

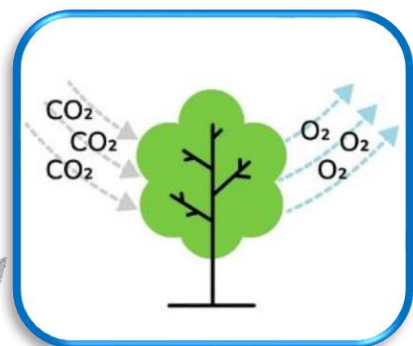
INFLUENCE OF METEOROLOGICAL
CONDITIONS ON A YOUNG BEECH FOREST
GROSS PRIMARY PRODUCTIVITY: INSIGHTS
FROM 24 YEAR-LONG MEASUREMENTS
USING A NOVEL WAVELET-BASED
APPROACH

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GEMBLOUX AGRO BIO-TECH, ULIEGE - BELGIUM

OBJECTIVES AND CONTEXT

Influence of **meteorological conditions** on a **young beech forest** gross primary productivity: Insights from **24 year-long measurements** using a novel **wavelet-based approach**



Study site

1 90% Beech (*Fagus Sylvatica L.*)

2 50 years-old in 2014

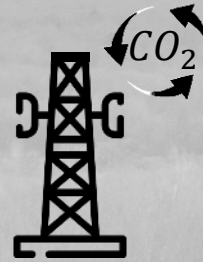
3 Sparse understorey vegetation

4 24 years of continuous 30 min data (1997-2020)

5 Regular thinning (1999, 2005, 2010, 2016)



Data



Eddy covariance
measurements
CO₂ Fluxes (GPP)



Available variables
R_g, T_{air}, P, VPD, REW

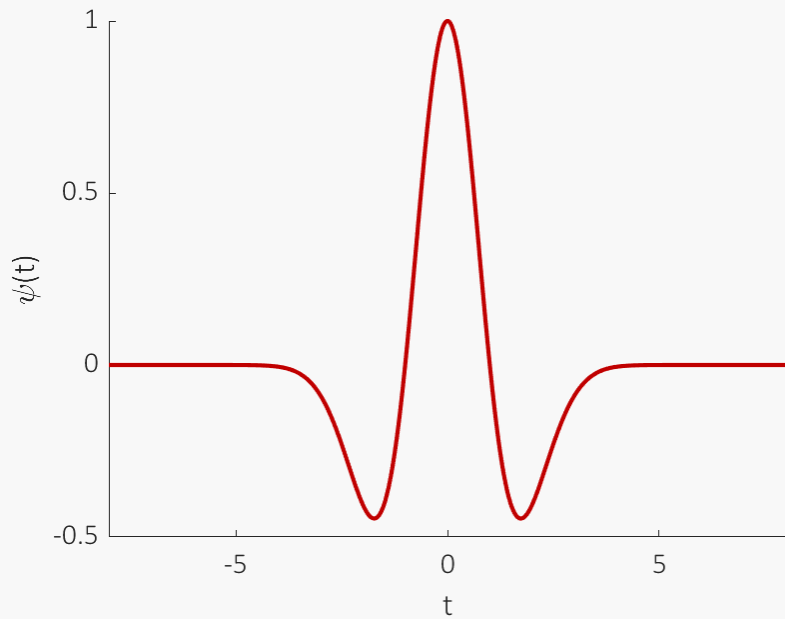


LAI, circumference
measurements (automatic
and manual)


Wavelet Area Interpretation (WAI)

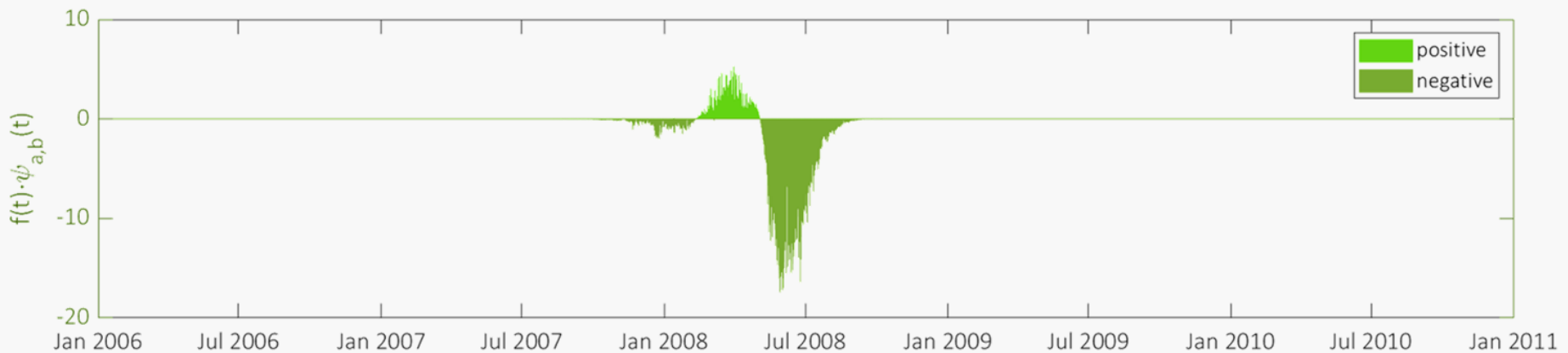
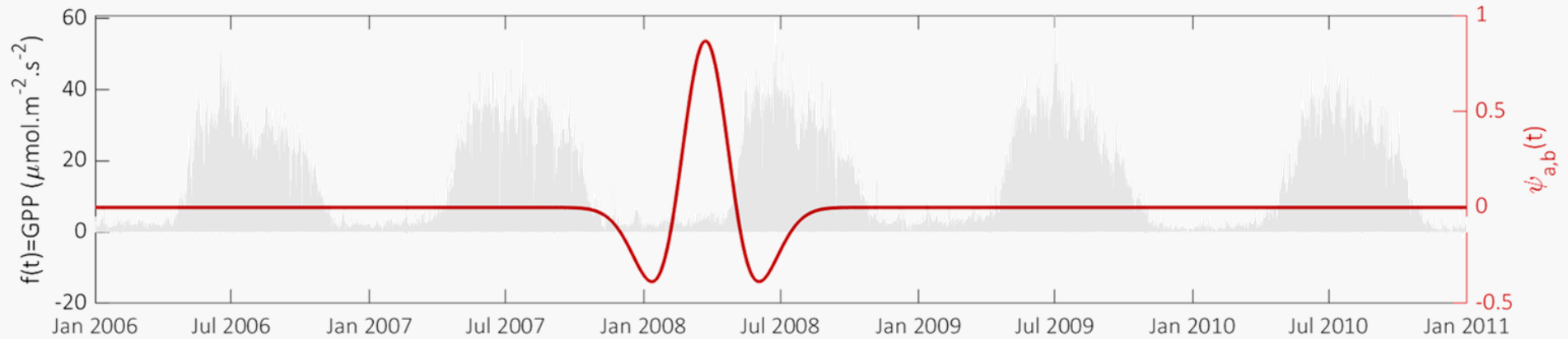
$$\int_{-\infty}^{+\infty} f(t) \psi_{a,b}^*(t) dt$$

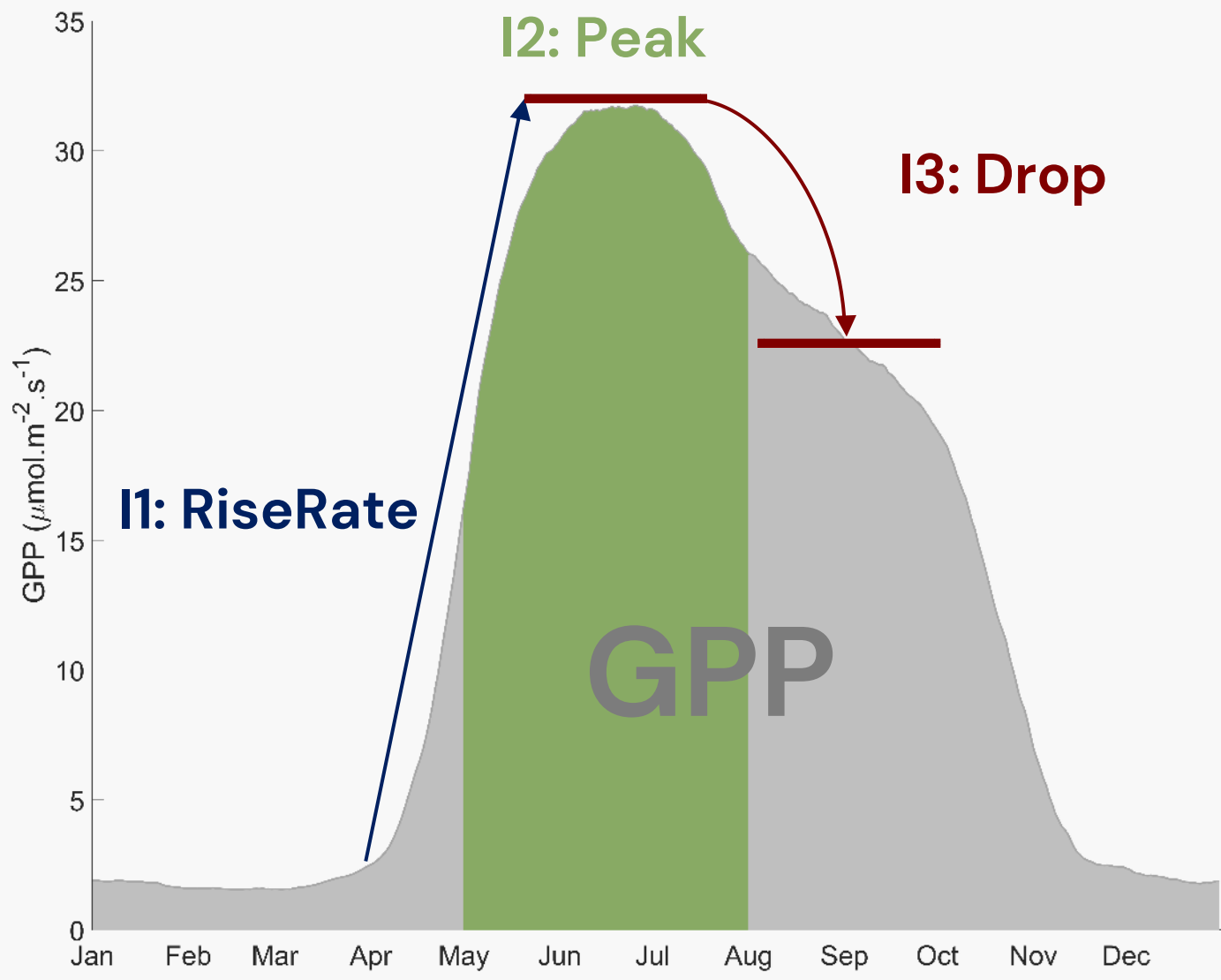
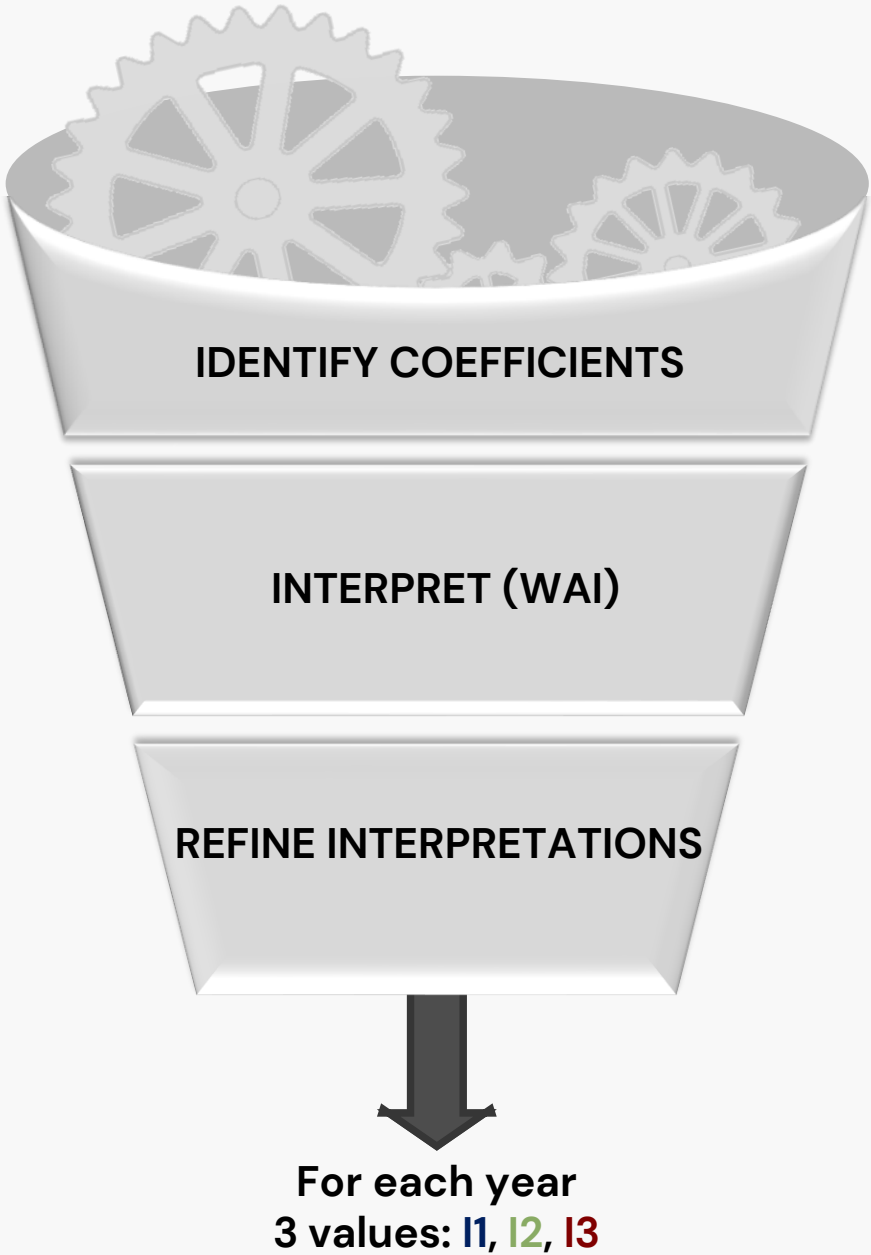
scale position



