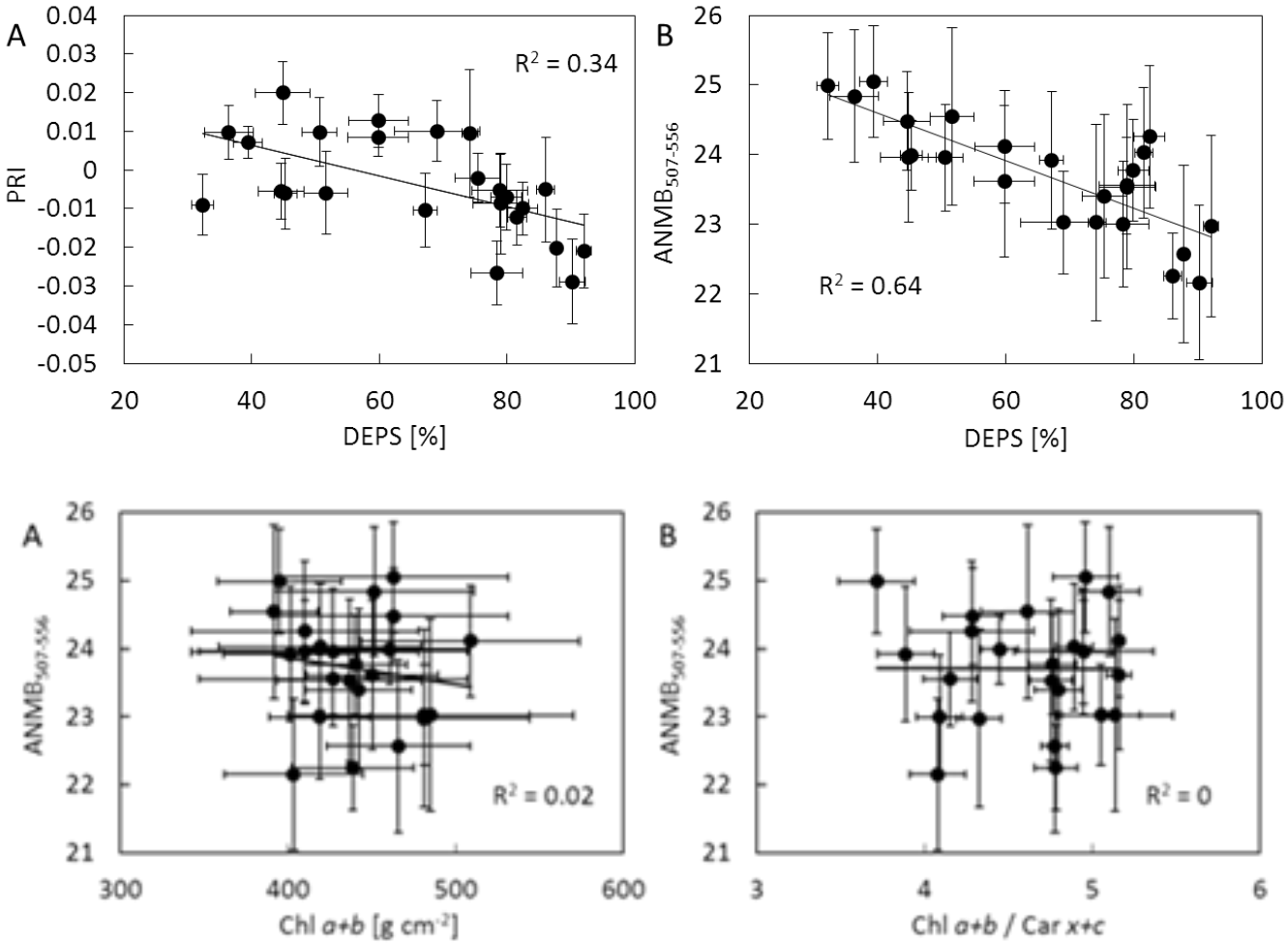
(Mann-Whitney U-test, P<0.05, n=7-10) .





Functional Plant Biology (2012)

$ANMB_{507-556}$ linearly scales with DEPS and is less influenced by content of common leaf pigments as shows regression analysis.



Functional Plant Biology (2012)

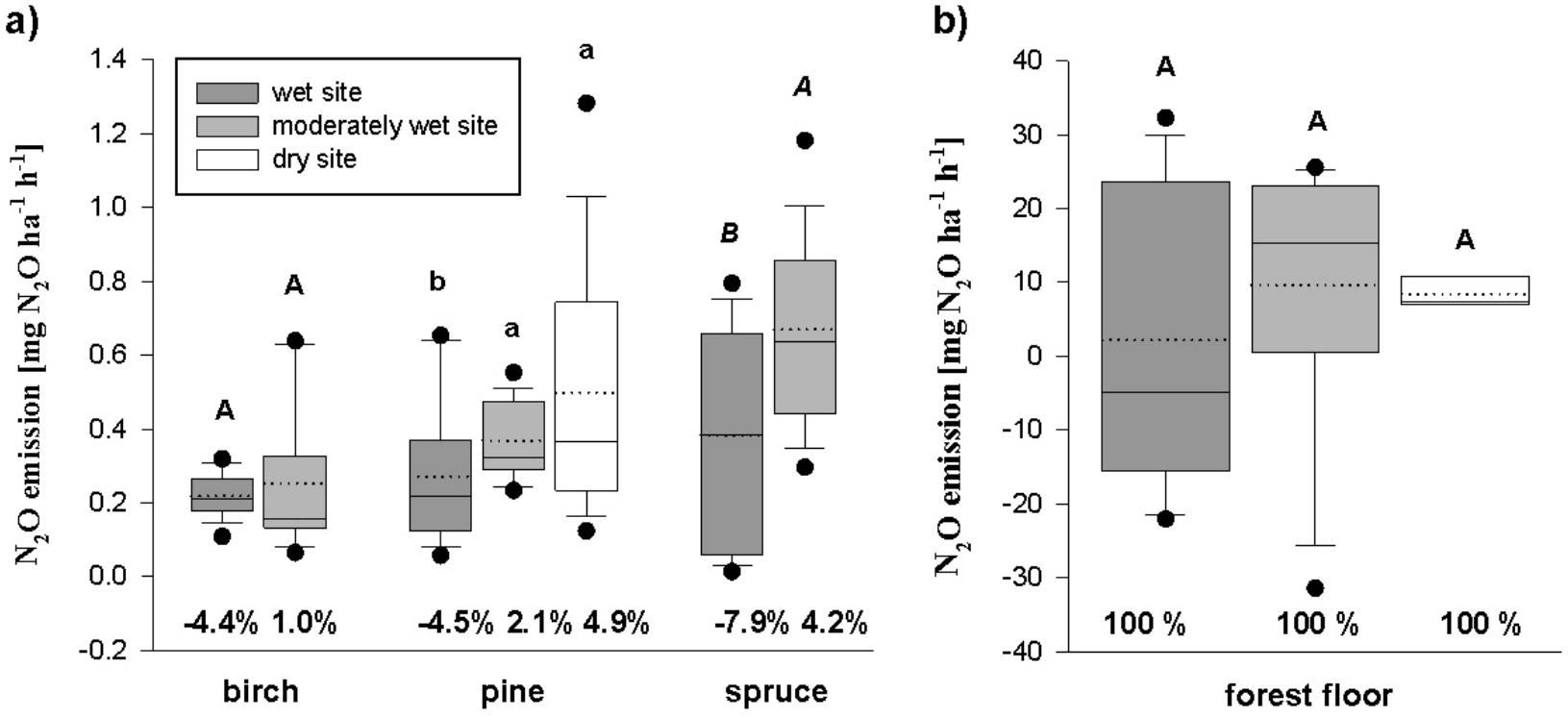
Summer fluxes of nitrous oxide from boreal upland forest

(Kateřina Macháčová et al.)

Objective: (1) to quantify and upscale the N_2O fluxes from stems of mature silver birch (*Betula pendula*), Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*), and from forest floor of boreal forest in Southern Finland

(2) to estimate whether different soil humidity conditions affect the N_2O exchange of the forest.

Central graph



Take home message:

Coniferous trees *P. abies* and *P. sylvestris*, and a broadleaf tree *B. pendula* emit N_2O from their stems and therefore significantly contribute to the boreal forest exchange of N_2O.

This study highlights the necessity to include N_2O emissions from trees to the total forest ecosystem greenhouse gases budget.

Green light affects the geranylgeranyl reductase activity

Zuzana Materová

2.-4.2. 2015

Central graph

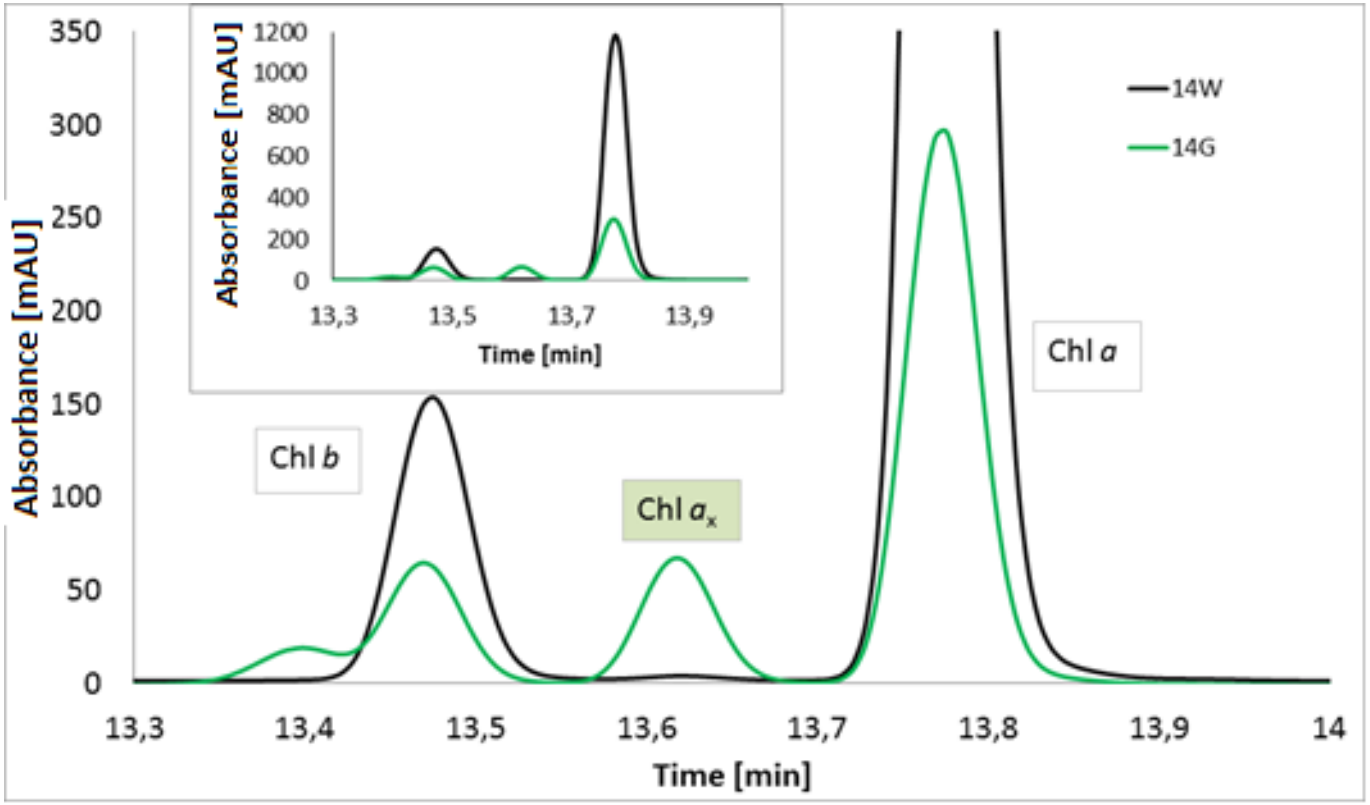


Fig.1 RP-HPLC chromatogram of 80% acetone leaf extracts from barley plants cultivated for 14days at 240µmol.m-2.s-1 intensity of white (14W, black line) or green (14G, green line) light. Based on retention time of eluents we see (from left to right side) the peak of chlorophyll b (Chl b), chlorophyll ax (Chl ax) and chlorophyll a (Chl a).

Spectral characteristics of chl a_x and chl a:

- same absorption spectra
- same fluorescence emission spectra
- same circular dichroism spectra

Based on a literature:

Geranylgeranyl reductase drives the hydrogenation of chlorophyll phytyl chain – to the final presence of one double bond – its activity should be affected by light (green light?)

