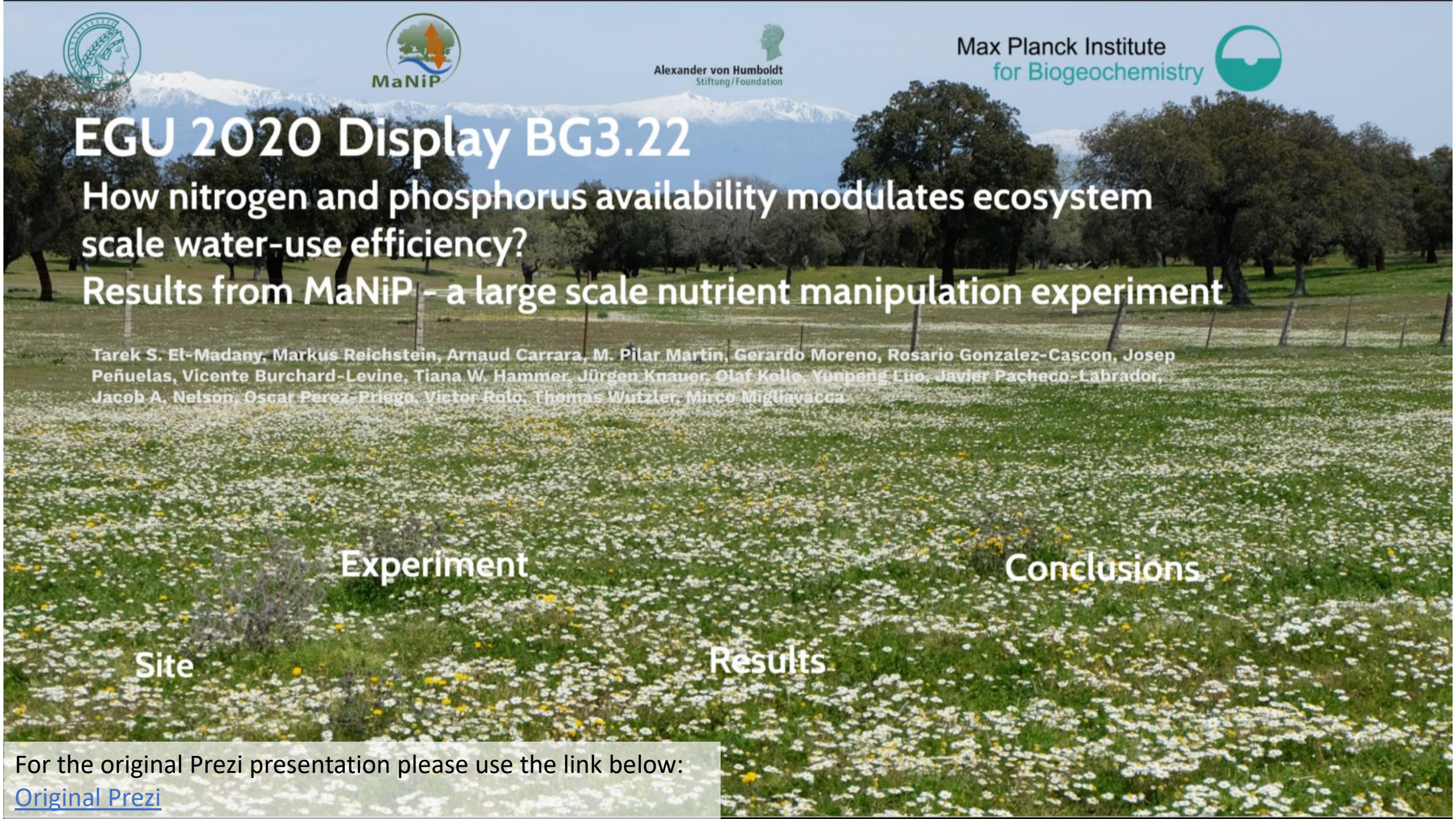
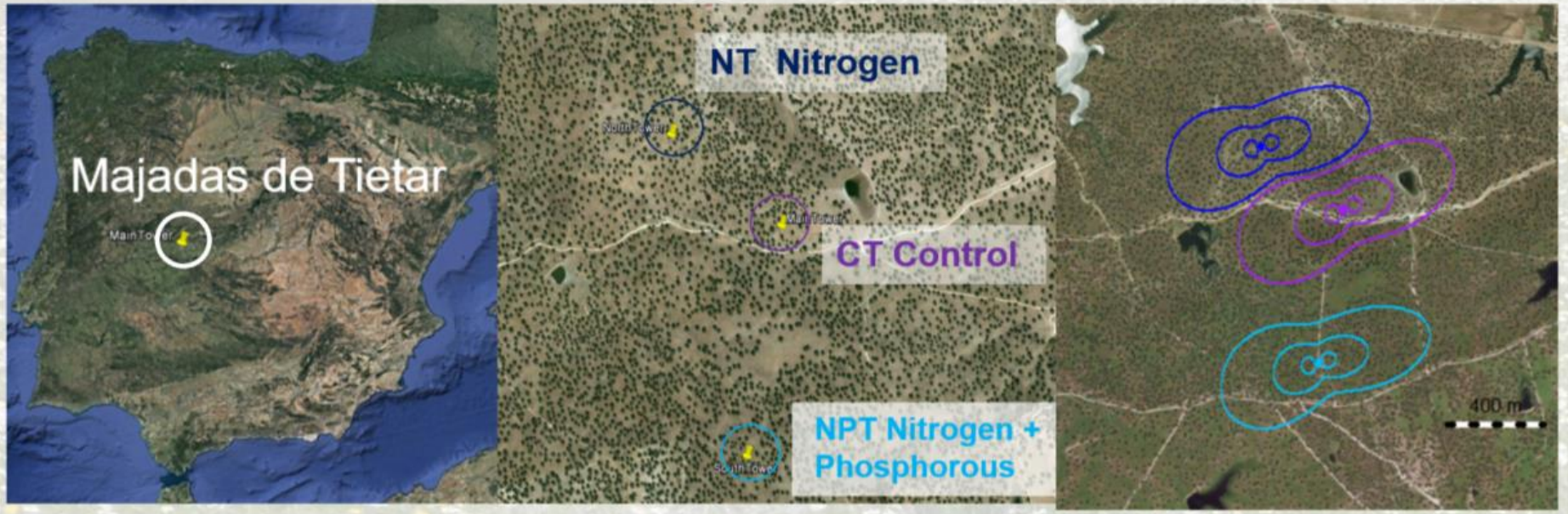