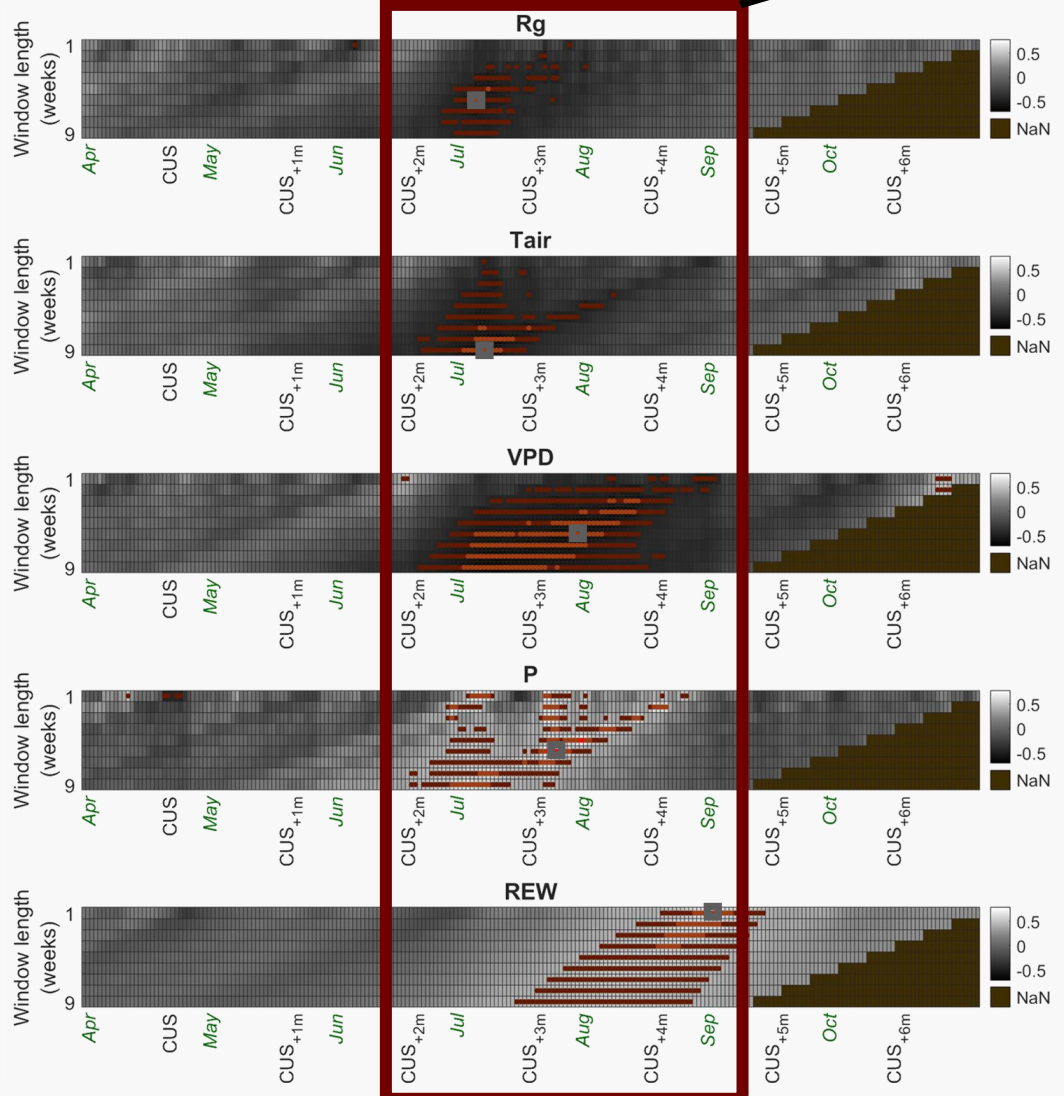
Wavelet Area Interpretation (WAI)

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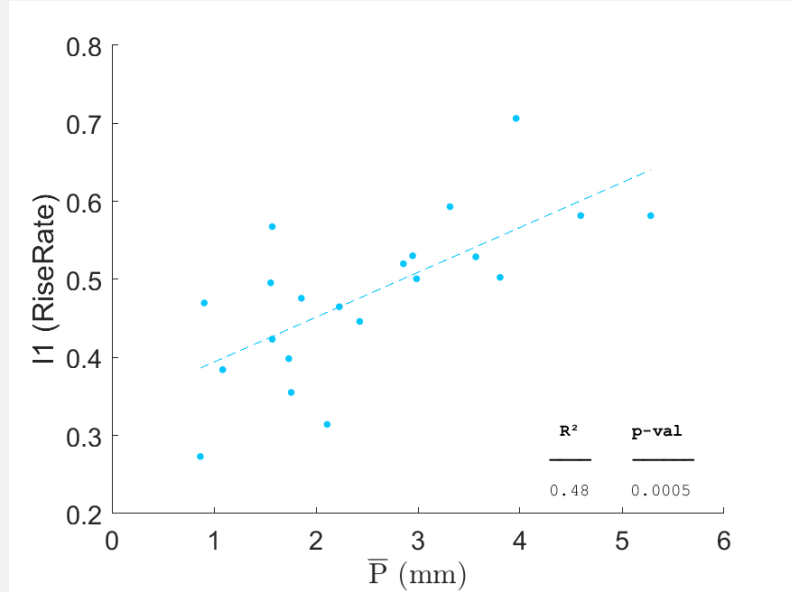




I1 - Previous year



	Partial correlation Control : P	P-value
VPD	-0.28	0.23
Tair	-0.3	0.21
Rg	-0.27	0.26
REW	0.09	0.71



Precipitation



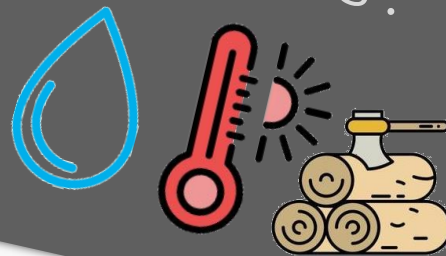
Extremes



Thinning



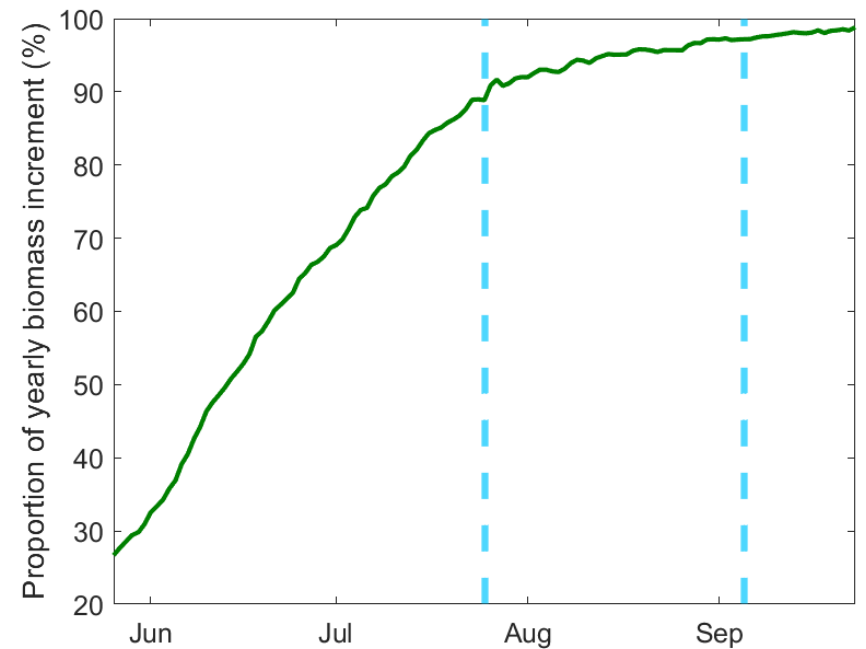
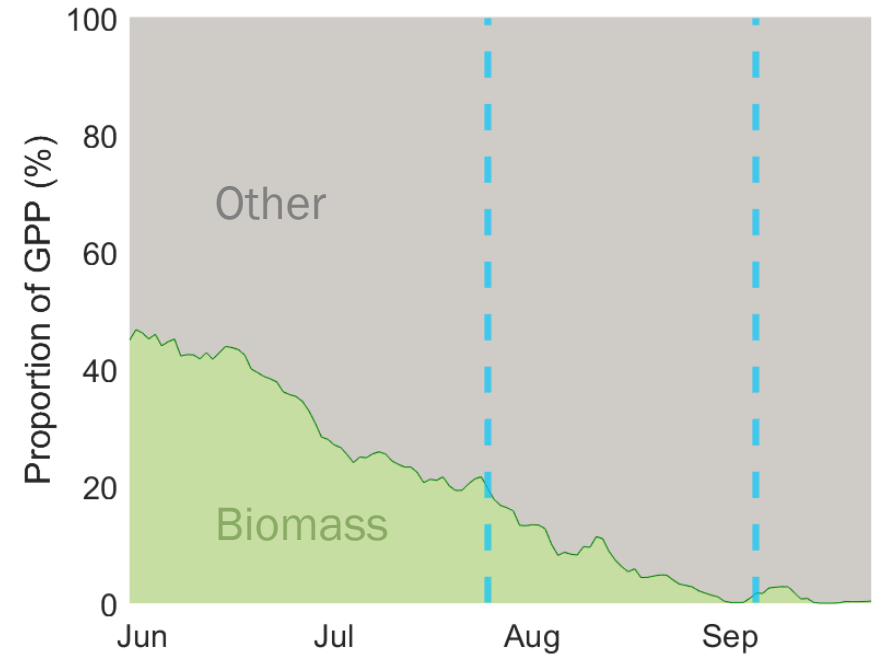
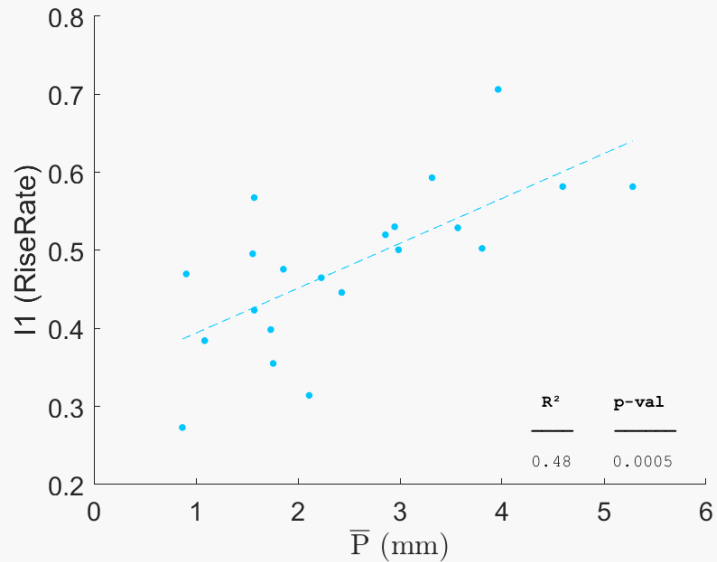
Studied events:





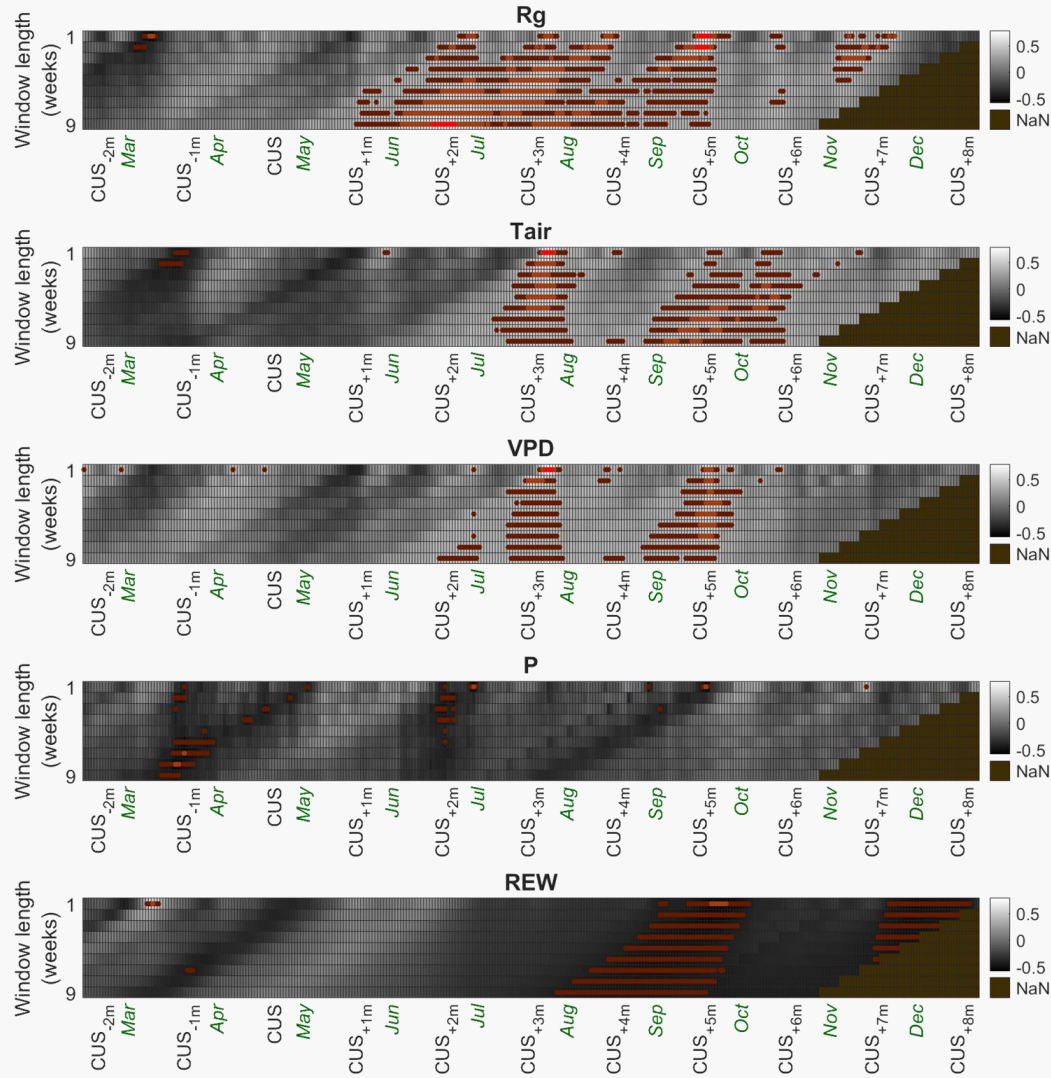
Precipitations

- Less pronounced drop in August
- Increased period of tree growth
- Decreased proportion of GPP allocated to biomass
 - **Reserves**
 - **Bud formation (Leaf primordia)**