Hypothesis: Green light stimulates the accumulation of chlorophyll a with the different number of double bonds at phytyl chain.

Can a low dose of UV-B radiation modulate metabolism in stolon-connected UV-B unexposed plants?

(working title)

J. Nezval, J. Kalina, Z. Materová, M. T. Robson

BACKGROUND

UV-B radiation affects plant morphology and metabolism by both, specific and unspecific mechanisms depending on the dose. High dose of UV-B often induces oxidative stress (overproduction of reactive oxygen species - ROS). Whereas it is easy to imagine that ROS wave can difuse through a plant tissues and induce changes of metabolism in unexposed parts of plants, it is a question if a low dose of UV-B radiation could modulate metabolism in distant unexposed tissues or even in connected unexposed plants.

HYPOTHESES

1. The low dose of UV-B causes metabolic changes in directly exposed leaf tissue

2. Low dose of UV-B can induce metabolic changes in stolon-connected UV-B unexposed plants.

METHODS

Plant material: *Fragaria vesca* L.

***In-vivo* methods:**

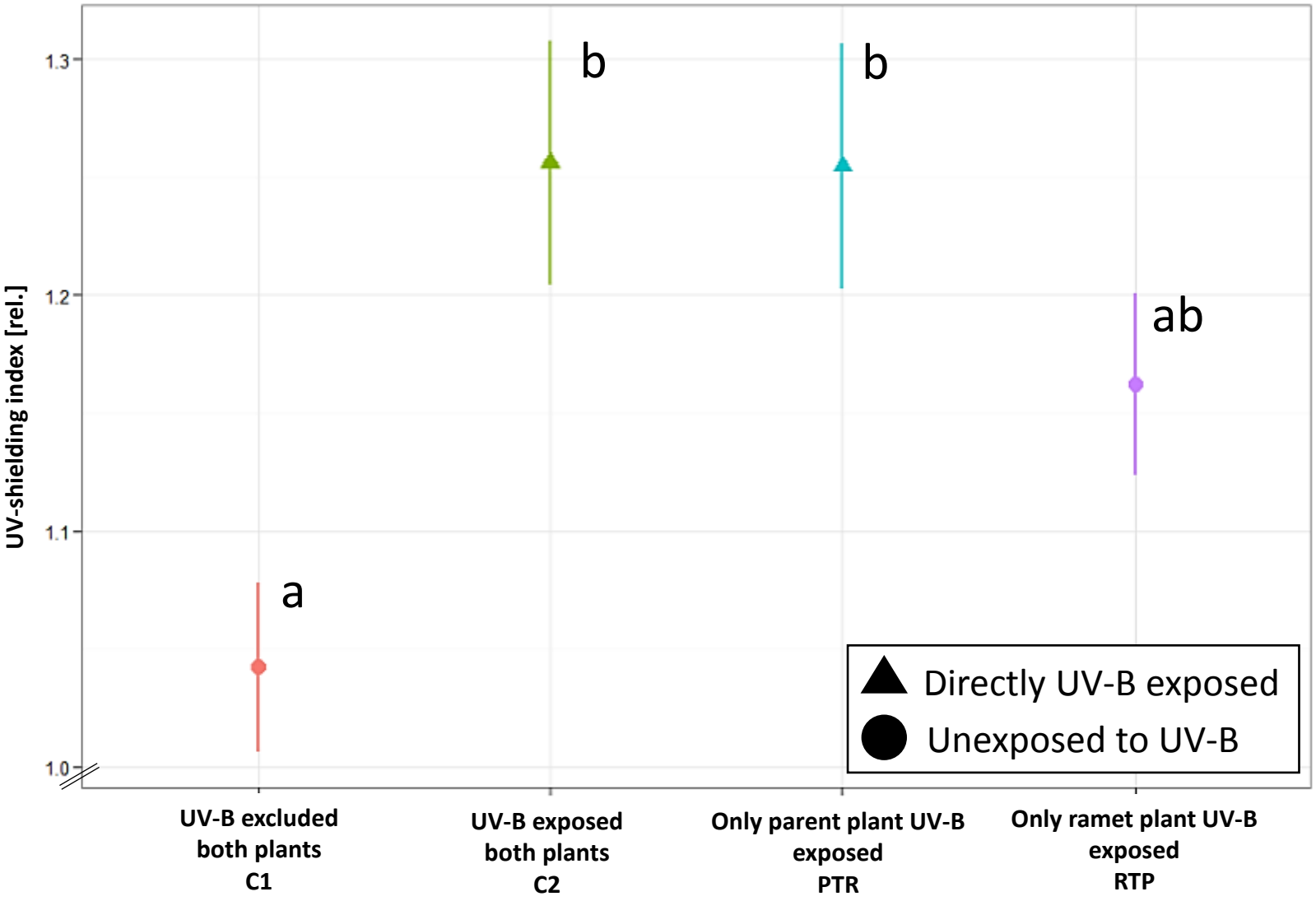
- measurement of UV-shielding index (assessment of phenolic compounds in a leaf epidermal layer); Dualex
- Assessment of chlorphyl content using SPAD

***In-vitro* methods:**

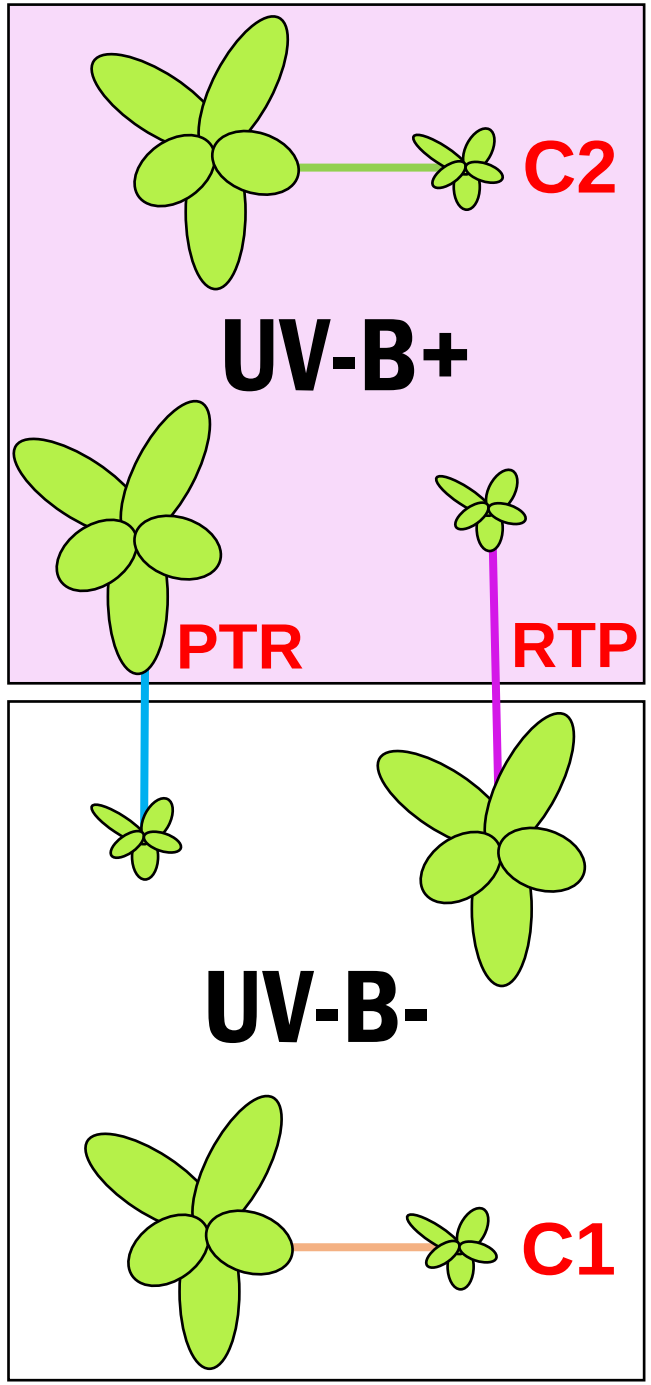
HPLC-DAD – determination of photosynthetic pigments, HPLC-MS – identification and quantification of phenolic compounds

ALTERATION OF UV-SHIELDING INDEX OF PARENT PLANT LEAVES DEPENDING ON PLANT ARRANGEMENT UNDER DIFFERENT UV-B RADIATION CONDITIONS

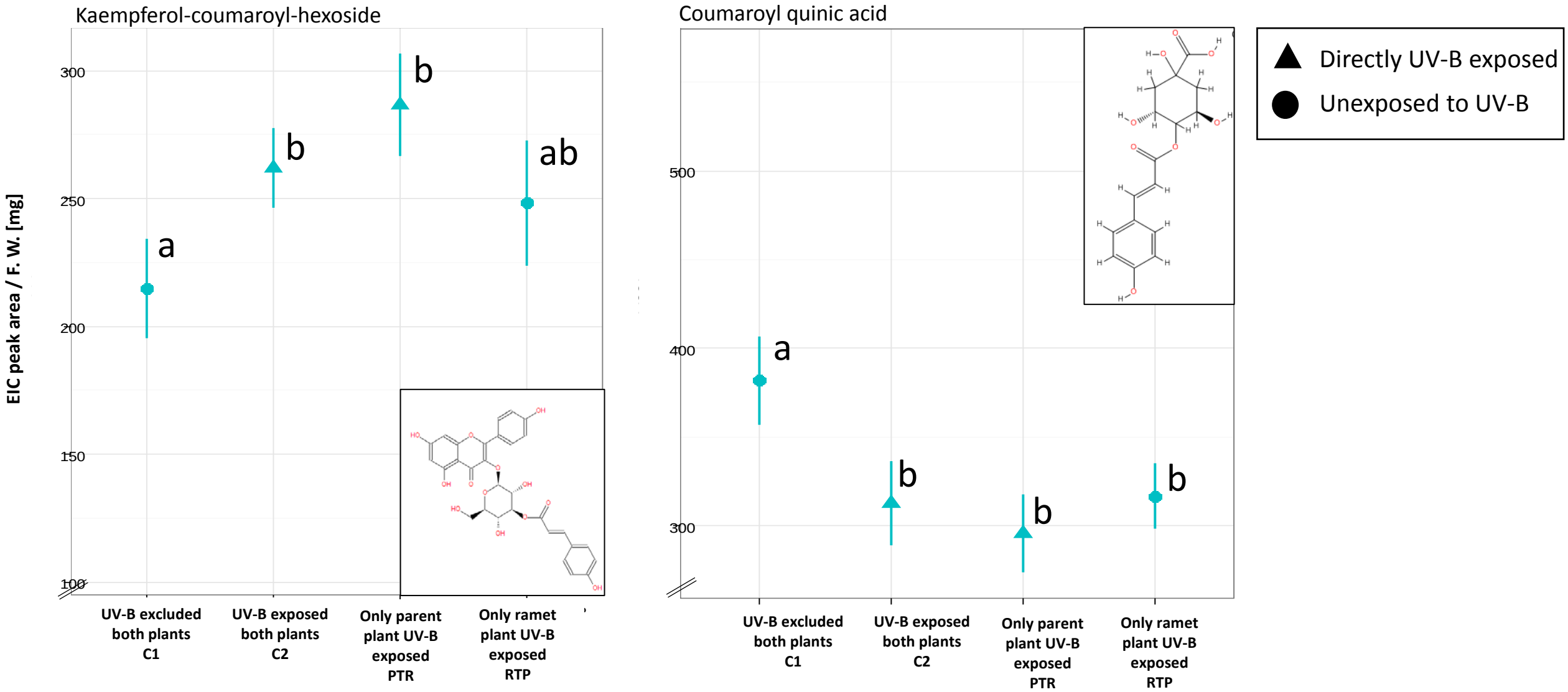
(ONE REPRESENTATIVE TIME POINT)



Mean values and ±SD are shown (n = 18), 1-way ANOVA followed by Tukey´s multiple comparison test



ALTERATION OF SOLUBLE PHENOLIC COMPOUND CONTENT IN PARENT PLANT LEAVES DEPENDING ON PLANT ARRANGEMENT UNDER DIFFERENT UV-B RADIATION CONDITIONS



Mean values and ±SD are shown (n = 18), 1-way ANOVA followed by Tukey´s multiple comparison test

CONCLUSION

Even a low dose of UV-B radiation induces the UV-shileding process in directly exposed leaves of *Fragaria vesca* L. Soluble phenolic compounds (secondary metabolites) responded to low-dose of UV-B radiation differently depending on their type/structure.