For the original Prezi presentation please use the link below:

Original Prezi

Site Location and background



- Center of Iberian Peninsula
- Typical Iberian Dehesa
- Three eddy covariance towers

Site description

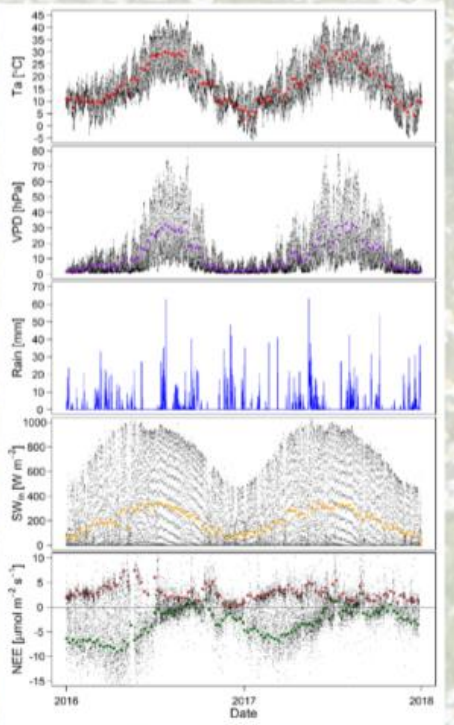
Site description

Winter

Spring

Summer

- Quercus ilex trees
- Canopy height 8.7 m
- 23 % canopy cover
- MAP 650 mm
- MAT 16.7 °C
- Slight N-limitation