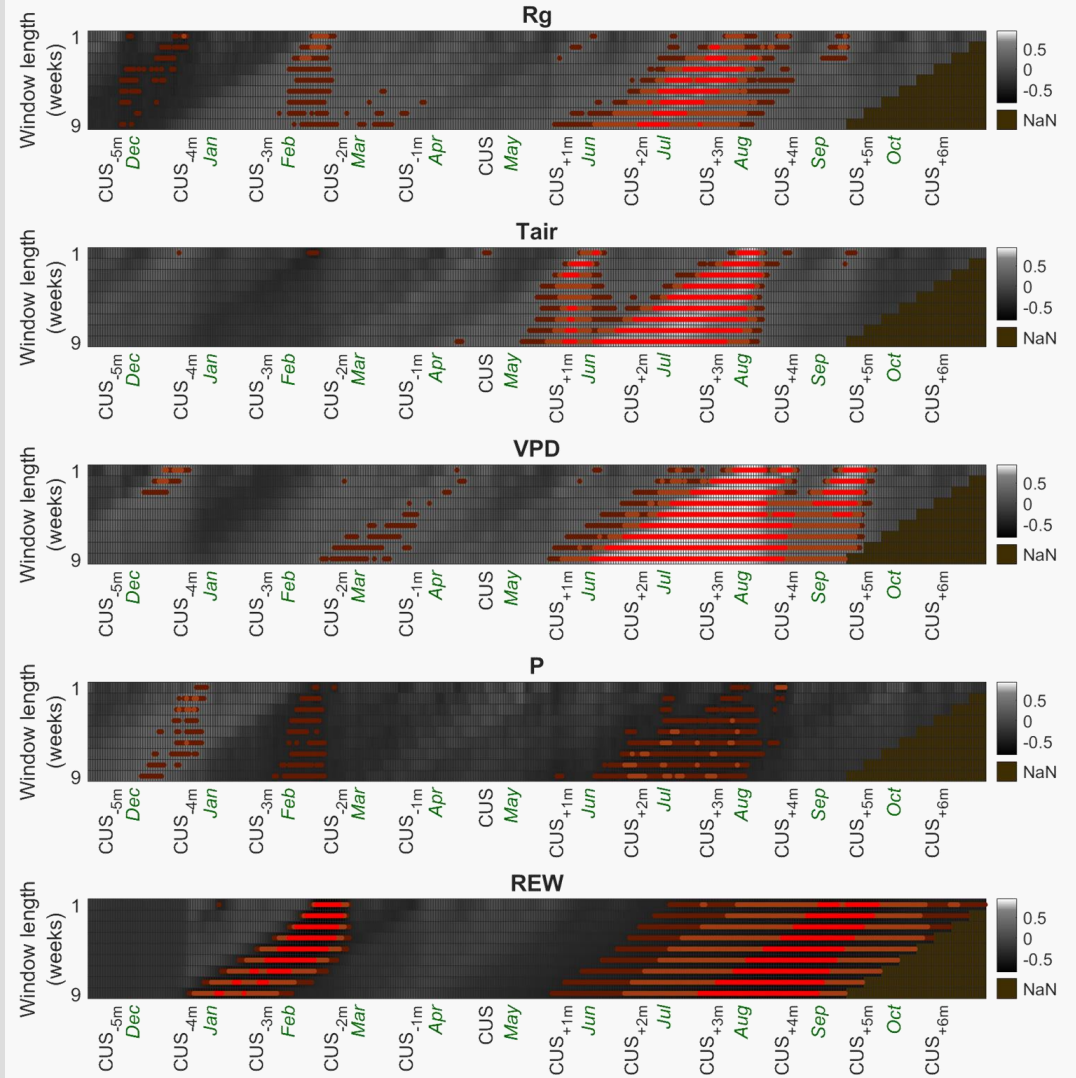




12 - Current year

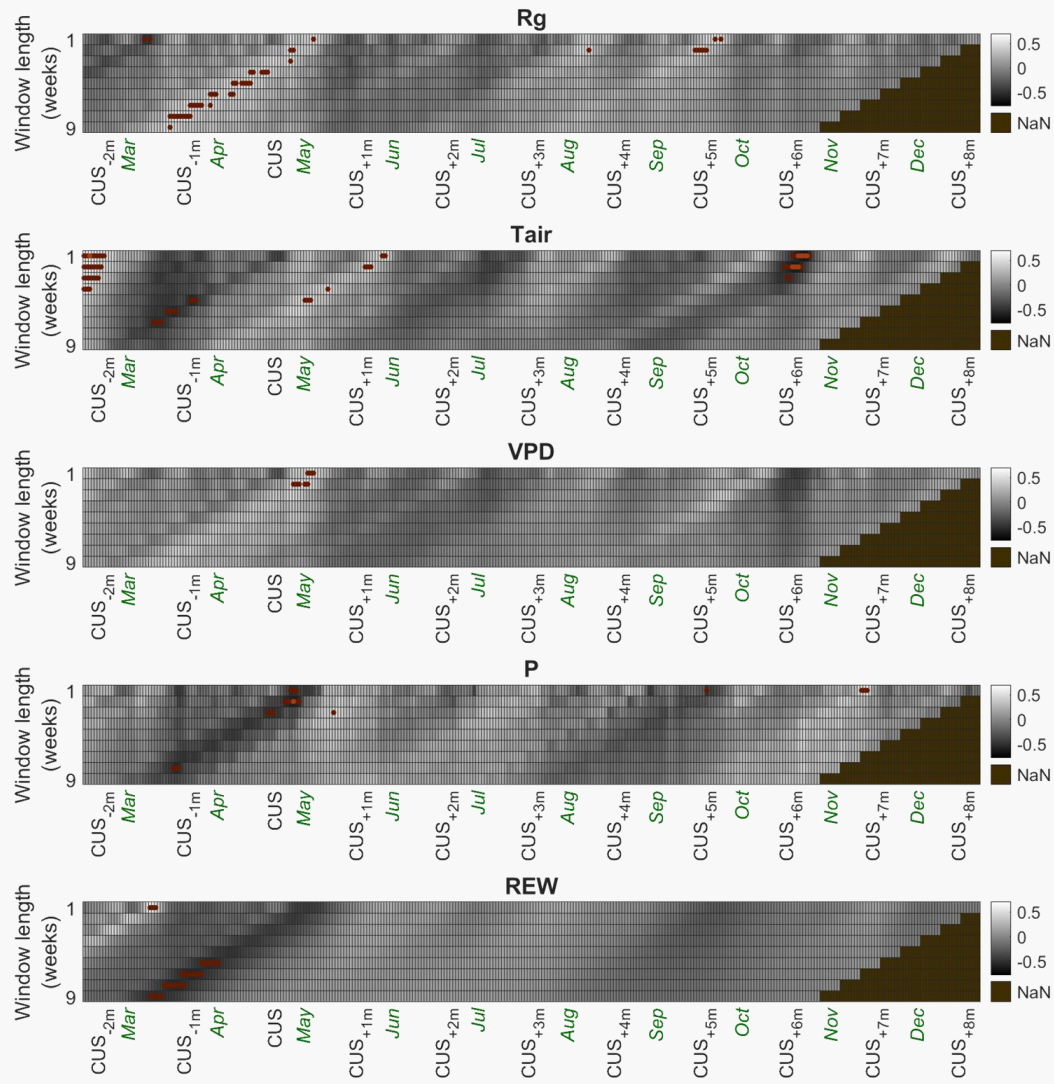


13 - Current year

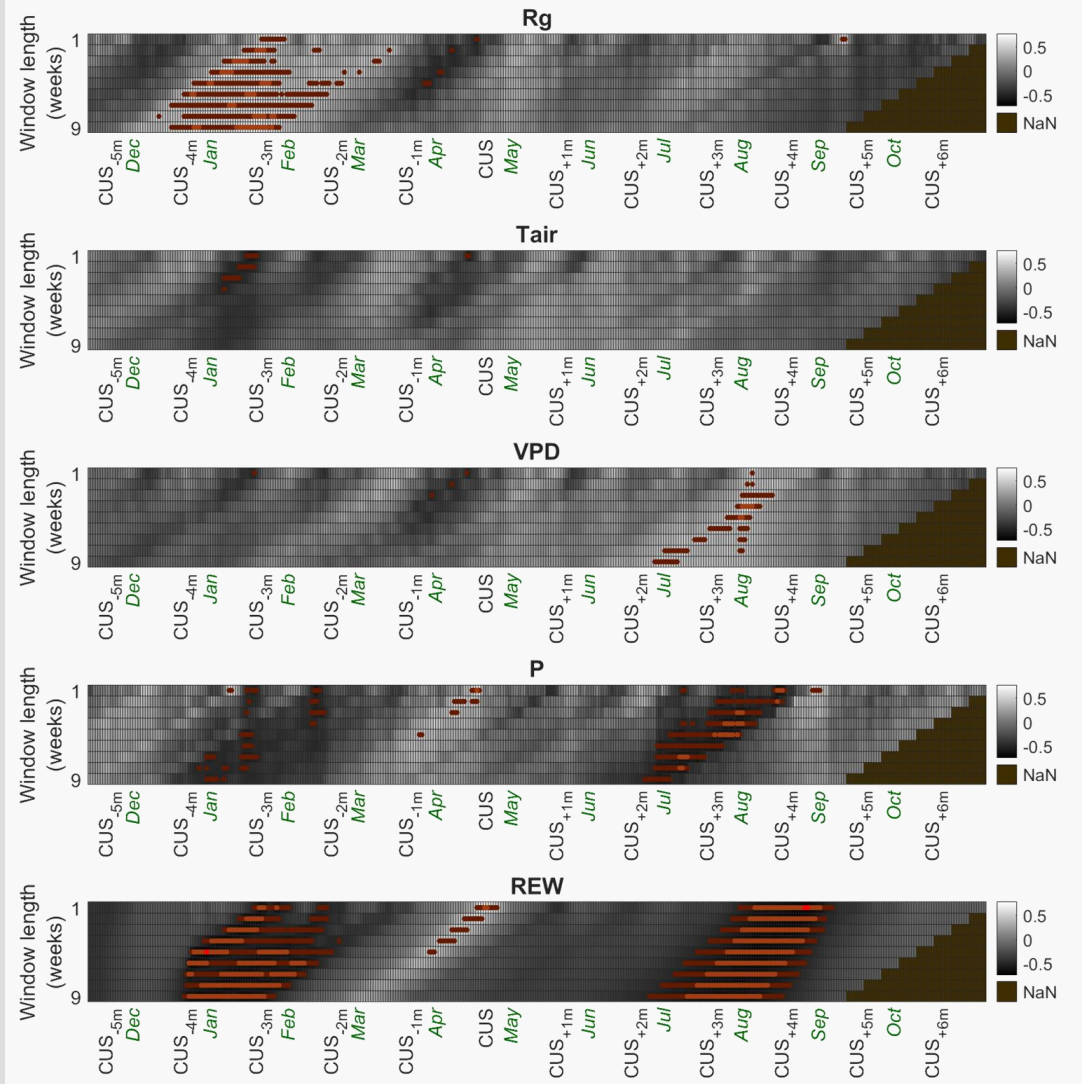




12 - Current year

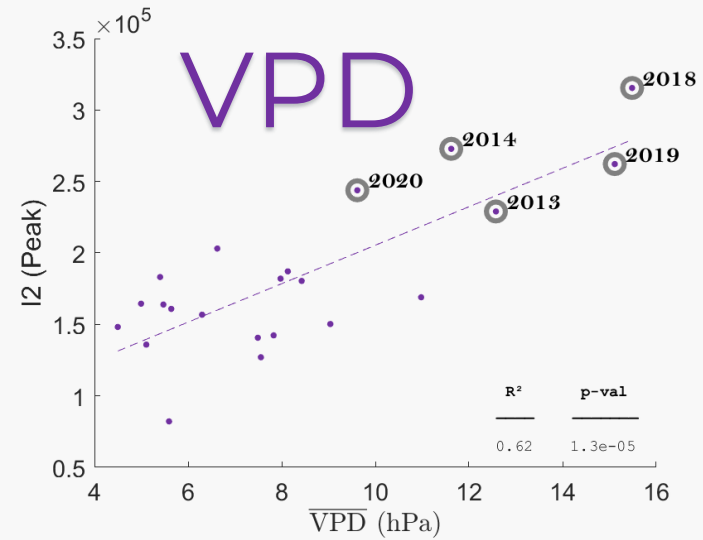
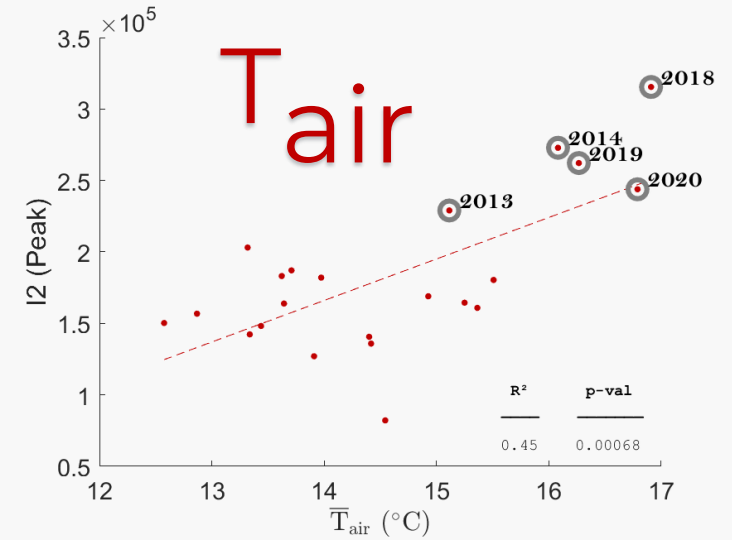
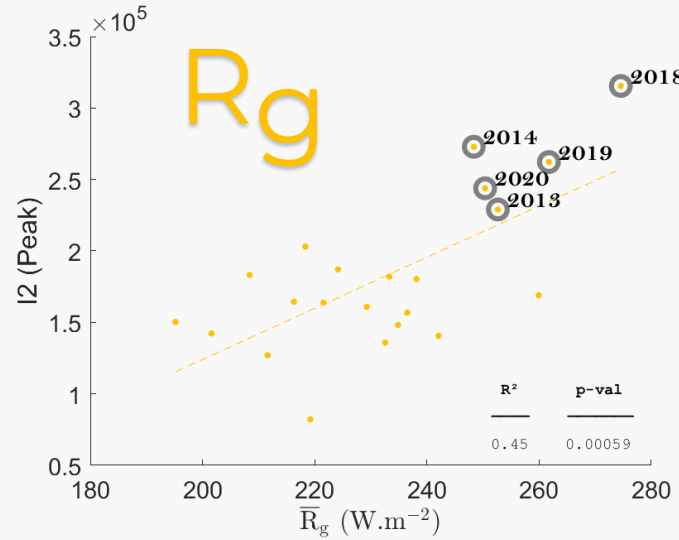
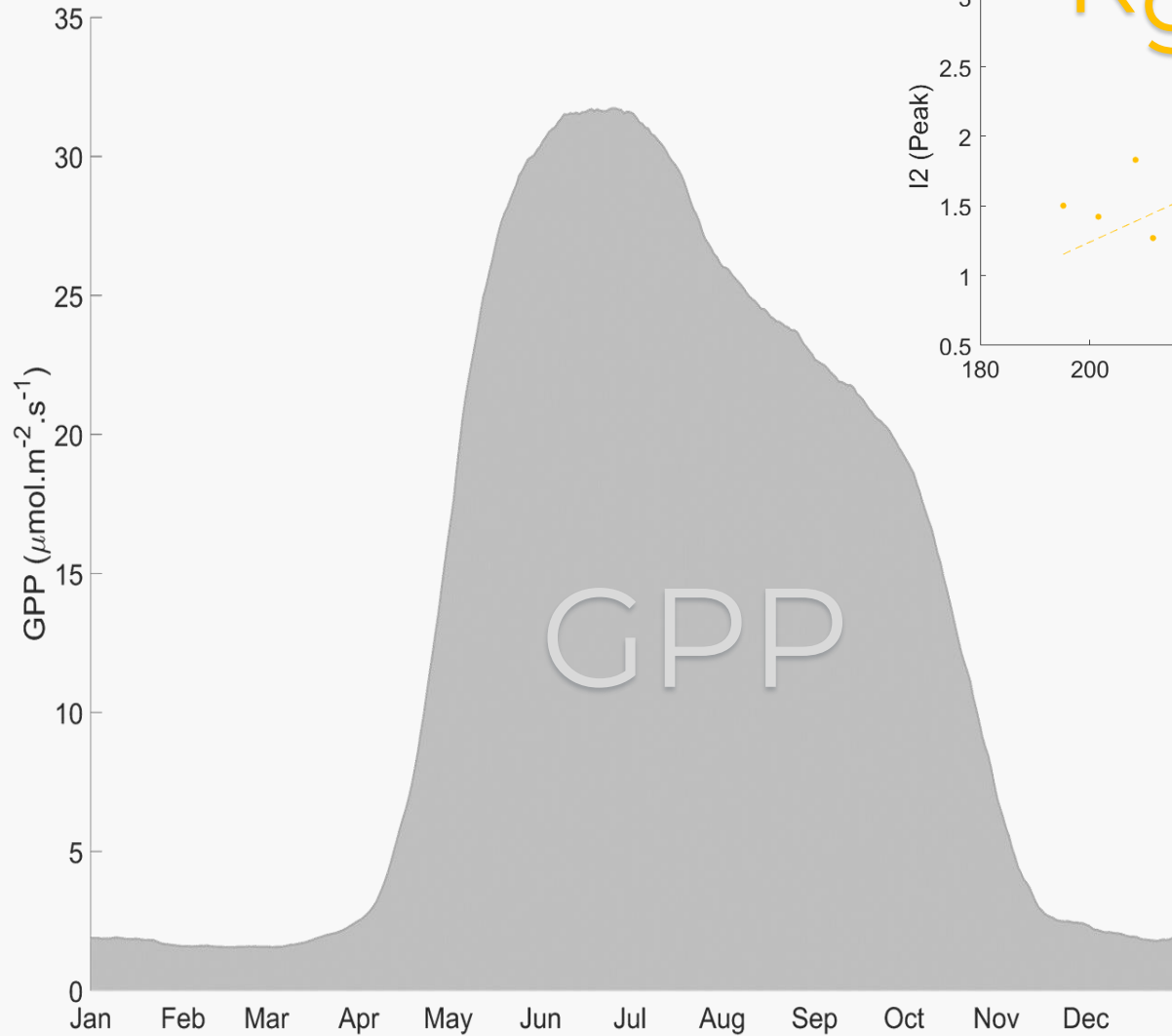