We observed higher values of UV-shielding index in leaves of plant which were connected to UV-B exposed ramet. For specific flavonoid derivatives we observed upregulation of synthesis in unexposed plants when their ramet was exposed to low dose of UV-B radiation.

TAKE HOME MESSAGE

LOW DOSE OF UV-B INDUCE METABOBLIC CHANGES IN DIRECTLY EXPOSED LEAVES AS WELL AS IN UNEXPOSED REMOTE PLANTS. WE SUPPOSE THAT SOME KIND OF SIGNAL WHICH MODULATES SECONDARY METABOLISM HAS TO BE TRANSDUCED BETWEEN EXPOSED AND UNEXPOSED STOLON-CONNECTED PLANTS.

Interactive effects of elevated CO_2 concentration, drought and nitrogen nutrition on yield and grain quality of winter wheat

Kateřina Novotná [1,2]

[1] *Global Change Research Centre, Department of Impact Studies, Belidla 4a, 603 00 Brno, CZ*

[2] *Department of Agrosystems and Bioclimatology, Faculty of Agronomy, Mendel University in Brno, Zemedelska 1, 613 00 Brno, CZ*

Hypotheses

- elevated CO_2 concentration (EC) stimulates photosynthesis in wheat and thus leads to increased grain yield
- higher production of assimilates causes inbalance between starch and protein in wheat and this results in lower protein content in grain
- UV radiation decreases plant growth and therefore also reduces the stimulation effect of EC

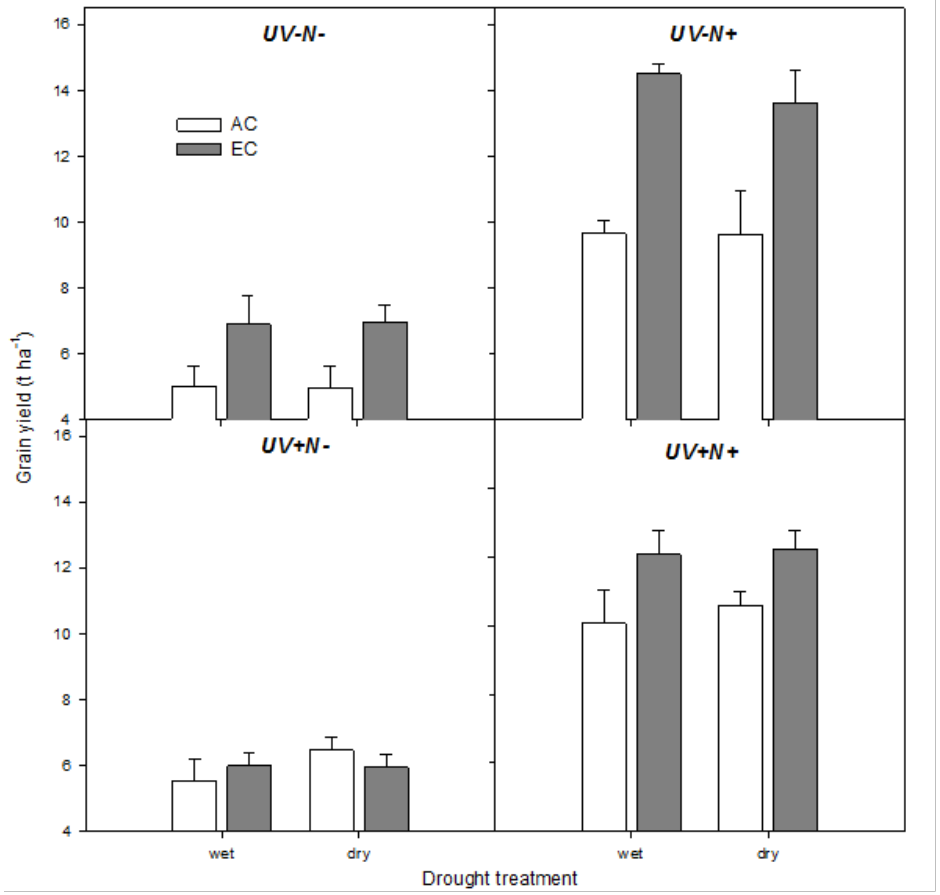
Materials and methods

- 24 open-top chambers allowing manipulation of CO_2 concentration (AC – ambient CO_2 concentration, EC – elevated CO_2 concentration), precipitation and UV exclusion
- plots inside were divided to N-fertilized (200 kg N ha^{-1}) and unfertilized
- *Triticum aestivum* – 'Bohemia'
- Domanínek near Bystřice nad Pernštejnem in Bohemian-Moravian highlands (Czech Republic)
- altitude 575 m a. s. l.
- mean annual precipitation 610 mm
- mean annual temperature 7.2 °C

Results

- effect of elevated CO_2 concentration:

- increased the above ground biomass and grain yield
- increased rates of photosynthesis and formation of assimilates
- UV exclusion stimulated the effect of the EC



- higher level of nitrogen increased the stimulatory effect of EC on the above-ground biomass and grain yield

Figure 1 Grain yield (t.ha $^{-1}$) in winter wheat varying in different treatments.

Results

- EC caused reduction of grain quality parameters, such as Zeleny sedimentation test and protein content

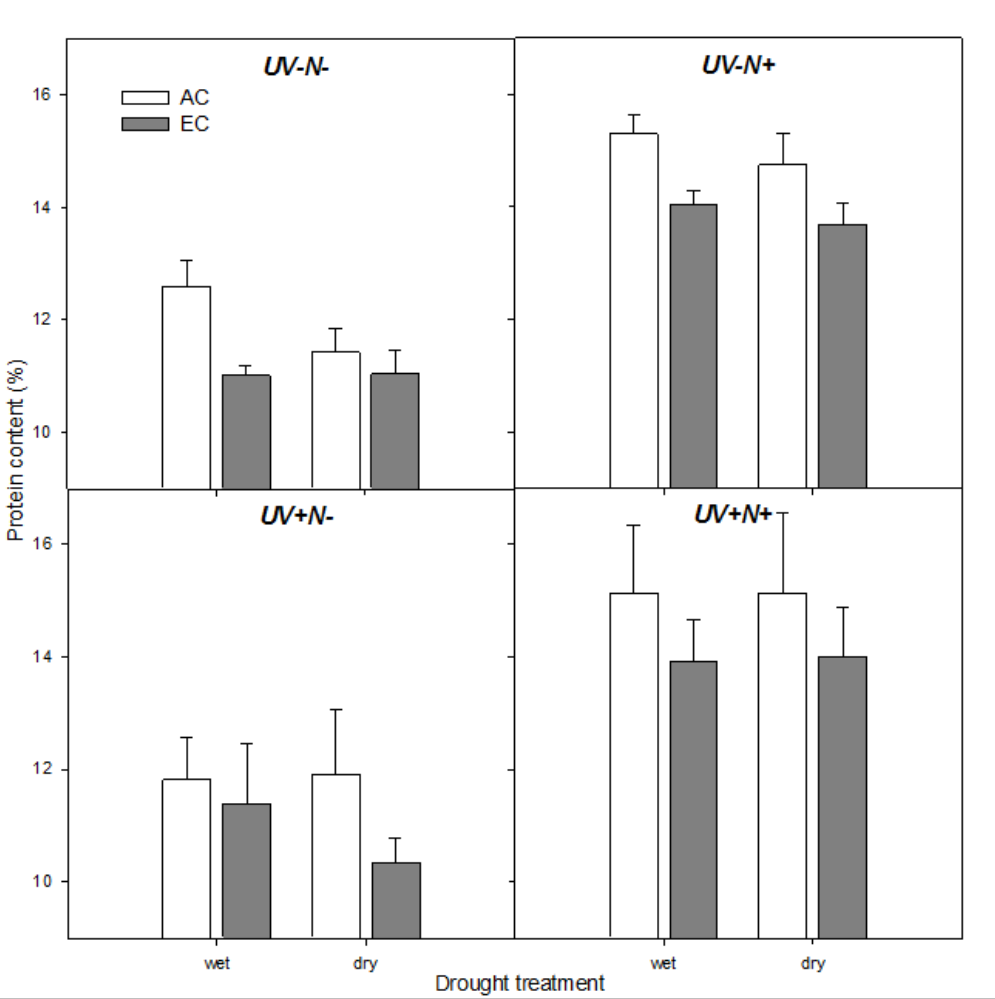


Figure 2 Protein content (%) in winter wheat varying in different treatments.

Take home message

- we expect almost double CO_2 concentration in the end of this century
- this will positively affect the amount of above ground biomass or grain yield
- but it will also negatively affect grain quality parameters

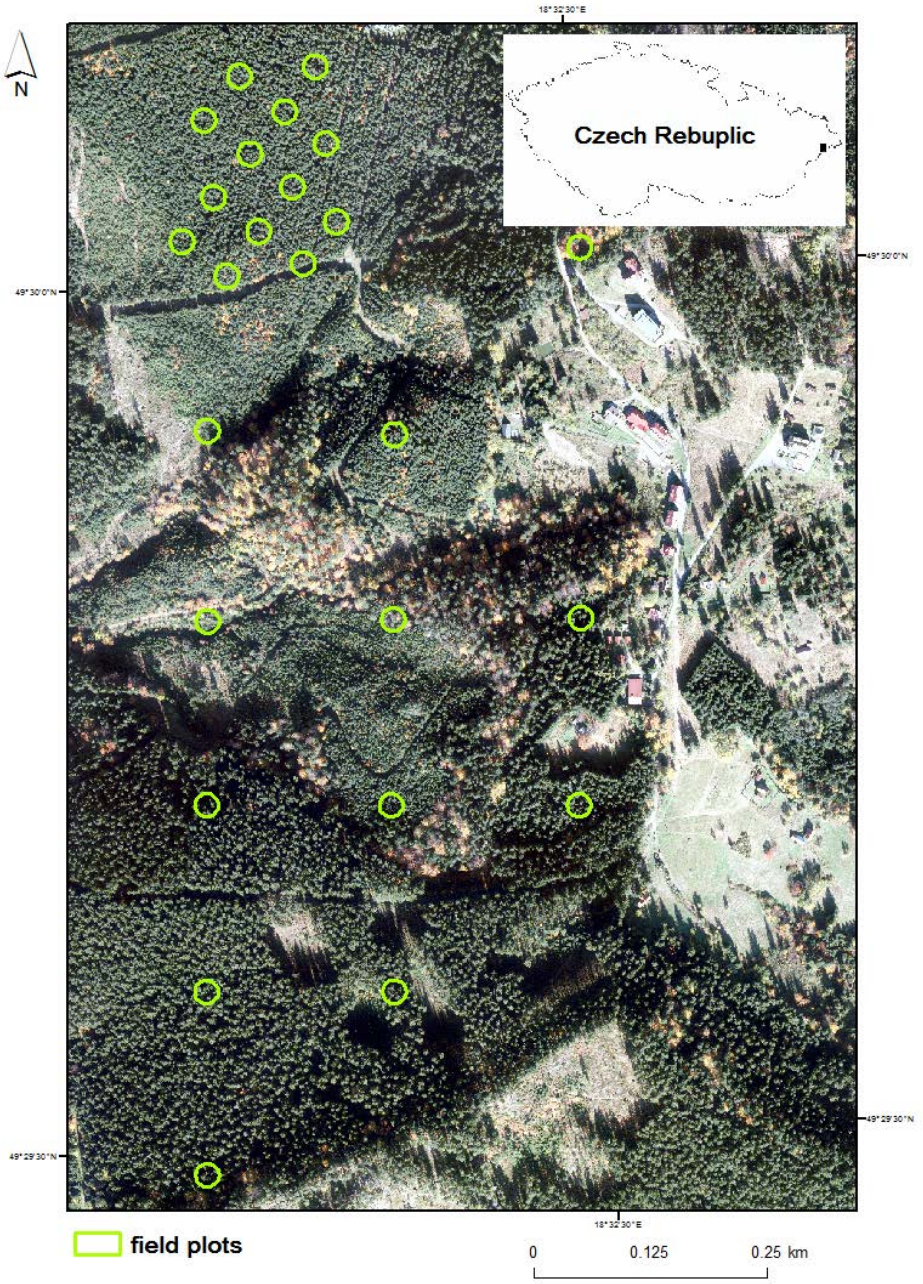
Mapping of aboveground tree biomass using airborne data: a case study in the Beskydy Mts.