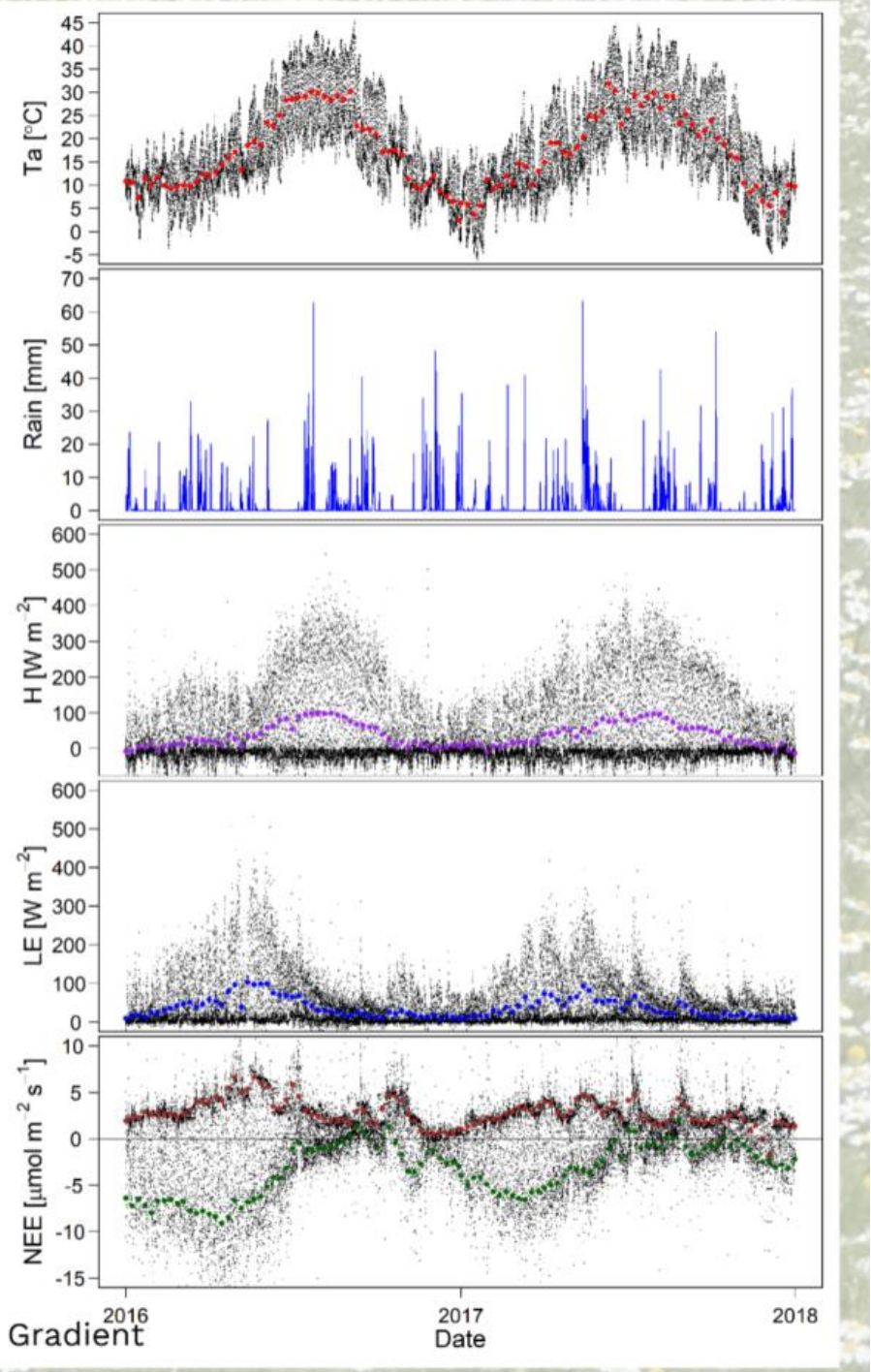
Large temperature range

Highly variable precipitation

Energy limited winter

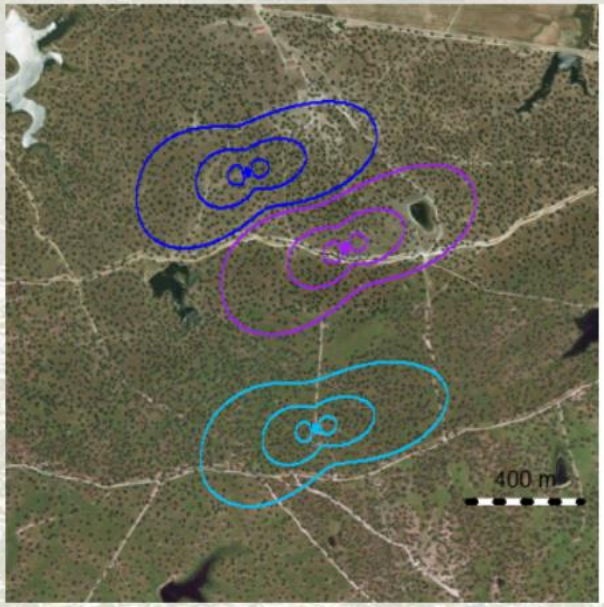
Water limited summer

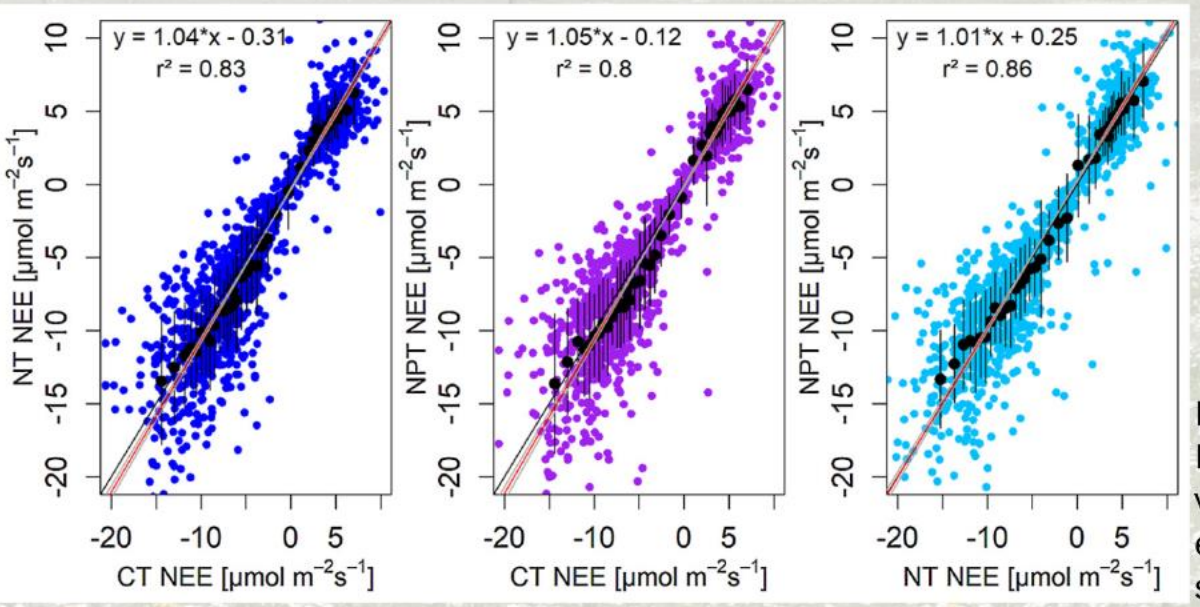
Growing season length and productivity are water driven



El-Madany et al., (2020)
Drought and Heatwave Impacts on Semi-Arid Ecosystems' Carbon Fluxes along a Precipitation Gradient

Experimental Design





El-Madany et al., (2018) Drivers of spatio-temporal variability of carbon dioxide and energy fluxes in a Mediterranean savanna ecosystem