13 - Current year



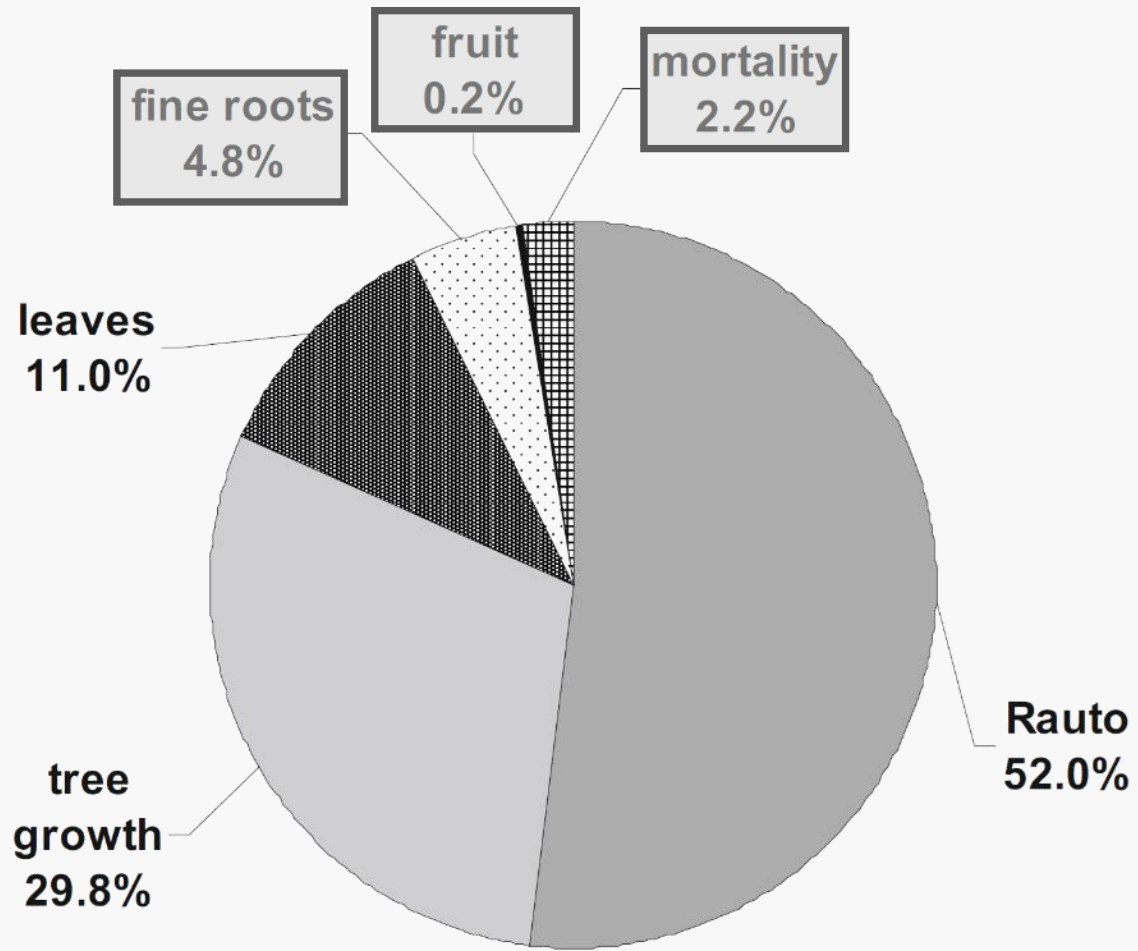


I2 - Current year





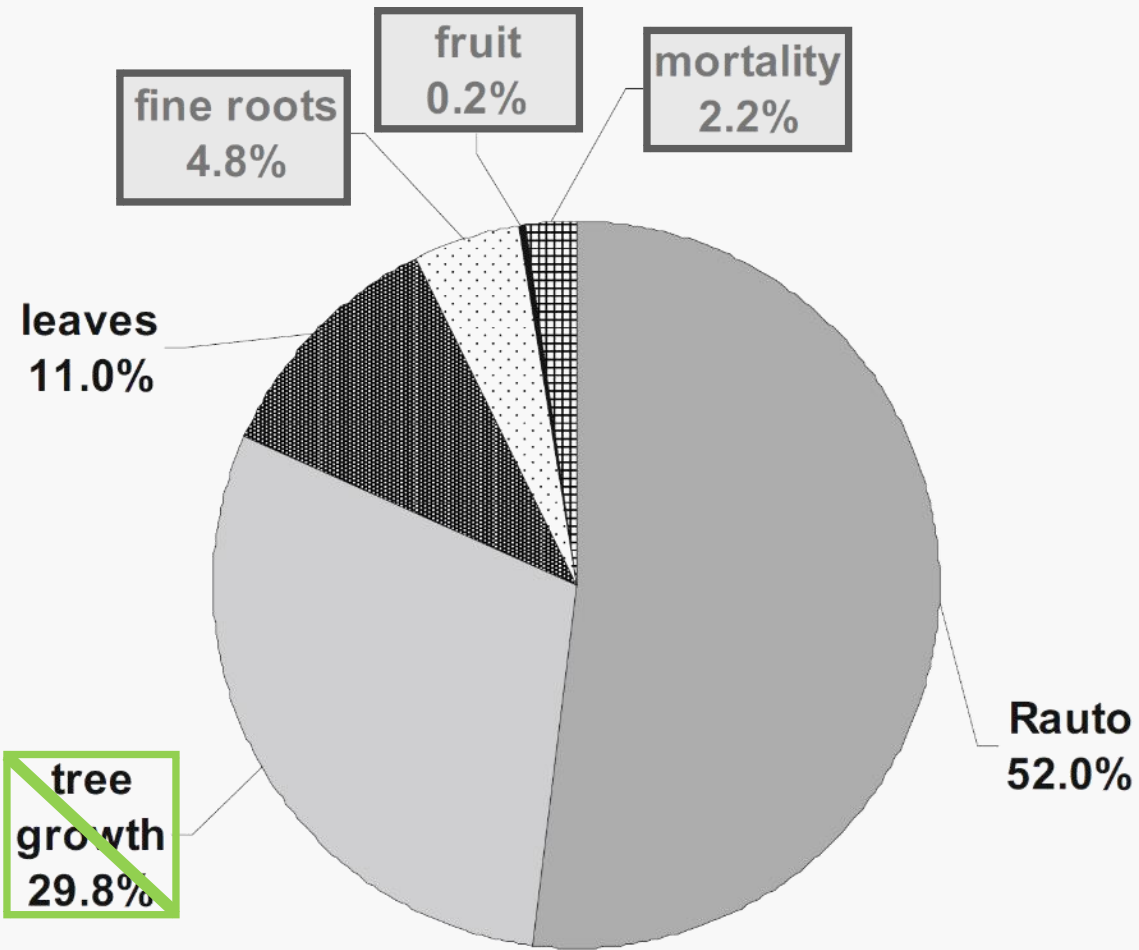
Fate of the GPP at Hesse



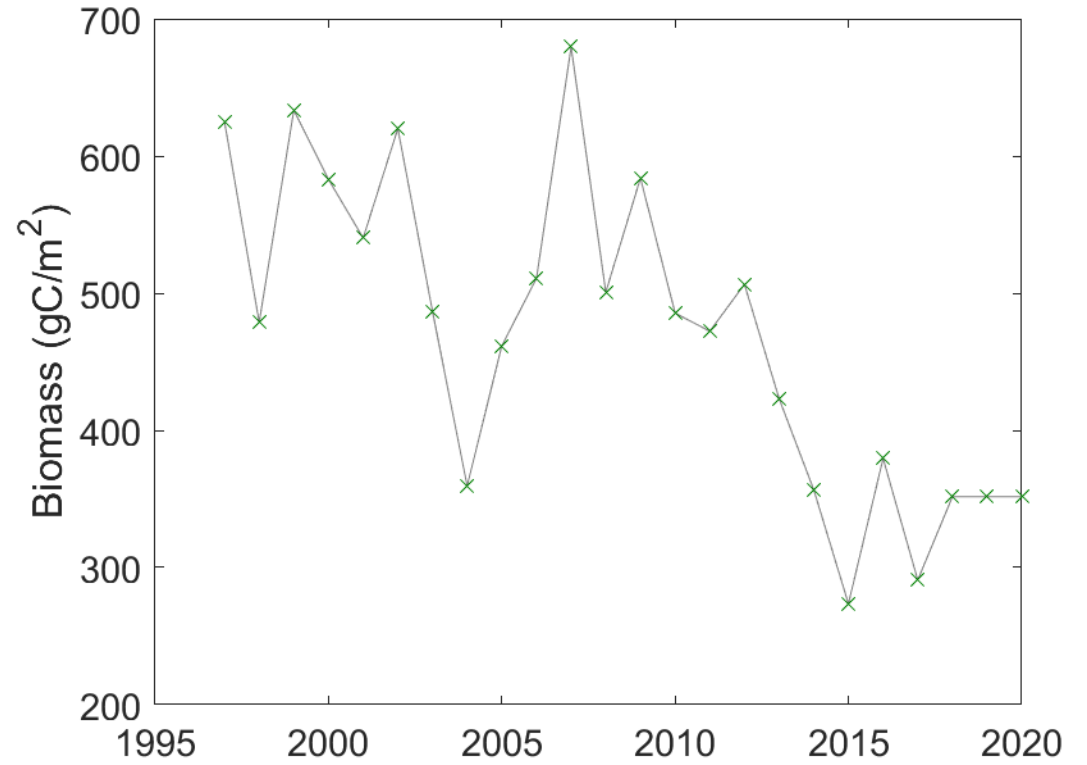
Granier et al. (2008)



Fate of the GPP at Hesse

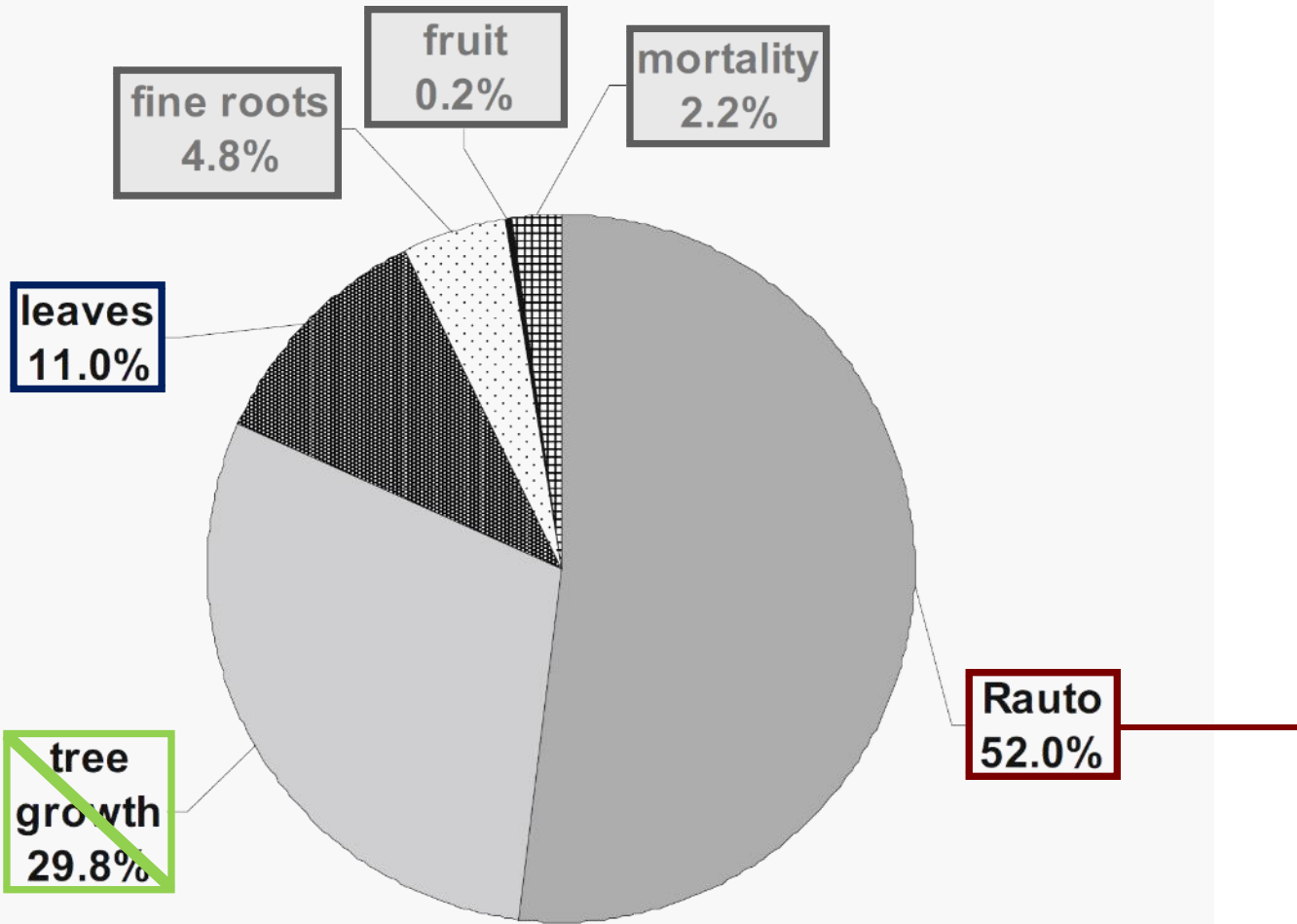


Granier et al. (2008)