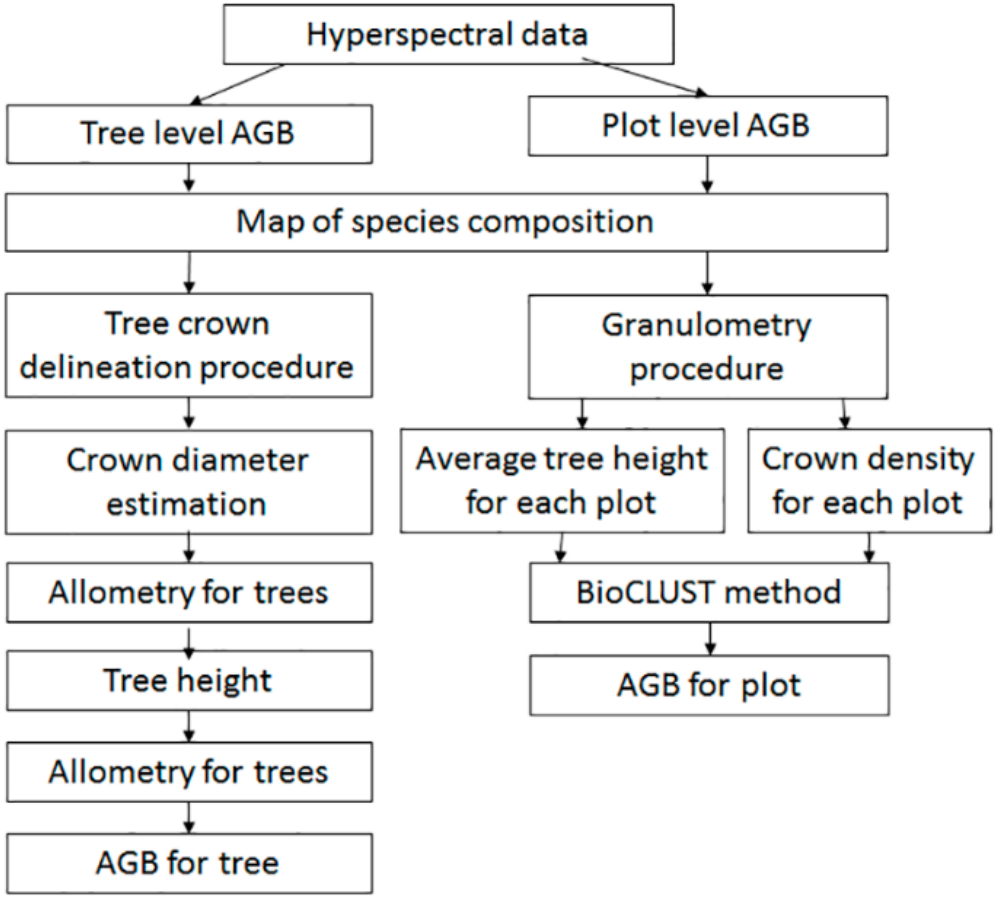
Ing. Jan Novotný
Department of Remote Sensing

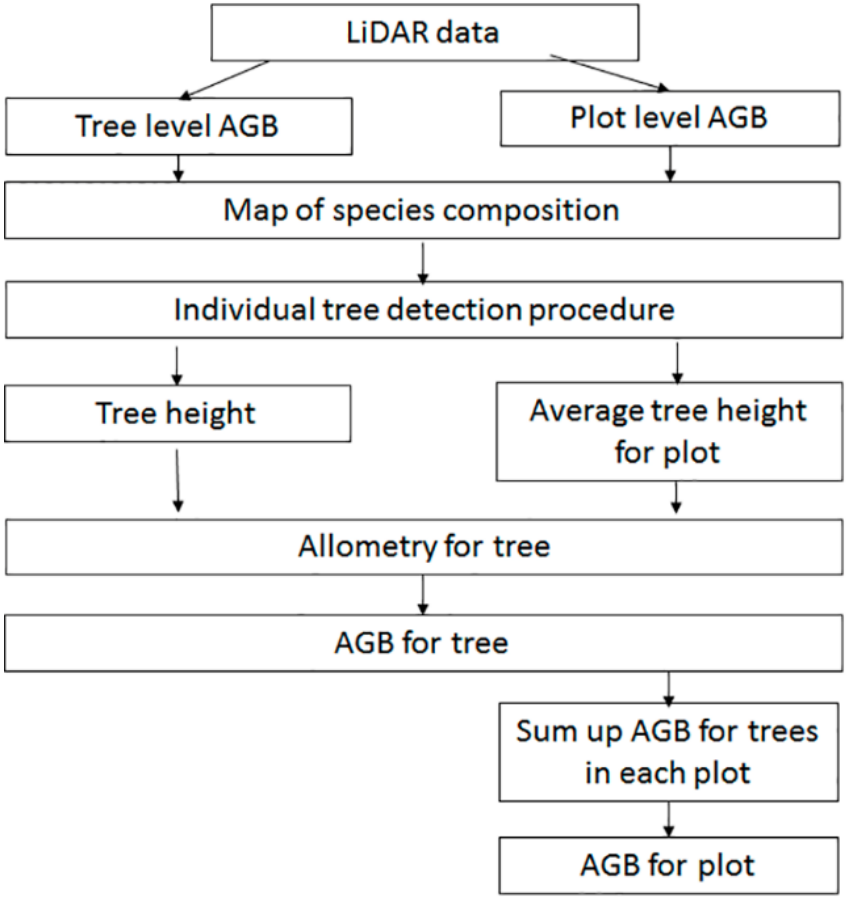
Mapping of aboveground tree biomass using airborne data: a case study in the Beskydy Mts.

- hyperspectral data
- laser scanning data

- biomass estimation
- on a tree level
- on a compartment level




Hyperspectral data
Tree level AGB
Plot level AGB
Map of species composition
Tree crown delineation procedure
Granulometry procedure
Crown diameter estimation
Average tree height for each plot
Crown density for each plot
Allometry for trees
BioCLUST method
Tree height
AGB for plot
Allometry for trees
AGB for tree


LiDAR data
Tree level AGB
Plot level AGB
Map of species composition
Individual tree detection procedure
Tree height
Average tree height for plot
Allometry for tree
AGB for tree
Sum up AGB for trees in each plot
AGB for plot

Distribution of scytonemin in microbial communities from halite crust in the hyperarid zone of the Atacama Desert, Chile

(FEMS Microbiology Ecology)

Petr Vítek

Global Change Research Centre, AVČR

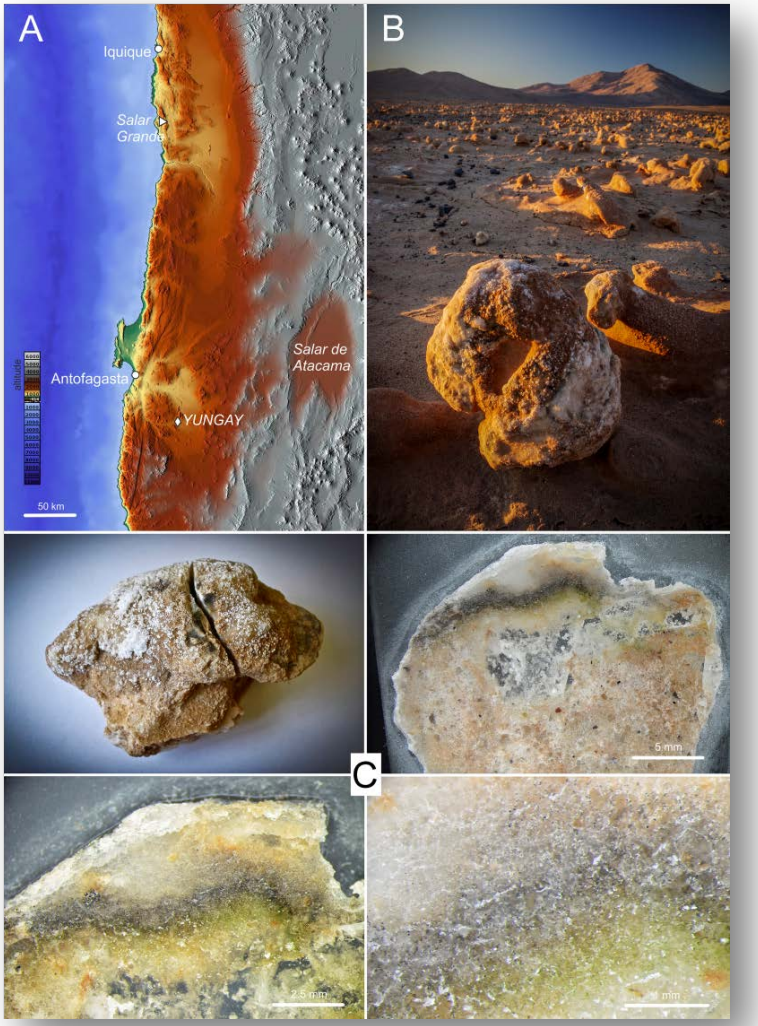
Halite crust in the Atacama Desert - endolithic cyanobacteria

A – location of the studied area

B – halite crust

C – closer view of the sample

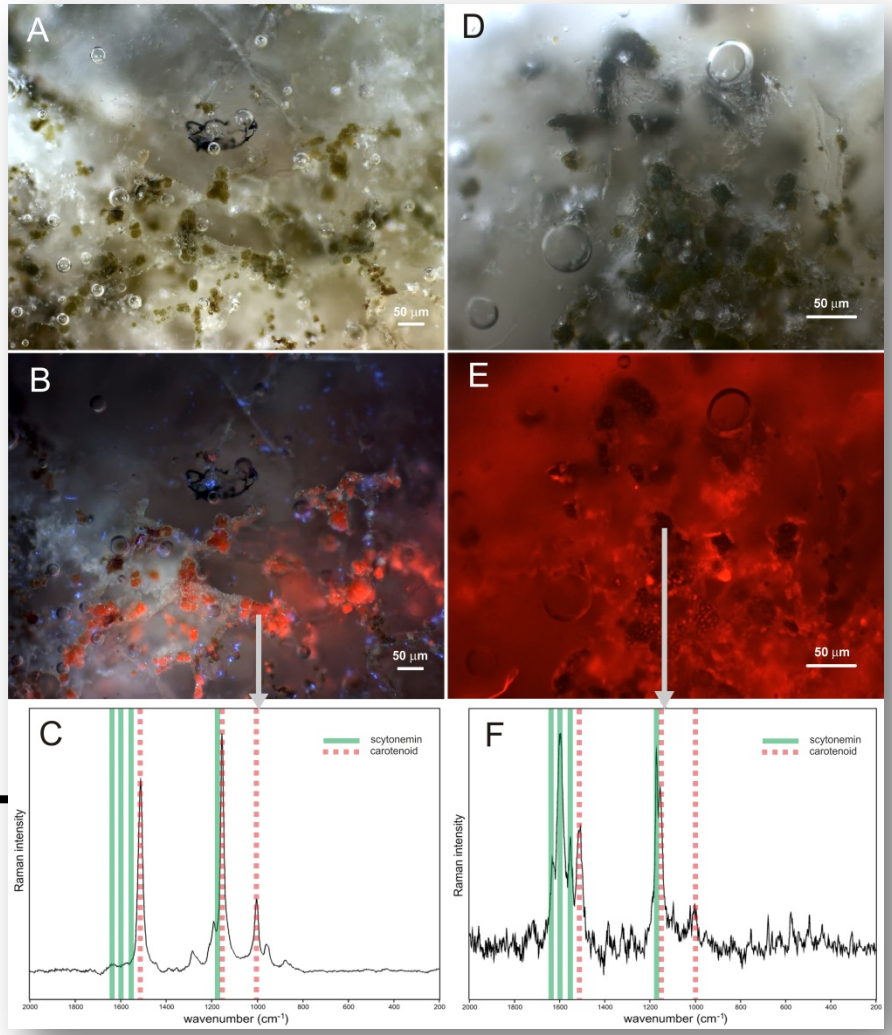
Scytonemin distribution?