CT Control treatment background signal and IAV

NT High N-availability, wide N:P ratio, P-limitation

NPT High N and P-availability, P-limitation released

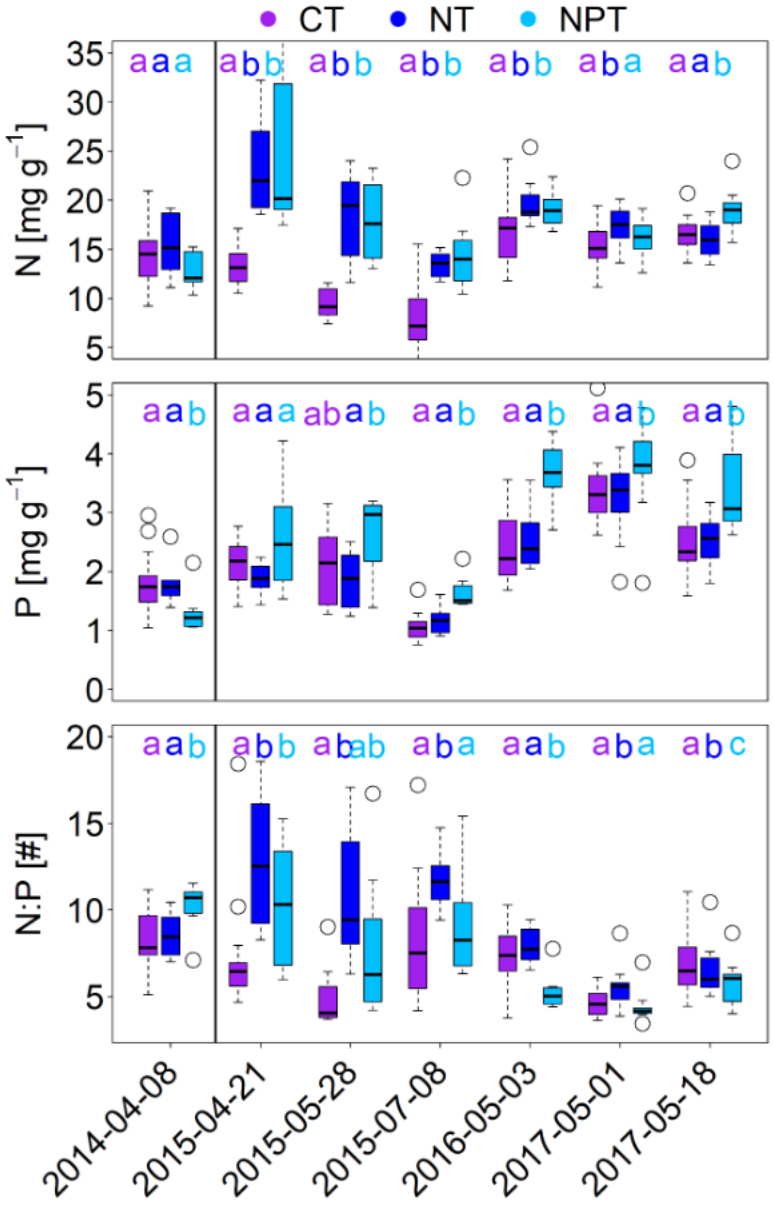
Did plants take up nutrients?

Did carbon fluxes change?

Did water fluxes change?

How did WUE change?