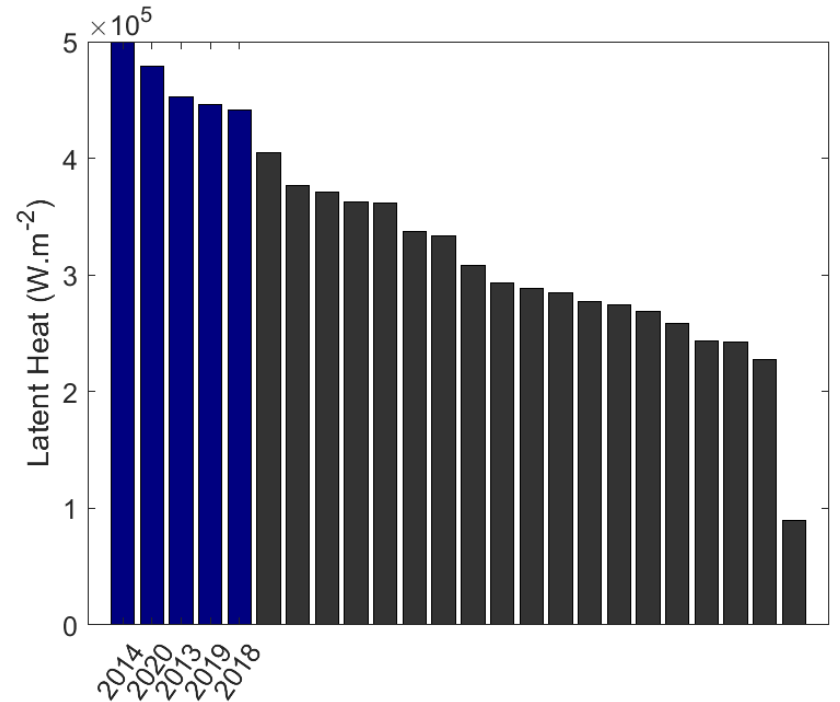
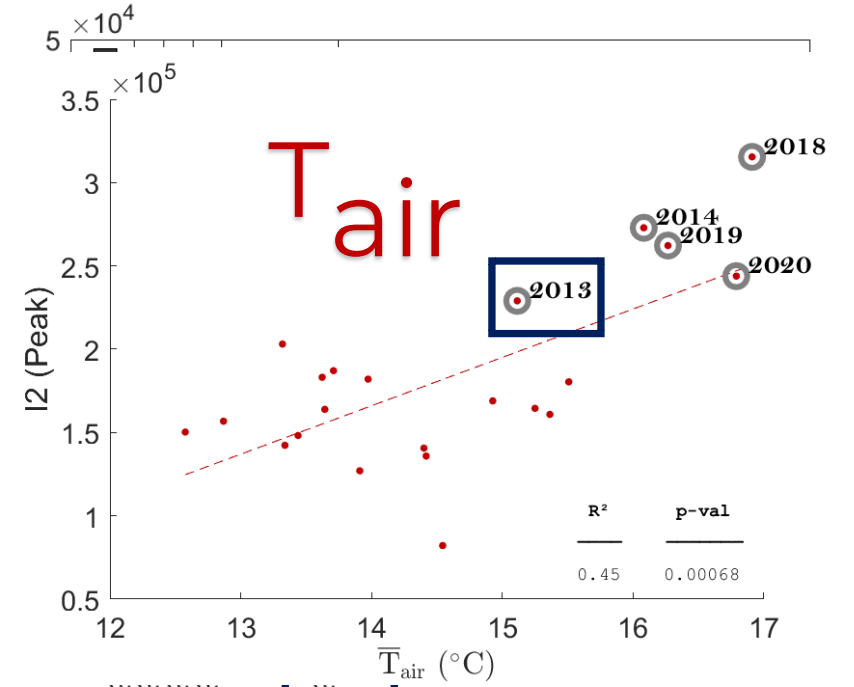


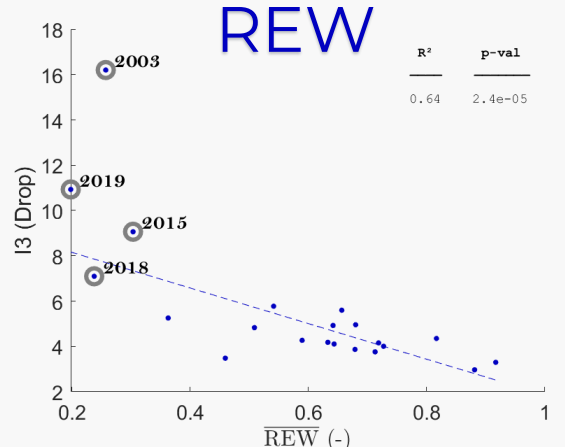
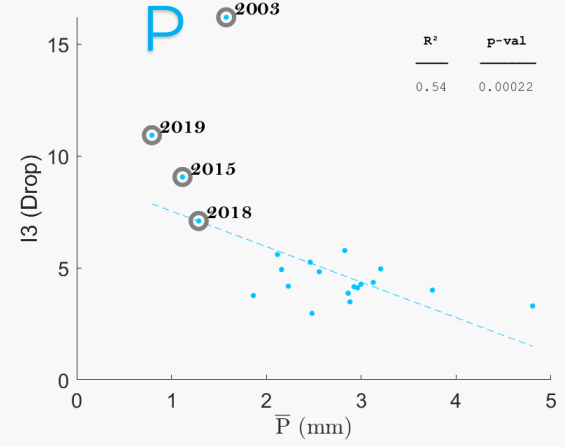
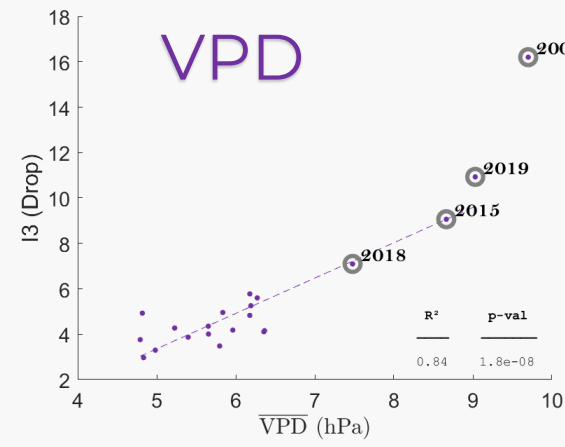
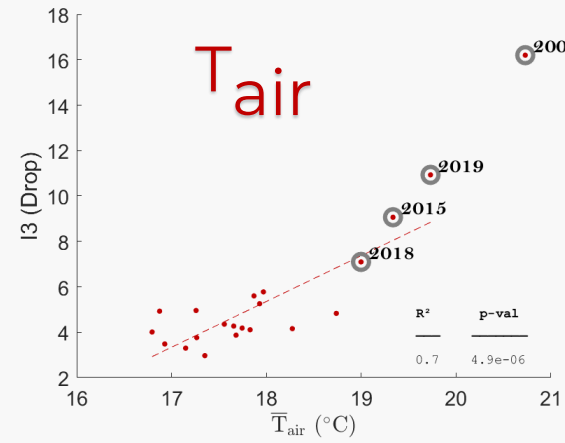
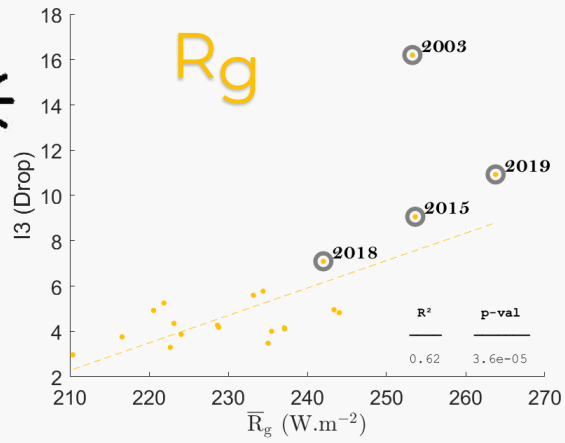