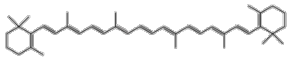
Halite crust – endolithic cyanobacteria

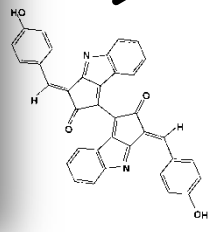
Green cell aggregates

Black cell aggregates

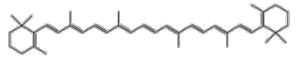


carotenoid



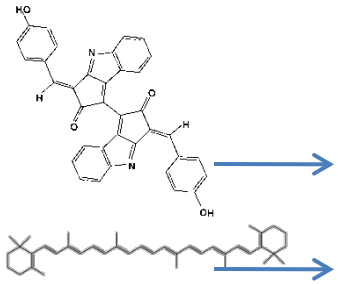


scytonemin + carotenoid



Halite crust – endolithic cyanobacteria

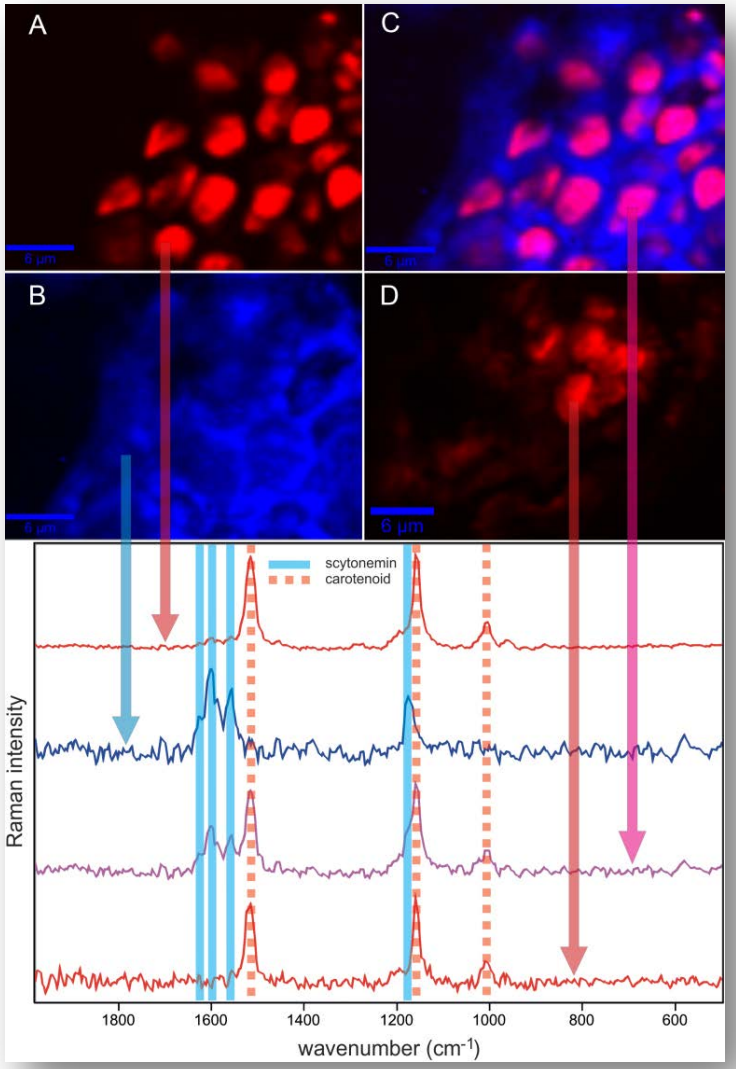
A, B, C – black aggregates
D – green aggregates



scytonemin

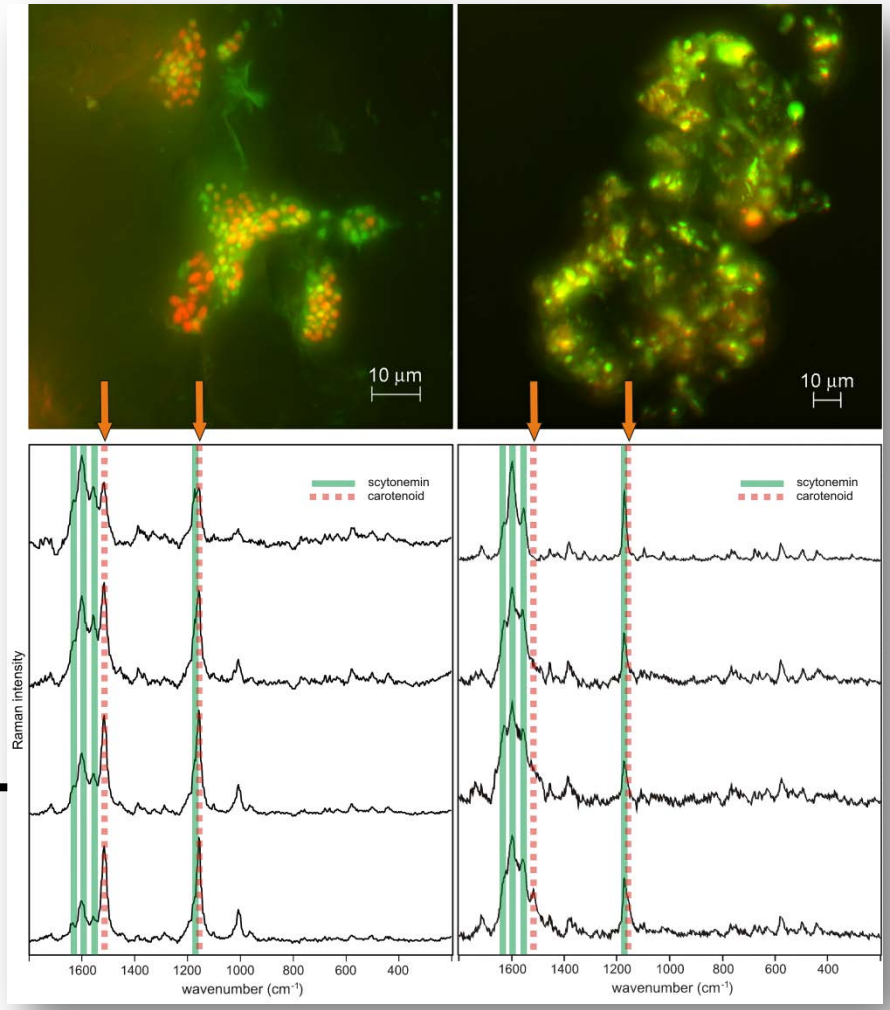
carotenoid

mixture of both



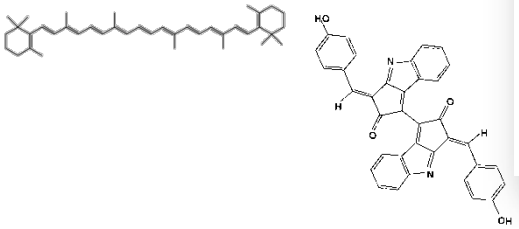
Halite crust – endolithic cyanobacteria

Black cell aggregates
Inside the rock

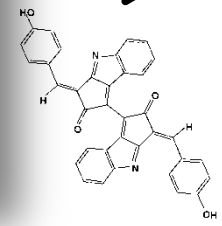


Black cell aggregates
Rock suface

scytonemin
+ carotenoid



scytonemin



Automated eddy covariance data quality control for long-term measurements

Šigut, L., Mauder, M., Sedlák, P., Pavelka, M., Špunda, V.

Introduction

- CzeCOS: Czechglobe network of eddy covariance towers (8 sites)
- Manual quality checking (qc) is not sustainable for this amount of data
- Mauder et al. (2013) published an approach for automated qc for German TERENO network

Hypothesis

- We aim to test whether the automated qc based on Mauder et al. (2013) is transferable to two selected CzeCOS sites in a way that is is effective and reliable

Main plot and results

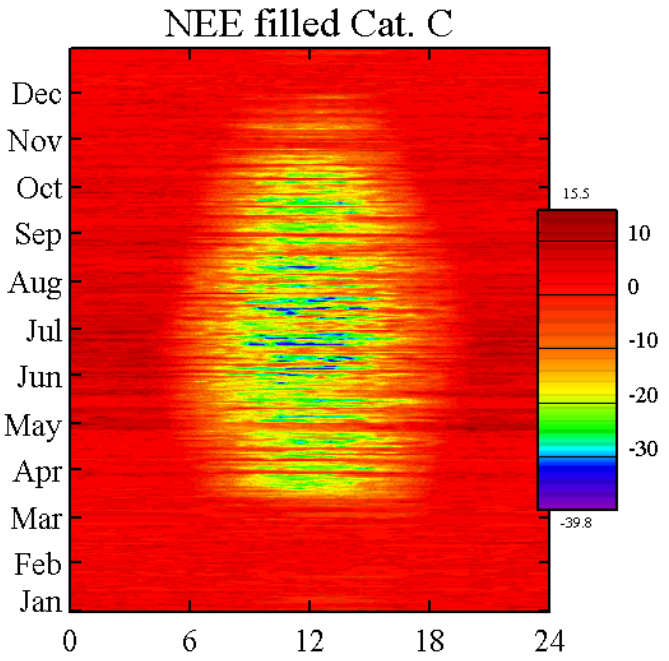
- qc flags produced based on visual inspection in comparison with automated approach (just the difference?

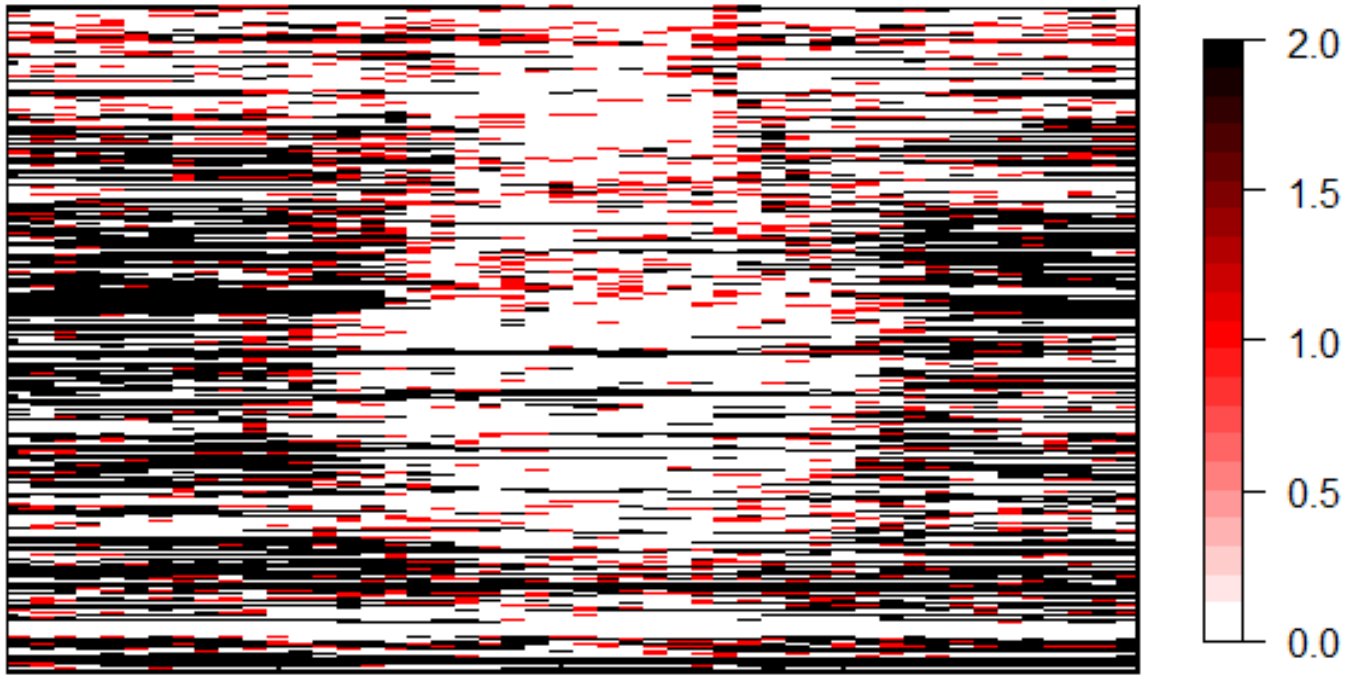
Fingerprint plot (Hovmöller diagram

Hours

Colour code:
qc flag = 0 white
qc flag = 1 red
qc flag = 2 black
qc flag = NA?