Nutrients in herbaceous layer

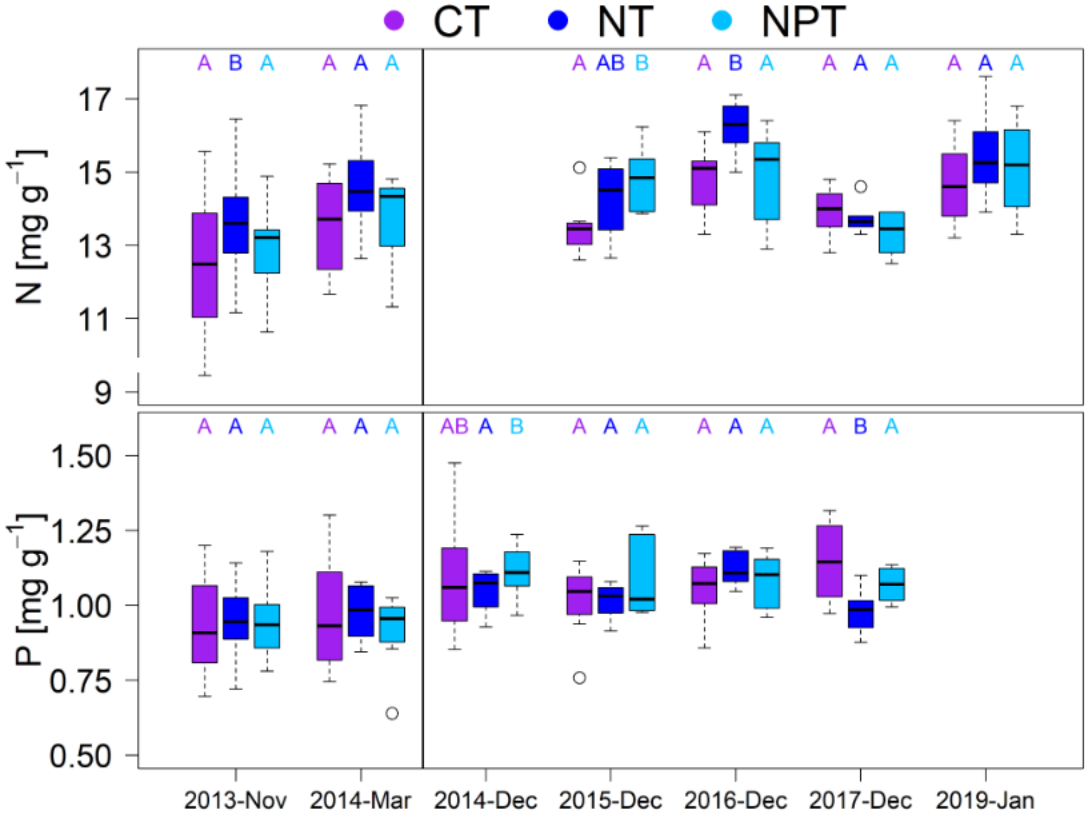


Significant increase in leaf nitrogen at NT and NPT

Significant increase in leaf phosphorus in NPT

Wide N:P ratio at NT
narrow N:P ratio at NPT

Nutrients in tree leaves



No systematic change in leaf nutrient content of the trees

Carbon fluxes across seasons and treatments

Season	Spring			Summer			Winter		
Variable	NEE	GPP	Reco	NEE	GPP	Reco	NEE	GPP	Reco
Unit	gC m^{-2} $month^{-1}$ ± unc								
ΔC-Flux NT	-11.4 ± 0.2	14.0 ± 0.2	2.4 ± 0.3	3.3 ± 0.2	-1.2 ± 0.2	2.5 ± 0.4	-13.2 ± 0.4	15.1 ± 0.4	1.7 ± 0.4
ΔC-Flux NPT	-11.7 ± 0.2	7.9 ± 0.2	-3.6 ± 0.3	7.0 ± 0.2	-8.9 ± 0.2	-1.6 ± 0.3	-11.9 ± 0.4	13.1 ± 0.5	0.1 ± 0.4
C-Flux CT	-89.6	167.6	78.1	0.1	40.1	39.8	42.8	68.2	24.9

Delta-C-Flux = Change due to fertilization at nitrogen treatment (NT) and nitrogen+phosphorus treatment (NT)
C-Flux = Reference flux at control tower (CT)

Growing season (winter spring):
Strong increase in GPP in both fertilized treatments

Senescent period (summer):
Strong reduction in GPP and more positive NEE in both treatments