Fate of the GPP at Hesse

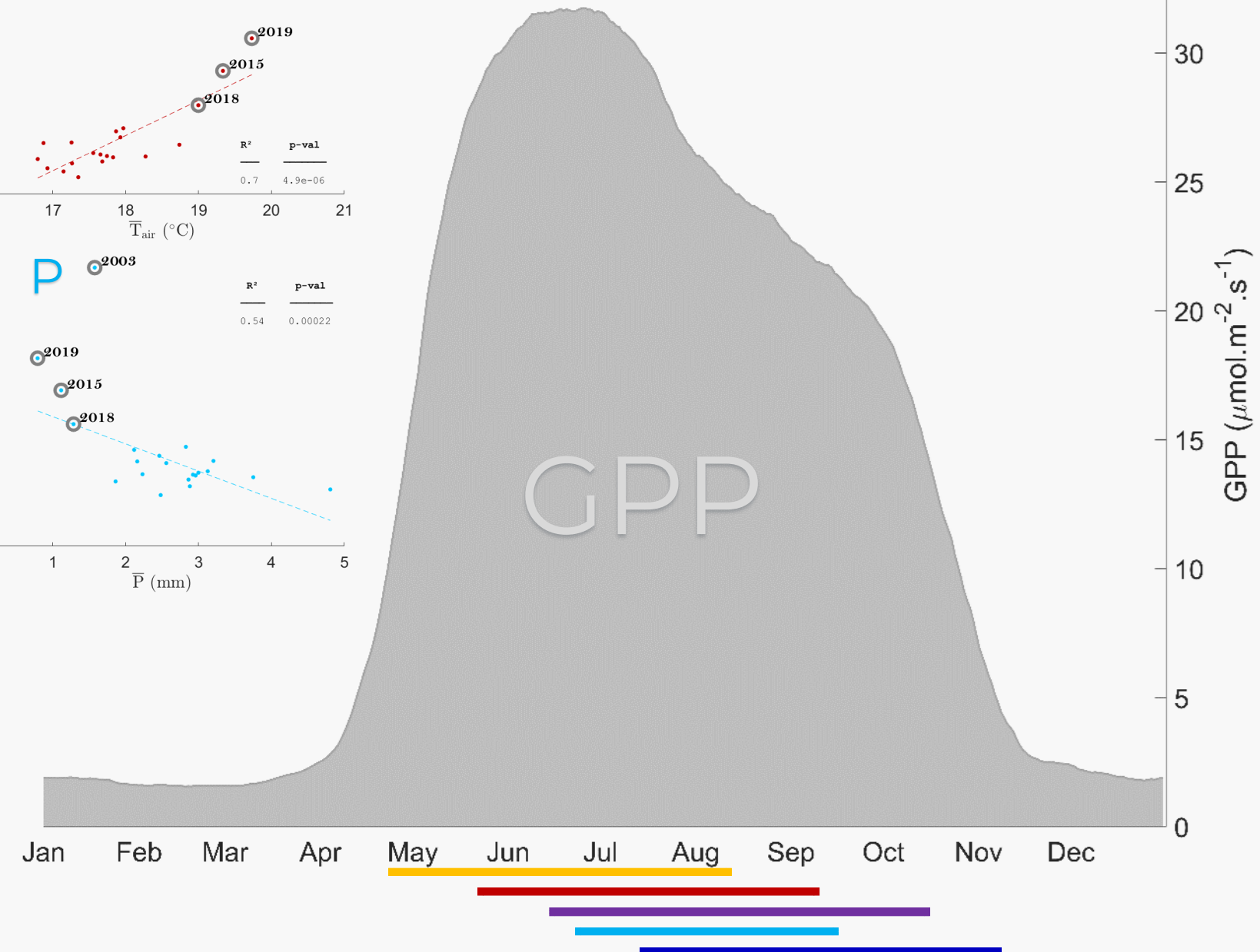


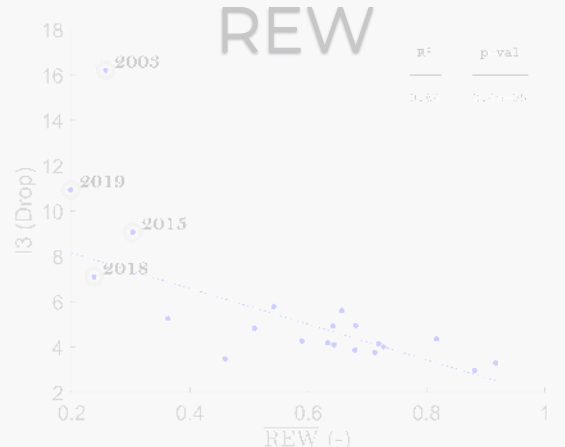
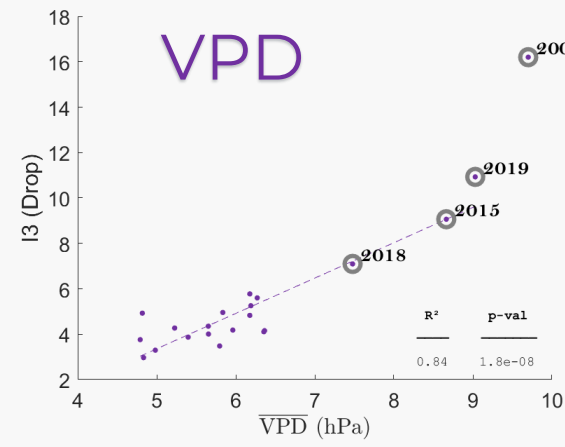
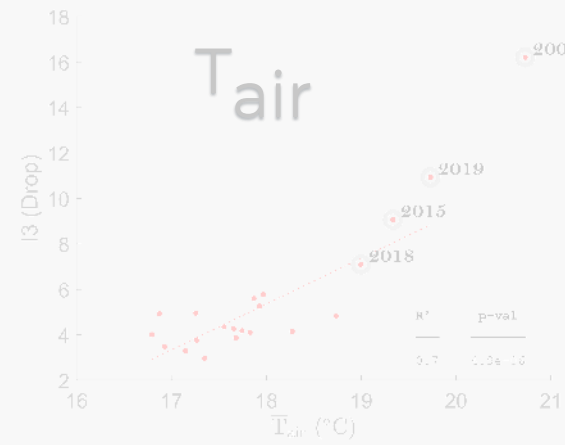
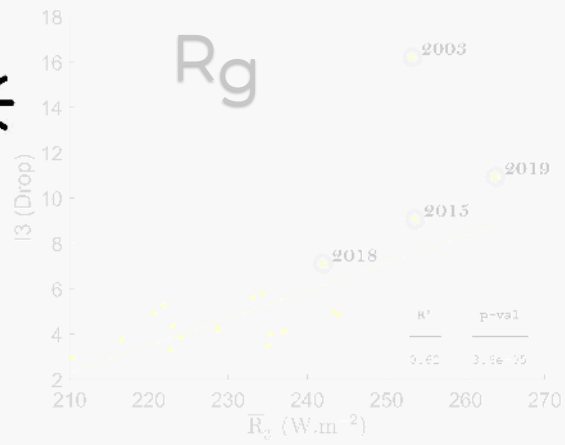
Granier et al. (2008)