DOY




2.0
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1.0
0.5
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Conclusion

- The automated qc provided sufficient results to be adopted on regular basis for these sites

STES

Marek Pivovarník

Global Change Research Centre AS CR, v.v.i.
Department of Remote Sensing

3.2.2015

1.
Central Graph

Algorithm STES($L_{LL}, L^{\downarrow}$)

Input: Land-leaving radiance L_{LL}
Downwelling radiance $L^{\downarrow}$

Output: Land Surface Temperature T
Spectral emissivity ε

Smoothing Module

1. $\varepsilon_{min} = \underset{\ell \in \langle 0.6,1)}{\arg\min}\ \textsc{SmoothingErr}(\ell, L_{LL}, L^{\downarrow})$
2. $T_b = B^{-1}(L_{LL})$
3. Find a and b by solving
   $1 = 1/(a\ \max(T_b)^3 + b)$
   $\varepsilon_{min} = 1/(a\ \min(T_b)^3 + b)$
4. Estimate emissivity
   $\varepsilon = 1/(aT_b^3 + b)$
5. Estimate spectrum
   $B' = \frac{L_{LL} - (1-\varepsilon)L^{\downarrow}}{\varepsilon}$
6. $T = \max(B^{-1}(B'))$
7. $\varepsilon'' = \frac{L_{LL} - L^{\downarrow}}{B(T) - L^{\downarrow}}$

TES Modules

8. $\beta = \textsc{RatioModule}(\varepsilon'')$
9. $\varepsilon''' = \textsc{MMDModule}(\beta)$

Final Correction

10. Find λ for which ε is the highest
    and estimate final temperature at λ
    $T = \left(\frac{L_{LL_\lambda} - (1-\varepsilon'''_\lambda) L^{\downarrow}_\lambda}{\varepsilon'''_\lambda} \right)$
11. $\varepsilon = \frac{L_{LL} - L^{\downarrow}}{B(T) - L^{\downarrow}}$

12. **return** $\{T, \varepsilon\}$

Function $\textsc{SmoothingErr}(\ell, L_{LL}, L^{\downarrow})$

1. $T_b = B^{-1}(L_{LL})$
2. Find a and b by solving
   $1 = 1/(a\ \max(T_b)^3 + b)$
   $\ell = 1/(a\ \min(T_b)^3 + b)$
3. Estimate emissivity
   $\varepsilon = 1/(aT_b^3 + b)$
4. Estimate spectrum
   $B' = \frac{L_{LL} - (1-\varepsilon)L^{\downarrow}}{\varepsilon}$
5. $T = \max(B^{-1}(B'))$
6. **return**
   $\sum_\lambda \left| \frac{B(T)}{||B(T)||_1} - \frac{B'}{||B'||_1} \right|$

2.
Results

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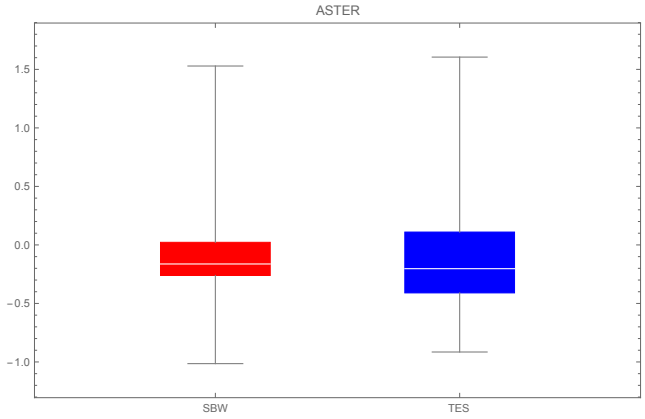

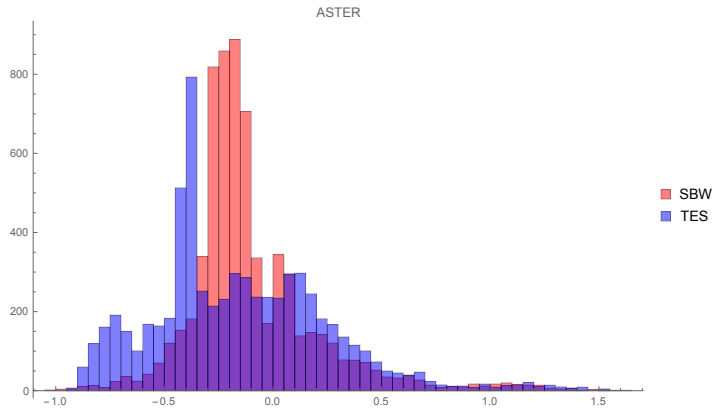

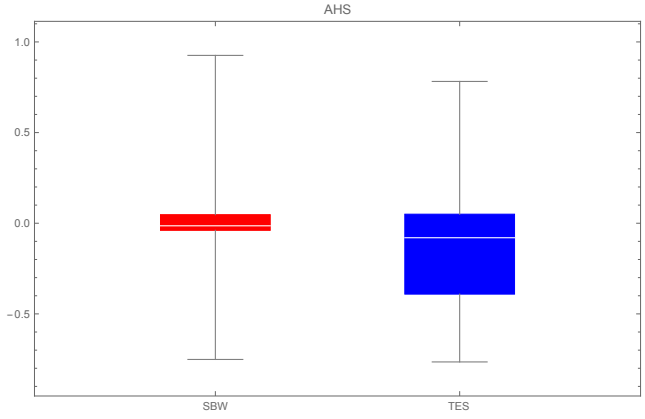

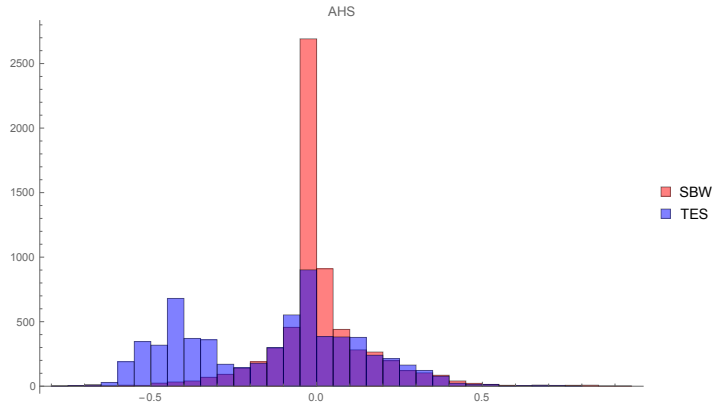

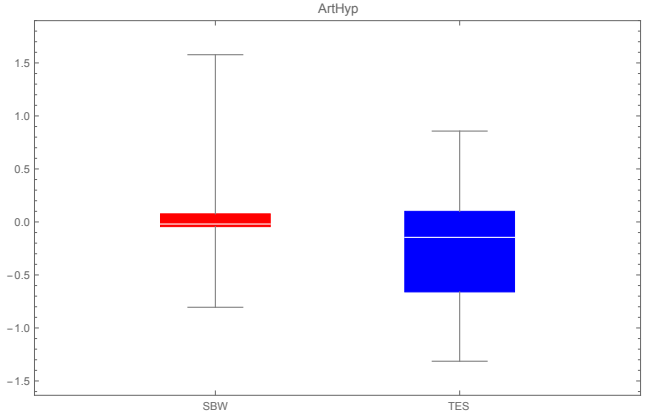

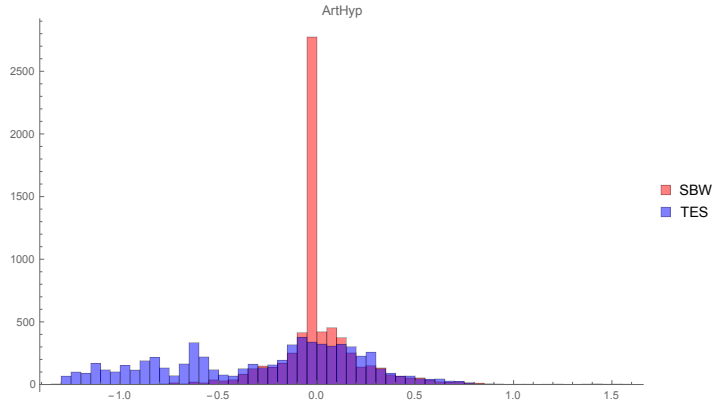

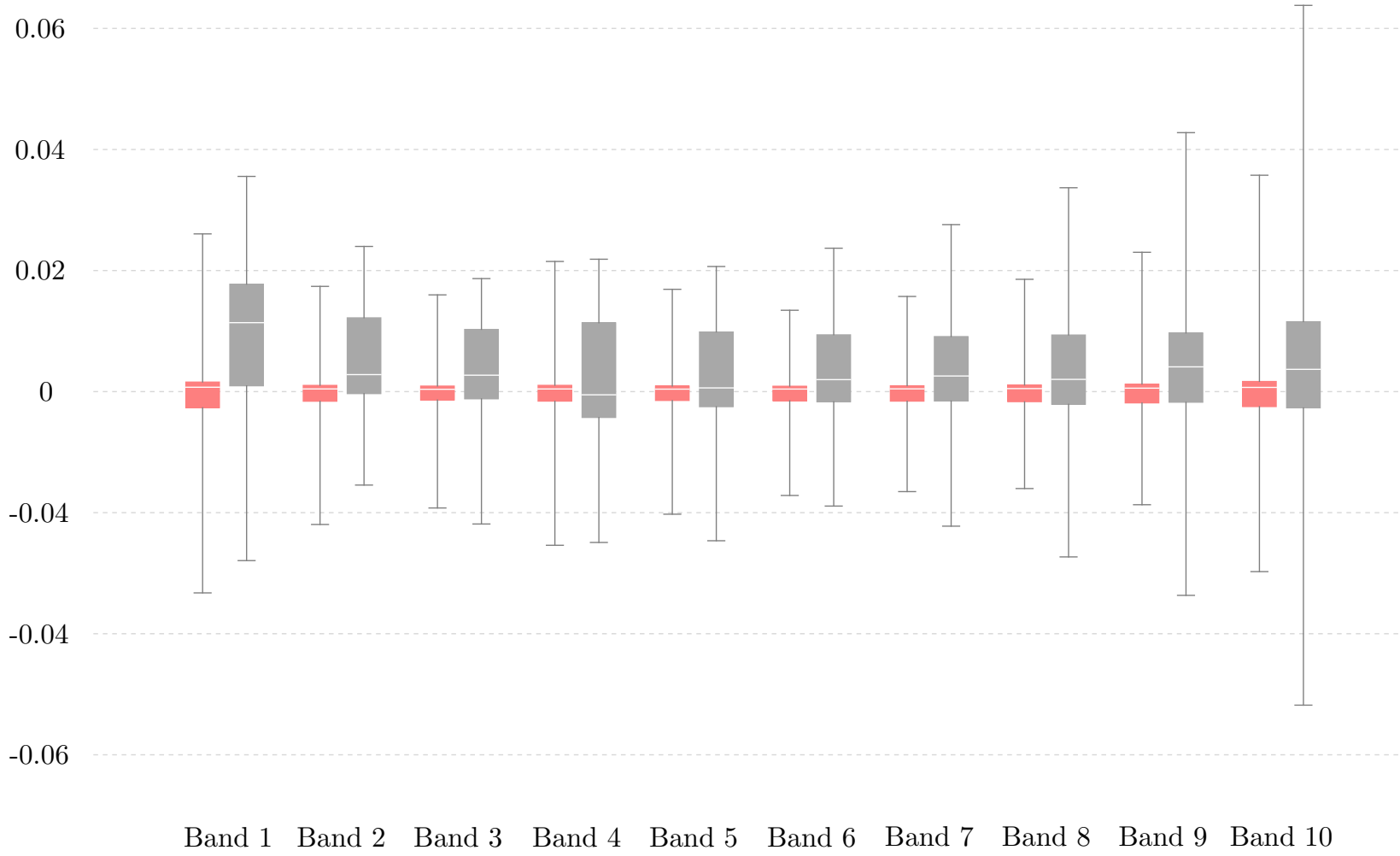
0.06
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Band 1
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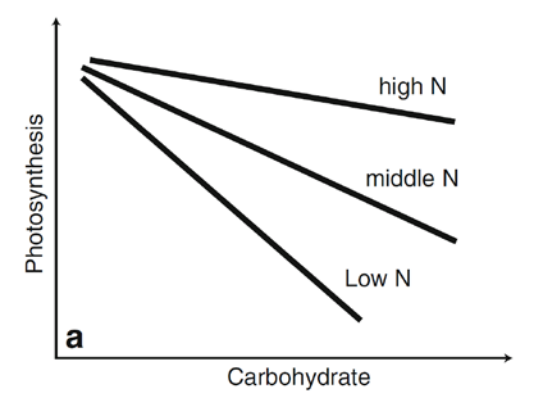
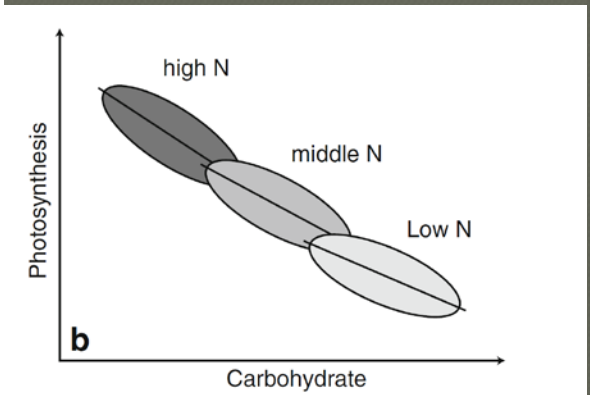
Band 6
Band 7
Band 8
Band 9
Band 10