Water fluxes across seasons and treatments

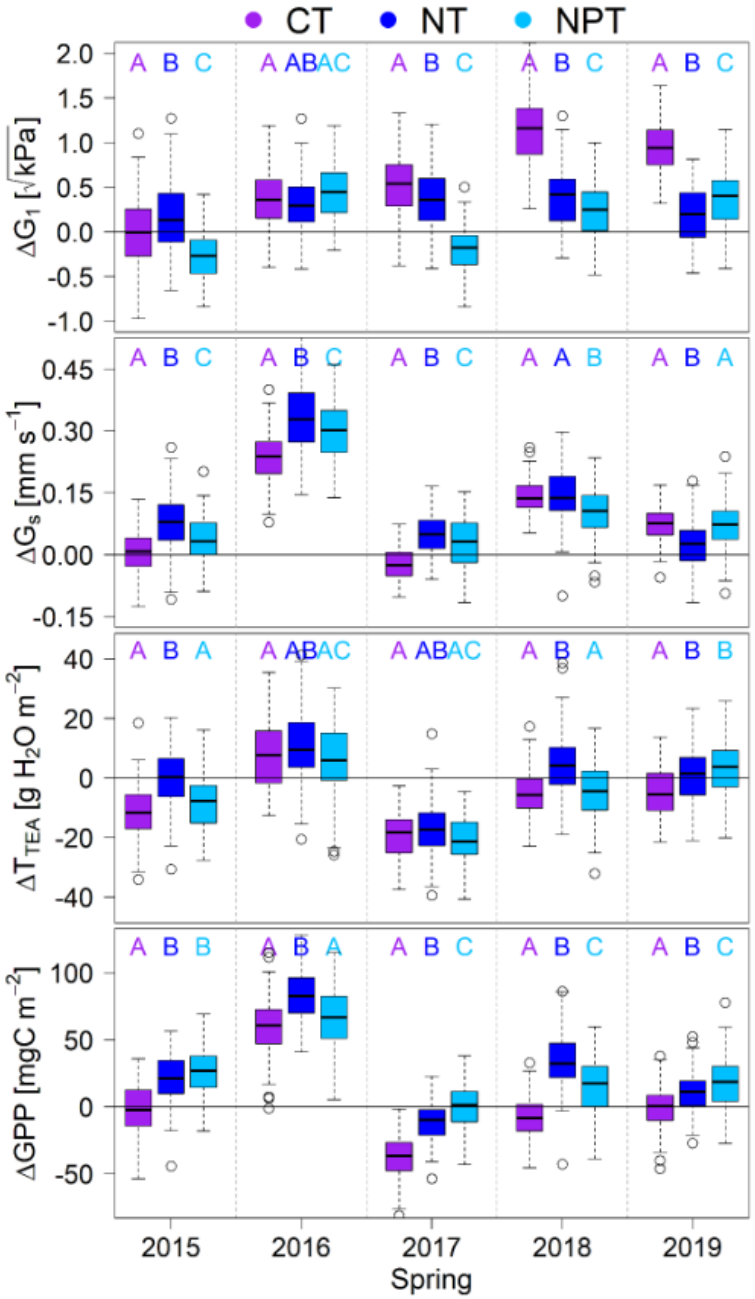
Season	Spring			Summer			Winter		
Variable	**ET**	**T**	**E**	**ET**	**T**	**E**	**ET**	**T**	**E**
Unit	**kgH_2O m^{-2} $month^{-1}$ ± unc**								
ΔH_2O-Flux NT	0.9 ± 0.1	3.1 ± 0.1	-2.3 ± 0.1	0.7 ± 0.1	-1.6 ± 0.1	1.6 ± 0.1	-0.3 ± 0.1	0.3 ± 0.1	-1.0 ± 0.1
ΔH_2O-Flux NPT	-3.6 ± 0.1	-1.2 ± 0.1	-2.8 ± 0.1	-3.6 ± 0.1	-3.8 ± 0.1	1.0 ± 0.1	-0.5 ± 0.1	1.5 ± 0.0	-2.0 ± 0.1
H_2O-Flux CT	62.3	52.5	13.1	25.4	15.6	10.4	13.7	8.6	5.8