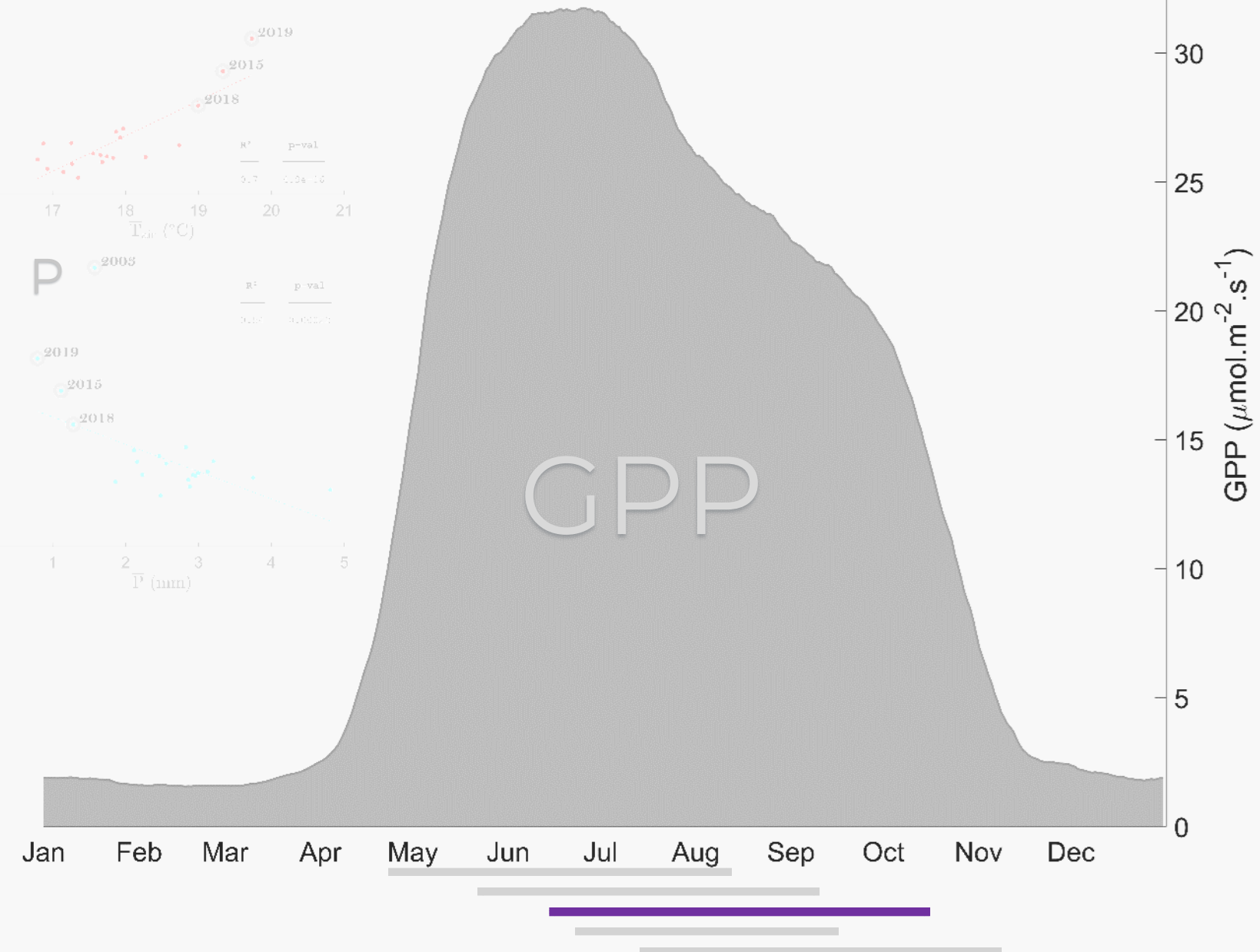


I3 - Current year



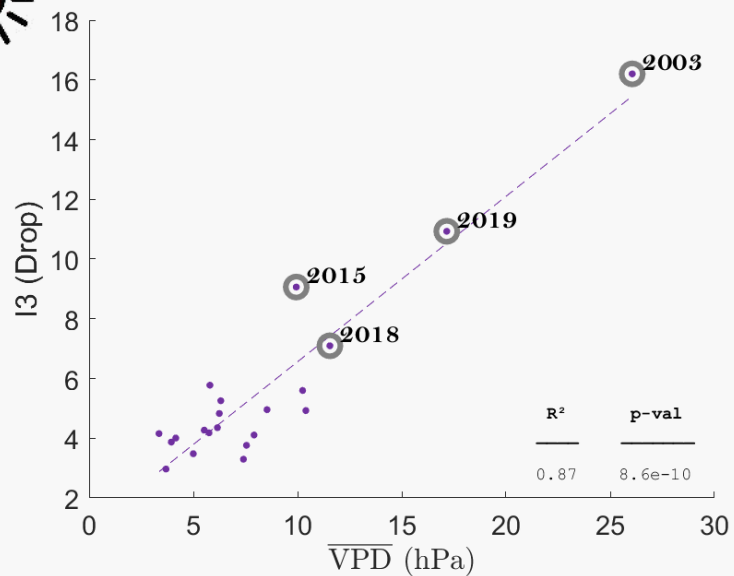


I3 - Current year

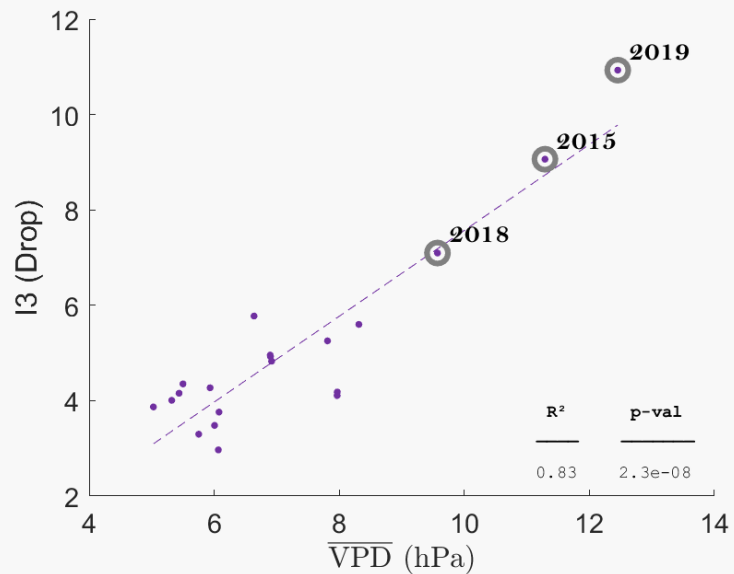




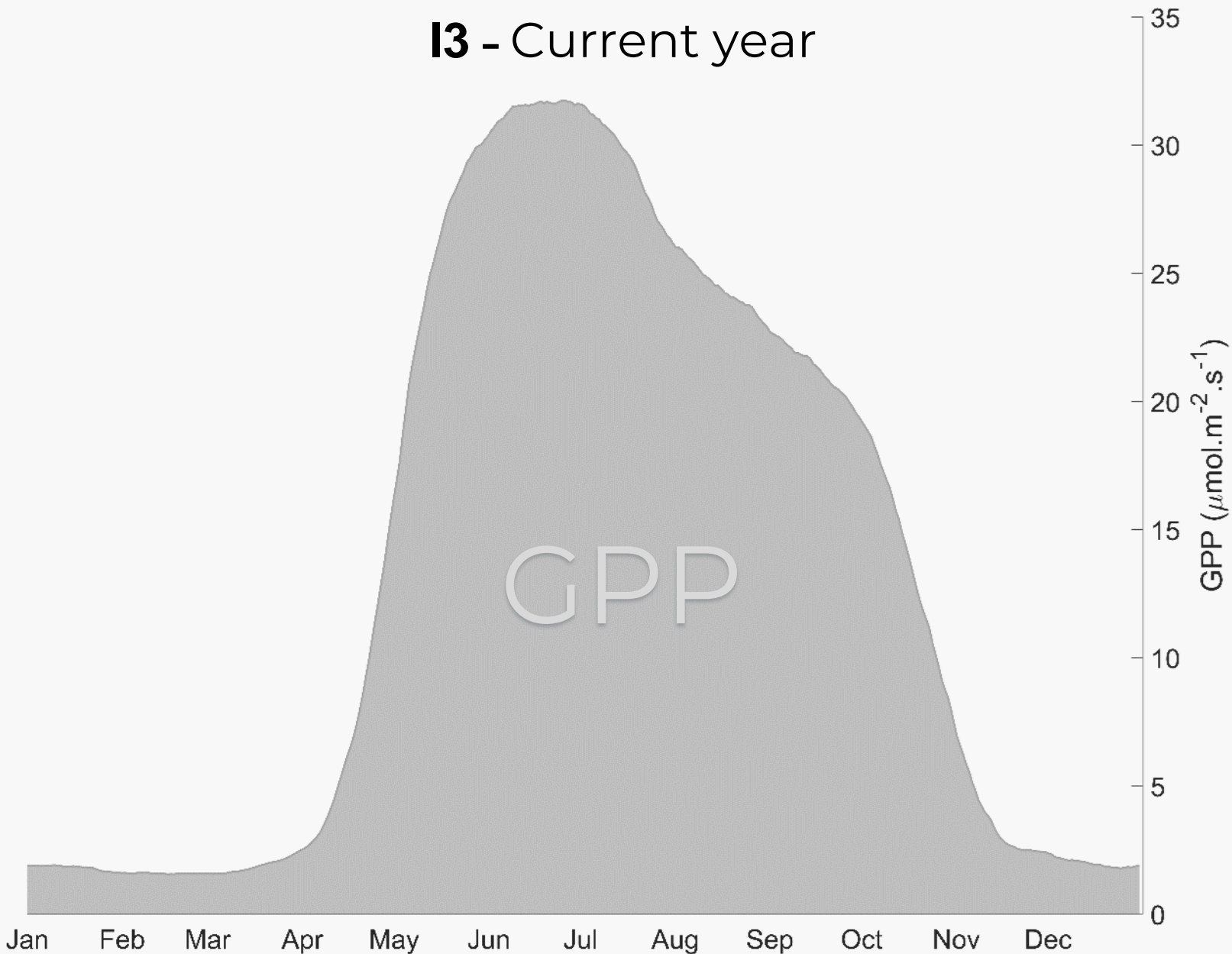
All years



Without 2003



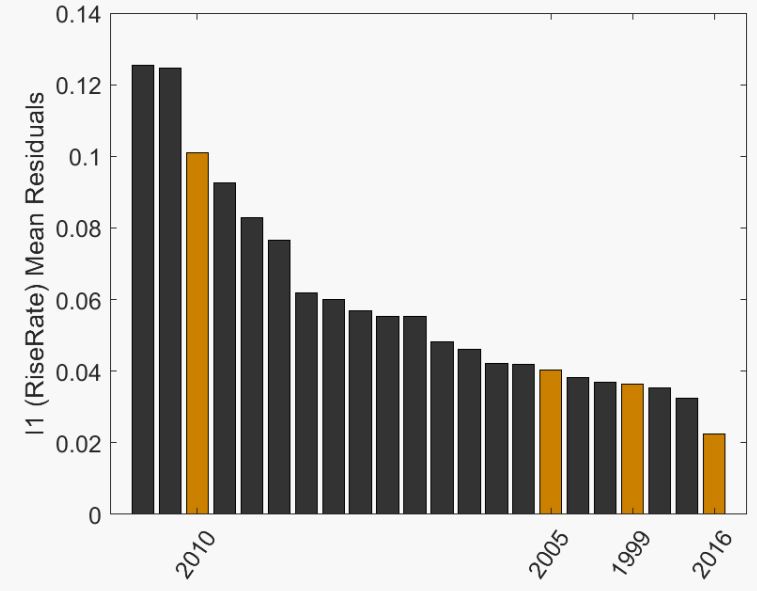
I3 - Current year



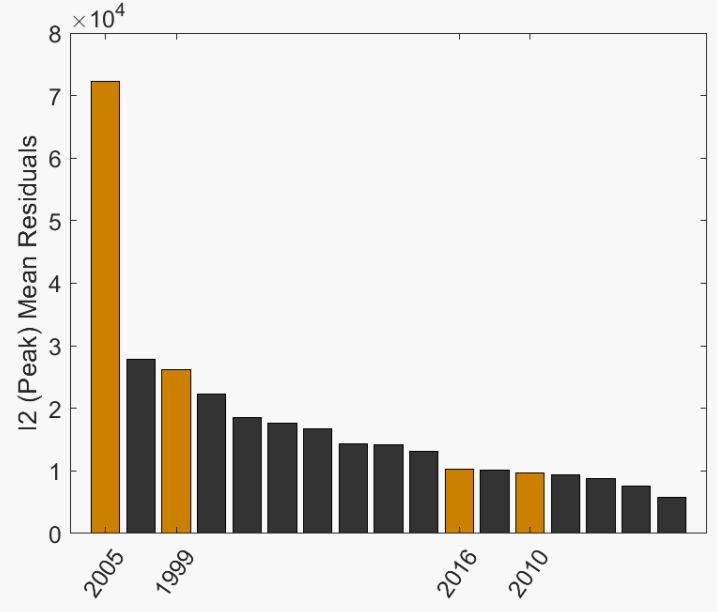


Thinning

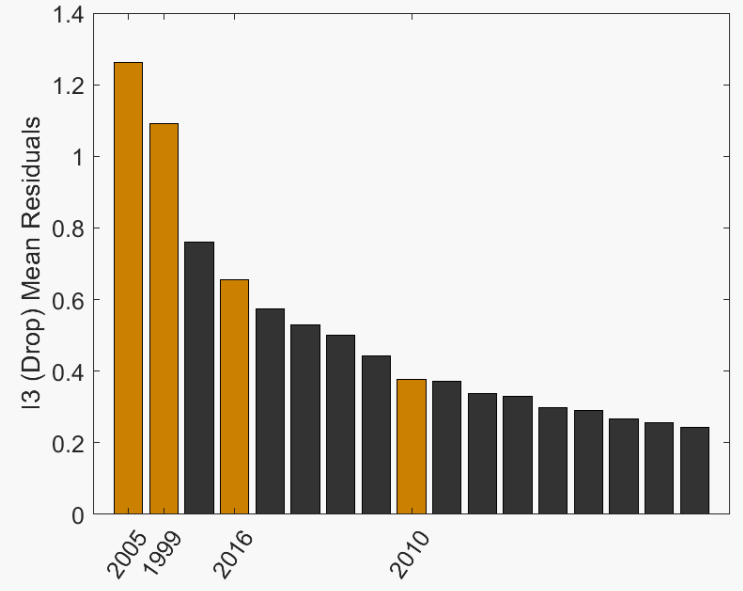
11



12



13



CONCLUSION

1

WAI: new perspectives

- Intra-annual dynamics comparison
- Localised effects of drivers
- Date selection

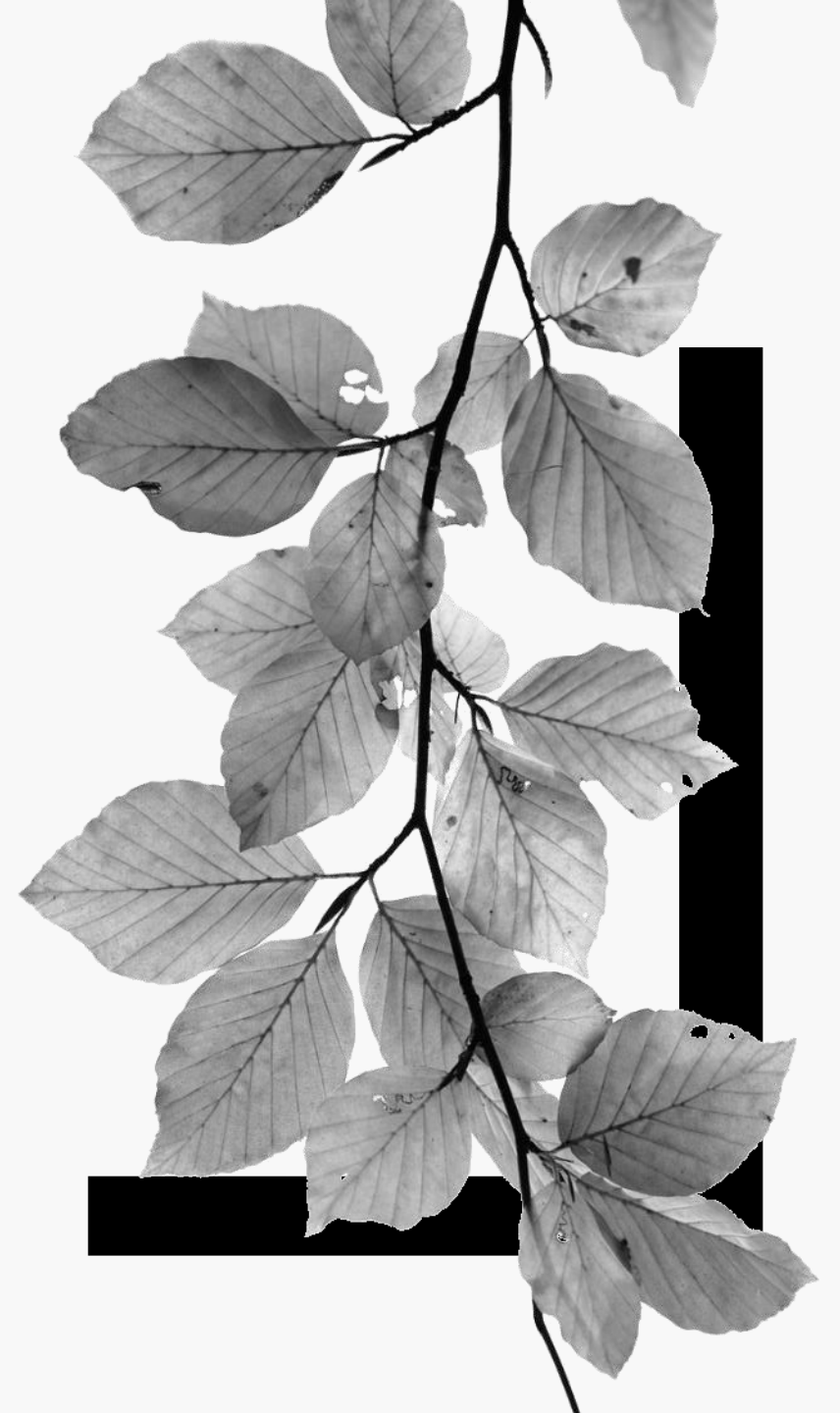
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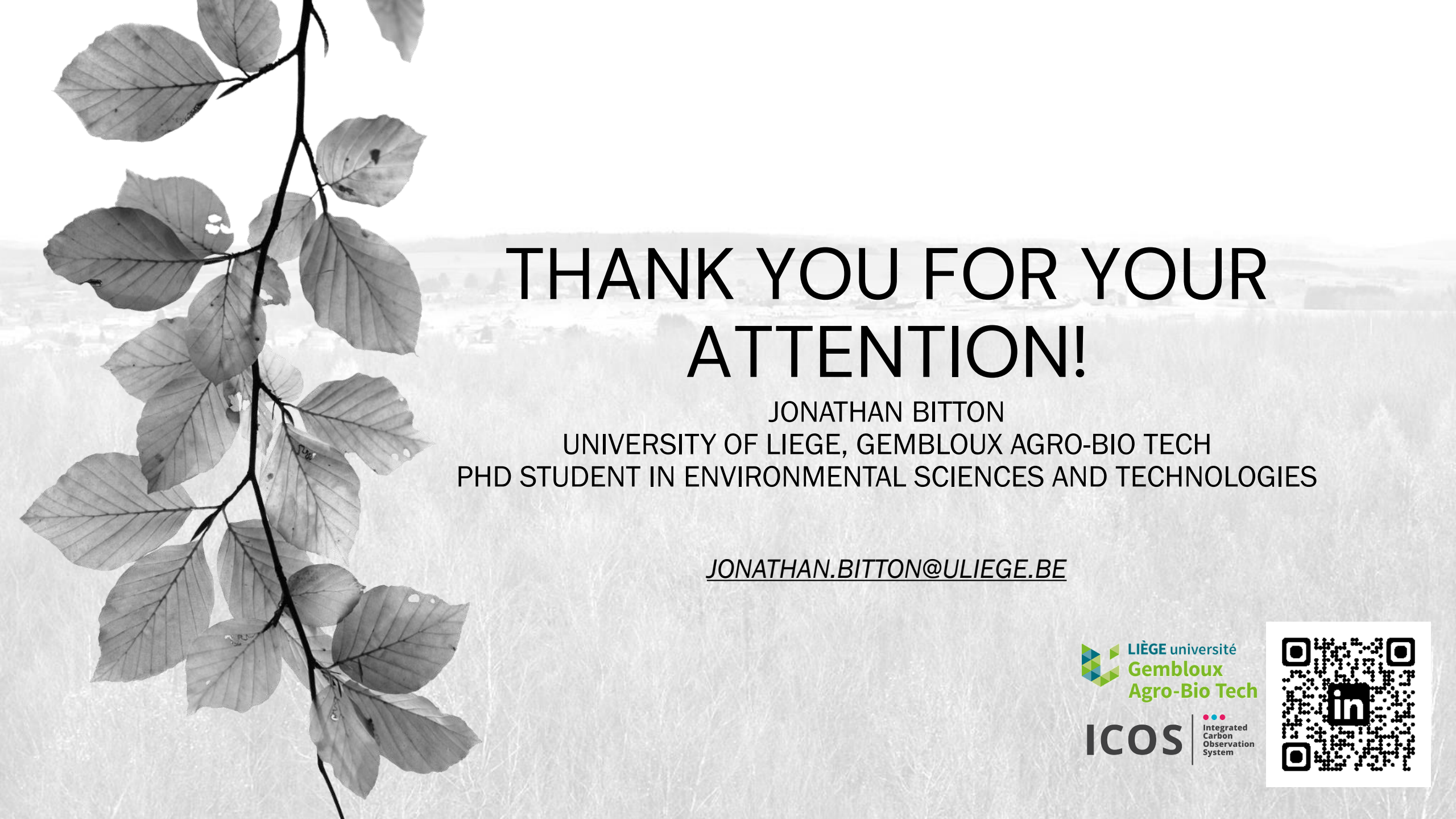
Contrasting meteorological & thinning effects

- Direct and delayed responses
- Decomposing large-scale influences in shorter ones

3

Importance of physiological measurements complementing eddy covariance





THANK YOU FOR YOUR ATTENTION!

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Gembloux
Agro-Bio Tech

 ICOS |  Integrated
Carbon
Observation
System