The effect of carbohydrate accumulation and nitrogen deficiency on photosynthetic down-regulation in beech (*Fagus sylvatica*) under elevated CO_2 concentration

Petra Rajsnerová, Karel Klem, Otmar Urban, Petr Holub



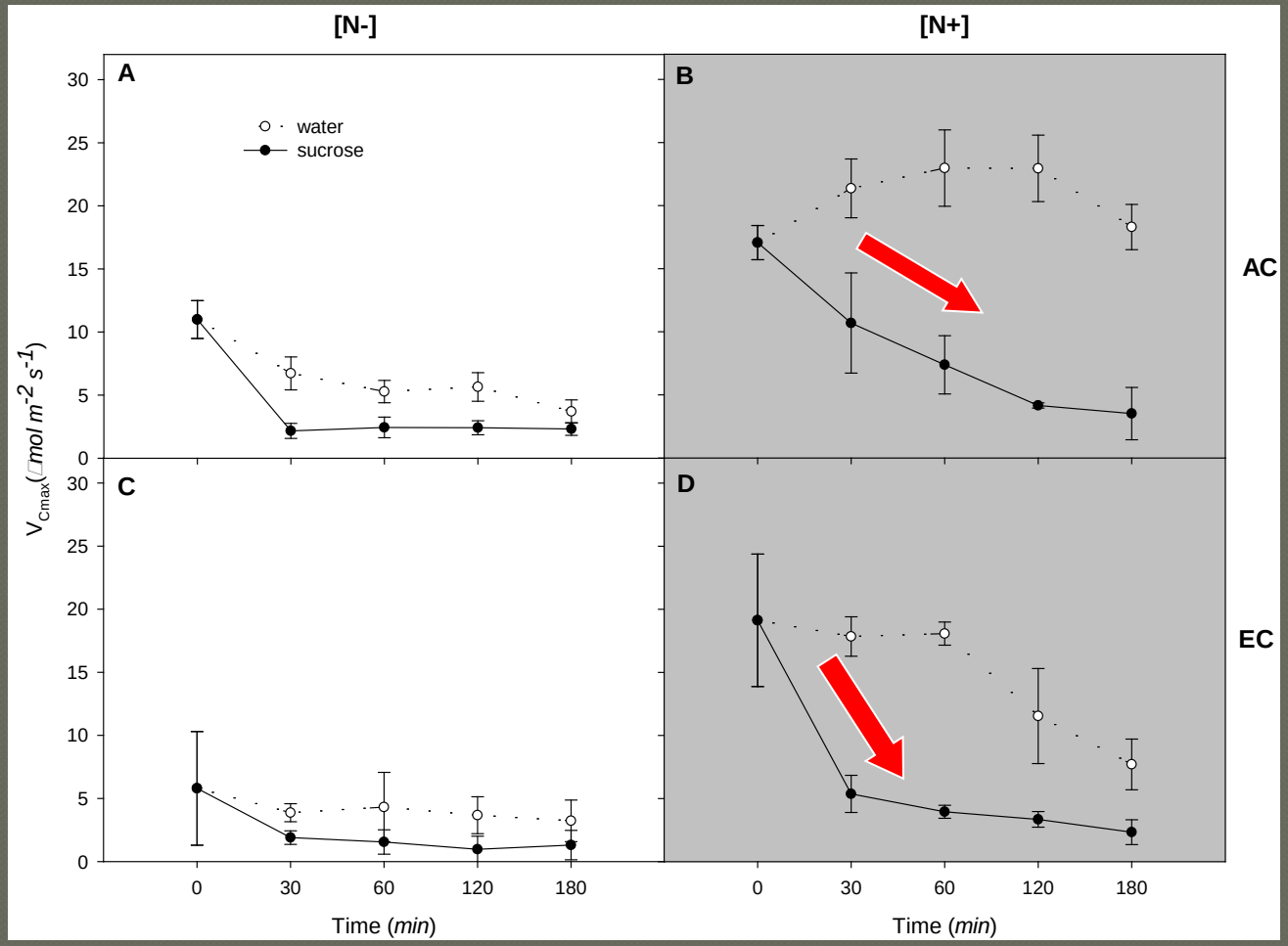


- under long term cultivation in elevated CO_2 concentration is often observed down-regulation of photosynthesis
- this means that the stimulation by elevated CO_2 concentration is decreasing in time
- there are two main hypothesis of photosynthetic down-regulation under elevated CO_2 concentration:
  - accumulation of assimilates (mainly sucrose) in leaves and sucrose mediated downregulation of photosynthetic genes
  - nitrogen dilution in increased biomass as nitrogen availability from soil is limited
- however, the role of interactions between nitrogen and carbohydrates is still not well understood
- therefore we studied combined effect of nitrogen nutrition and sucrose feeding in beech saplings under elevated CO_2 concentration

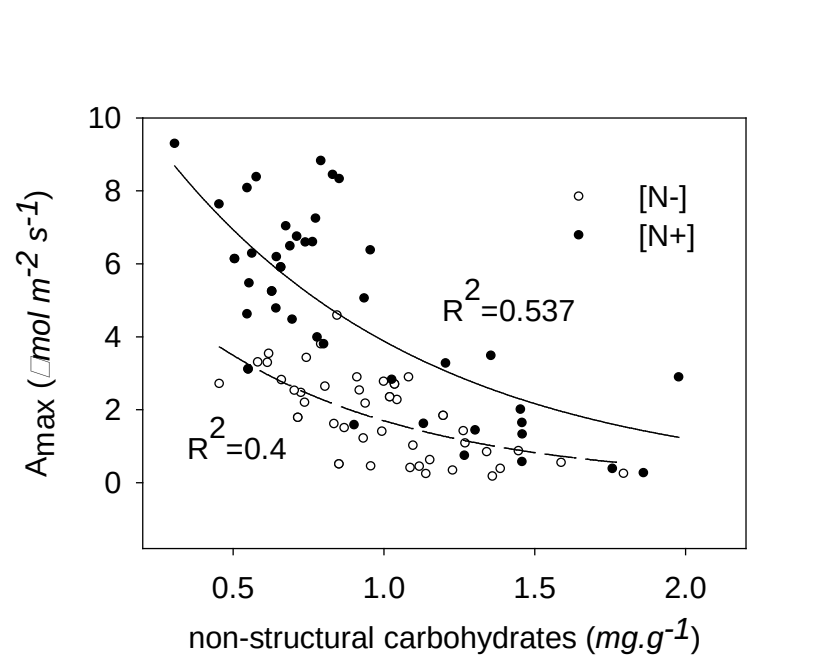
Material and Methods

- 3 years old beech (*Fagus sylvatica*) saplings were grown in large pots (13 l) under elevated CO2 concentrations in two levels of Nitrogen nutrition
- [N+] 200 mg N/l [N-] without N
- in summer the sucrose feeding have been done on fully developed leaves
- the CO_2 assimilation was measured in 30, 60, 90, 120min after beginning of sucrose feeding

- **we found major effect of sucrose feeding on Rubisco carboxylation (Vc_{max}) in Nitrogen deficient leaves and also effect of EC on this down-regulation**

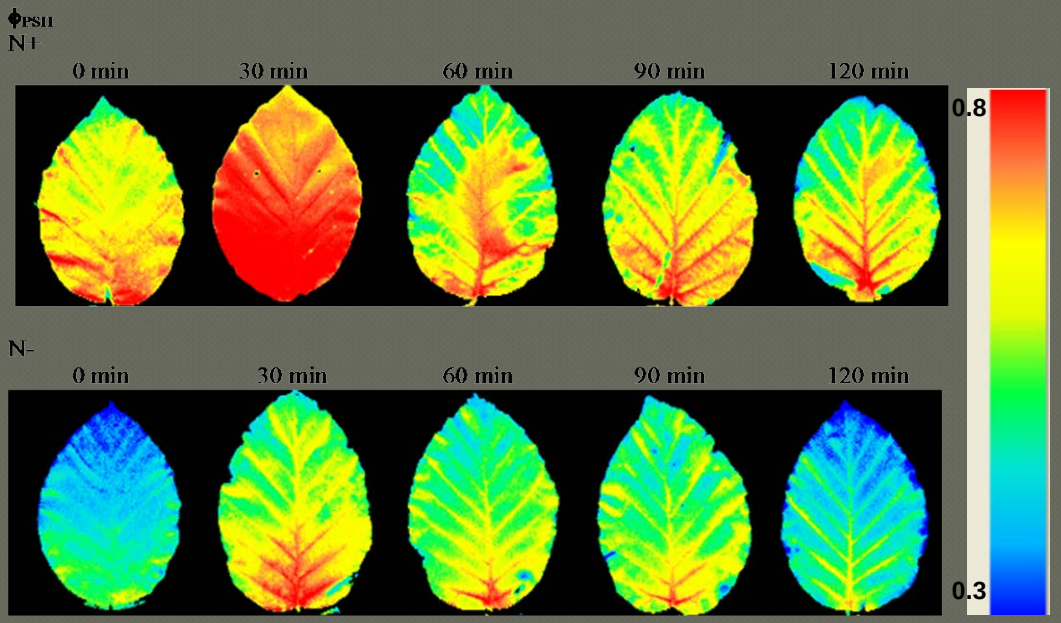


- **relationship between the content of non-structural carbohydrates and light saturated CO_2 assimilation rate shows that the photosynthesis is mainly down-regulated by accumulation of carbohydrates**
- **however, the effect of nitrogen shifts this relationship**



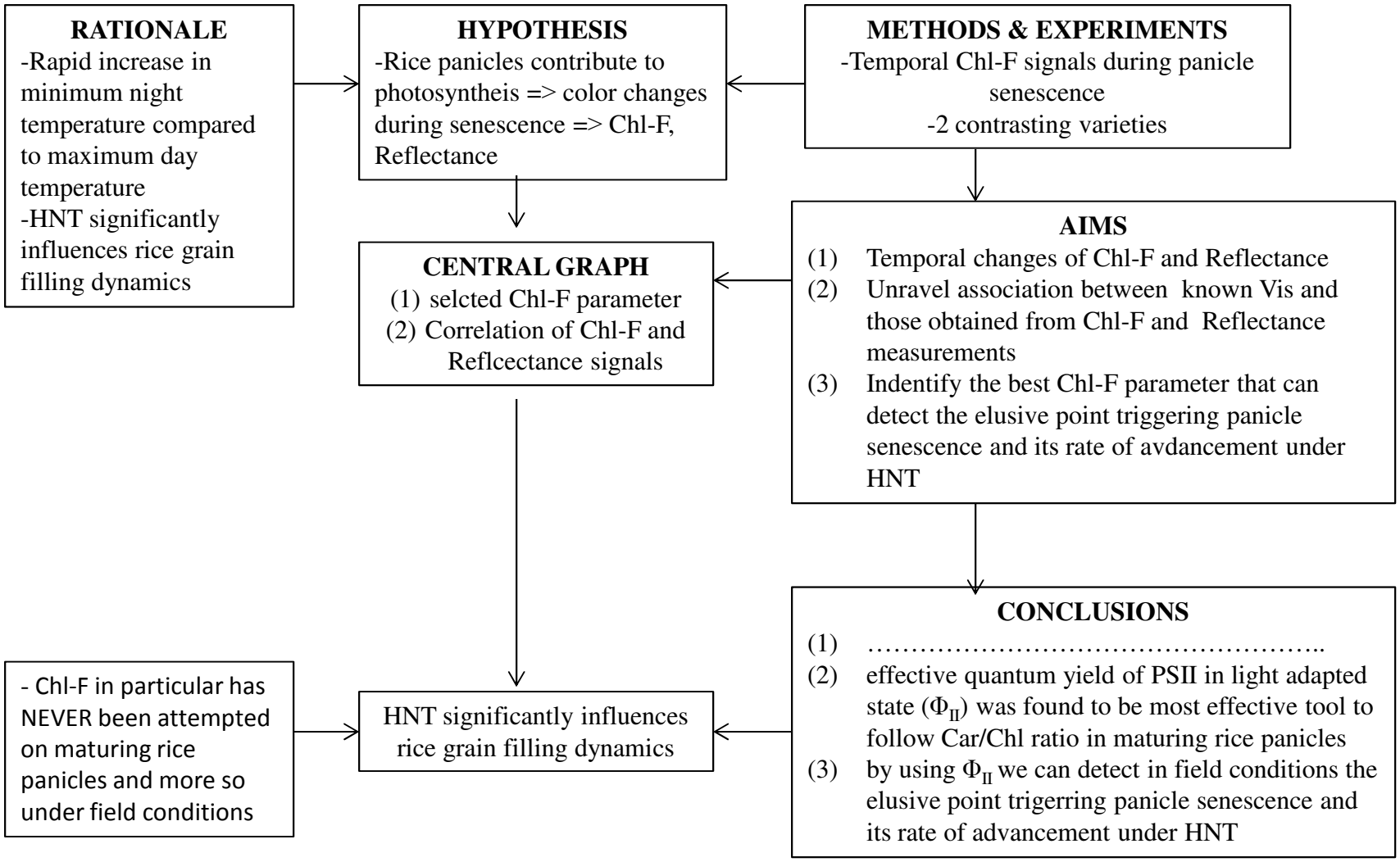
Conclusions

- **we found that the major effect on down-regulation of photosynthesis has the accumulation of carbohydrates and this effect is modified by nitrogen nutrition**
- **probably due to higher sink capacity in N+ treatment**
- **similar results were found for chlorophyl fluorescens parameter** PSII Φ_{PSII}



Detection of accelerated senescence of maturing rice panicles exposed to high-night temperature by chlorophyll fluorescence

David Šebela



Training school of scientific publishing and writing
Brno, 2. – 4. 2. 2015

Influence of variable weather on the incident solar radiation and its spectral composition in the Ostrava region, Czech Republic

Marie Opálková
PhD student of Biophysics
Department of Physics, Faculty of Science, University of Ostrava

RATIONALE:

- Clouds and air pollutants cause a reduction of incident solar radiation
- How much in our region?

METHODS:

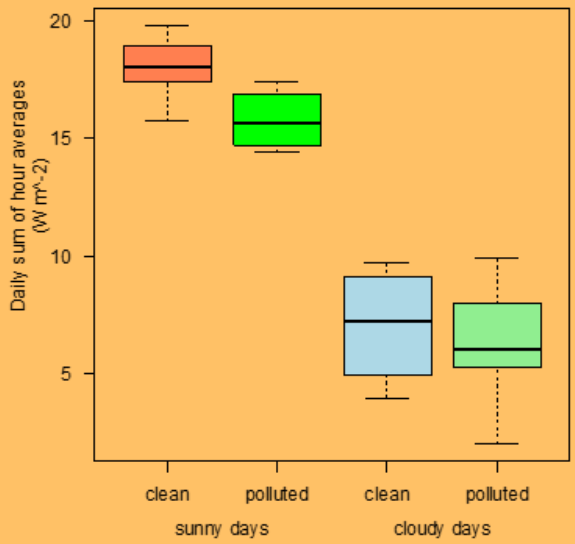
- Continuous measurement of spectral composition of incident solar radiation
- Percent differences in solar radiation between sunny, cloudy, clean and polluted days

HYPOTHESIS:

- Reduction of solar radiation by air pollution during both cloudy and sunny days

CENTRAL GRAPH:

- Graph comparing solar radiation during sunny, cloudy, clean and polluted days



TAKE HOME MESSAGE:

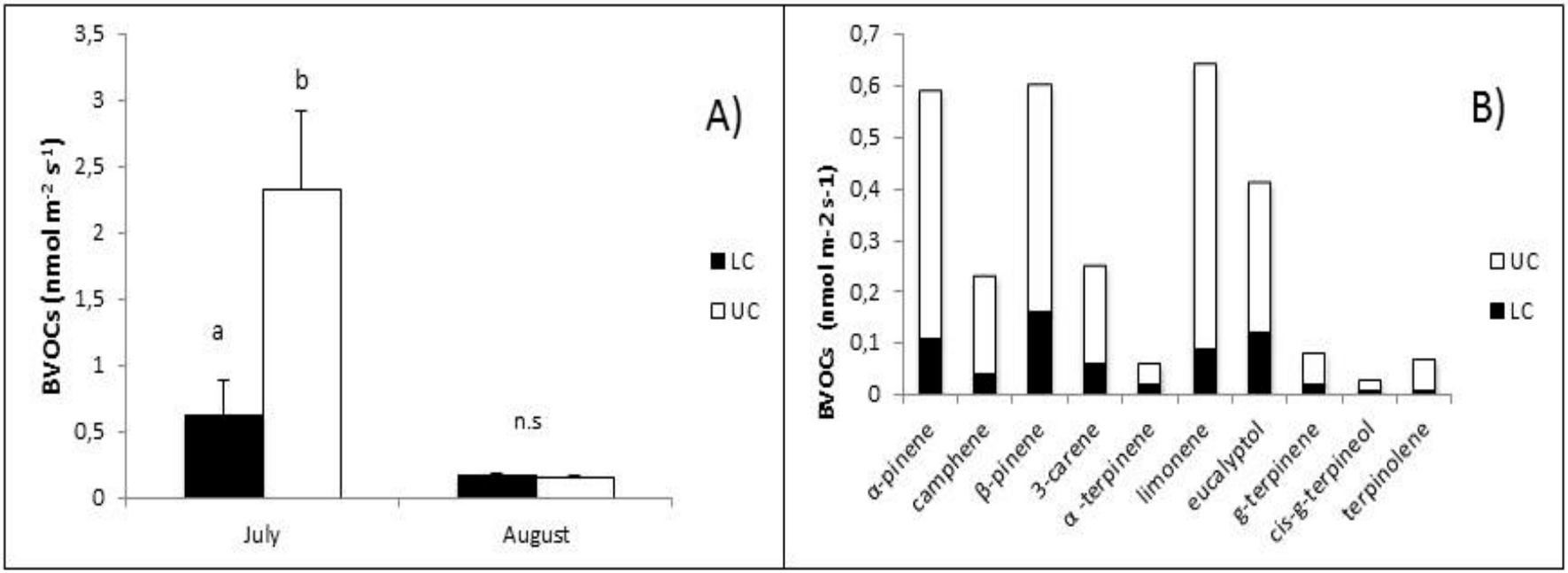
- Influence of atmospheric pollution on incident solar radiation is not negligible during both sunny and cloudy days

Thank you for attention

Seasonal changes in emissions and vertical distribution of biogenic volatile organic compounds within spruce canopy

Kristýna VEČEŘOVÁ

- to investigate seasonal changes in emissions of BVOCs and their vertical distribution within spruce canopy profile under the standard conditions (light intensity 1000 µmol m^{-2} s^{-1}, temperature 30 °C)
- Emissions were measured on current year needles from upper and lower canopy in early July and late August
- Sampled on Tenax tubes and then analysed on gas chromatography mass spectrometry (GC-MS)



A) Total BVOC emissions per unit needle area produced by Norway spruce (*Picea abies*), differences of emissions in early July (the daily average temperature 23 °C) and in late August (the daily average temperature 15 °C) in upper (UC) and lower canopy (LC) needles are shown. B) Differences between identified BVOCs in UC and LC needles in July. Mean values ± SE are shown for each treatment (n = 8).

Interactive effects of UV radiation and drought on the accumulation of flavonoids in selected herbs and grasses of the mountain grassland ecosystem

Effects of UV radiation and drought on the accumulation of flavonoids in plants

Barbora Veselá

MAIN HYPOTHESIS

- drought and ultraviolet (UV) radiation induce similar protective mechanisms

- **UV radiation alleviates the negative effects of drought on plants and ecosystems through stimulation of antioxidant accumulation (flavonoids)**

MATERIAL AND METHODS

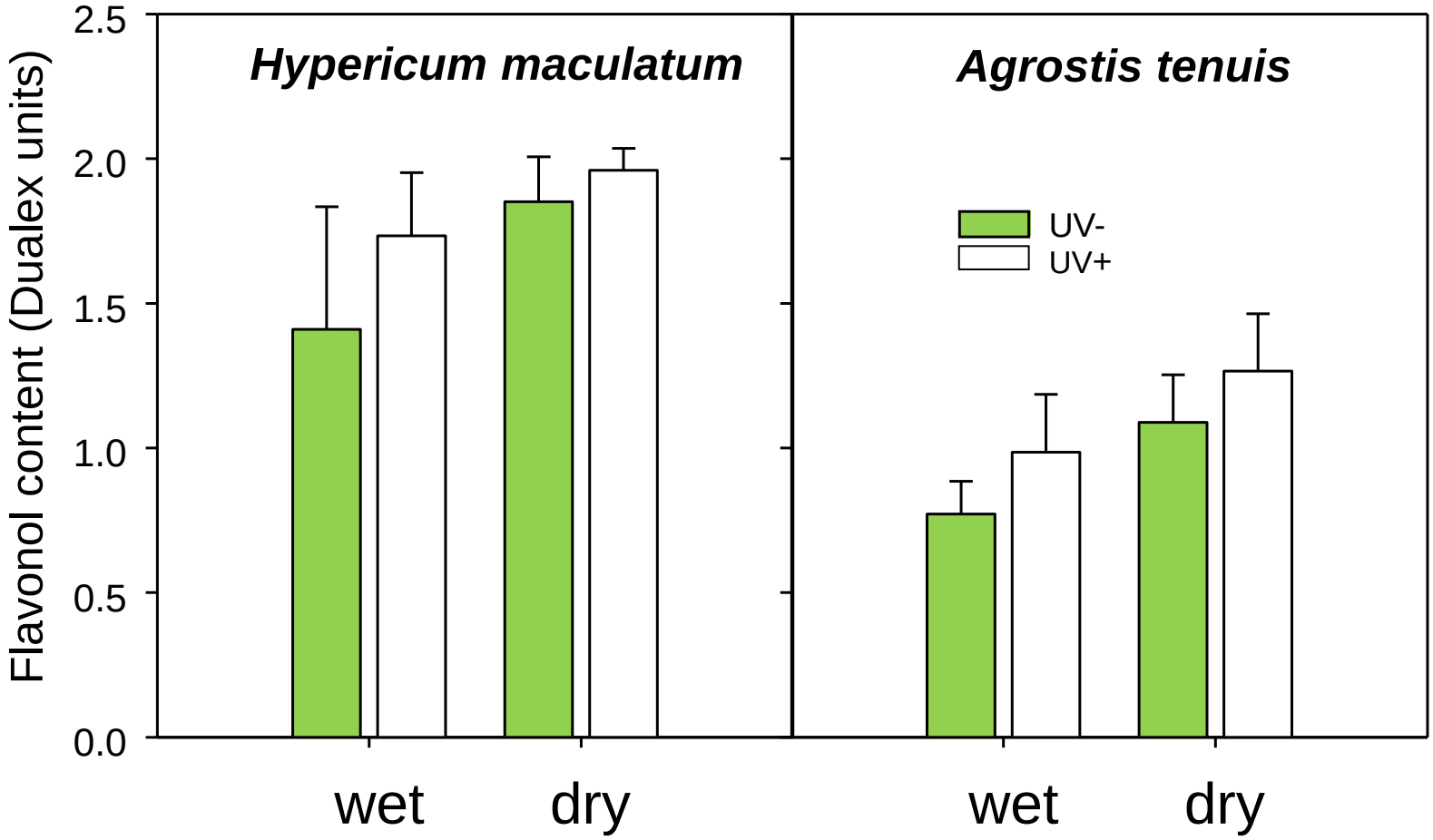
four treatments were maintained:

- [UV-] dry
- [UV+] dry
- [UV-] wet
- [UV+] wet

wet (transmitting precipitation)

dry (excluding precipitation)

MAIN RESULT


Flavonol content (Dualex units)
2.5
2.0
1.5
1.0
0.5
0.0
Hypericum maculatum
Agrostis tenuis
UV-
UV+
wet
dry
wet
dry

TAKE HOME MESSAGE

- UV radiation can moderate the negative effect of drought on both mono- and di-cotyledon species due to increased content of flavonoids

- **interaction of drough and UV radiation is very important for plants in natural ecosystems**