Delta-H_2O-Flux = Change due to fertilization at N treatment (NT) and N+P treatment (NT)
H_2O-Flux CT = Reference flux at control tower (CT)

Growing season (winter spring):
Strong reduction in E in both fertilized treatments
More reduction of ET and T in NPT comapred to NT

Senescent period (summer):
Increase in E and reduction in T in both treatments

Spring WUE and related parameters across treatments



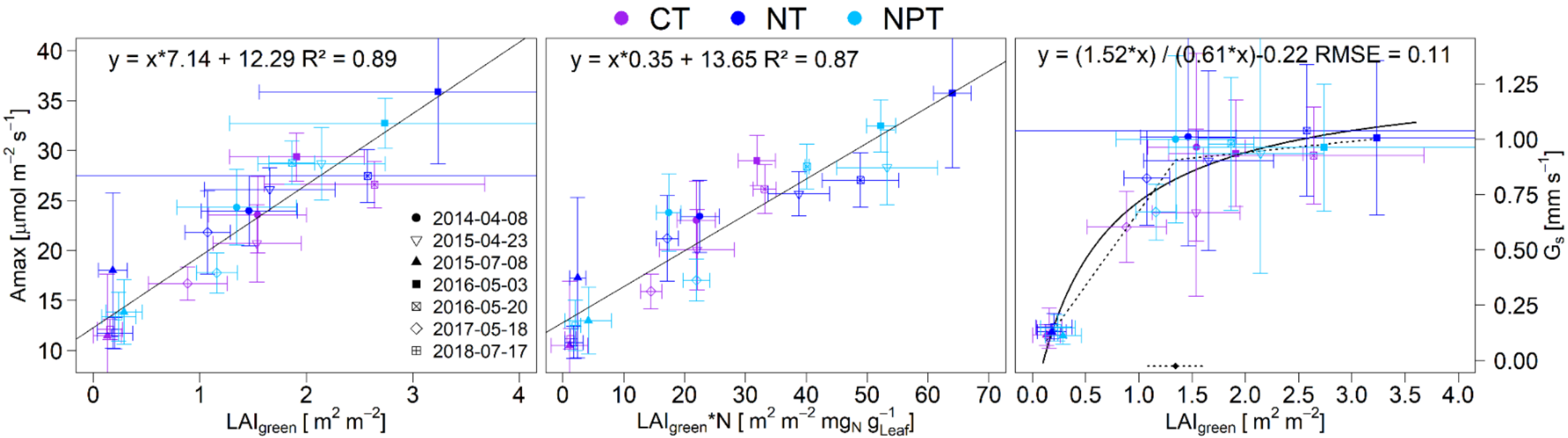
G_1: stomatal slope parameter inversly related to WUE
G_1 on average highest at CT and lowest at NPT
Order of WUE: NPT > NT > CT

G_s: surface conductance (includes E and T)
G_s on average highest at NT and lowest at CT
Order of G_s: NT > NPT > CT

T_{TEA}: transpiration based on Nelson et al., (2018)
T_{TEA} on average highest at NT and similar at NPT and CT
Order of T_{TEA}: NT > NPT ~ CT

GPP: gross primary productivity
GPP on average highest at NT and lowest at CT
Order of GPP: NT ~ NPT >> CT

Who is responsible?



Amax vs LAI_{greeen}

- Linear relation across treatments
- Offset from trees
- Summer variability smallest

Amax vs LAI_{greeen} * N

Basically same as Amax vs LAI_{greeen}

No significant influence of N on relation

G_s vs LAI_{greeen}

- No linear relation
- reached max at low LAI (segmented regression change point at LAI = 1.4)

Conclusions

- Increased N availability yields to higher LAI
- higher LAI results in more carbon uptake
- Especially during winter relative changes in carbon uptake are large
- Stoichiometric imbalance in N:P results in increased transpiration and respiration
- WUE is driven by increased C-uptake and between treatment differences are driven by increased transpiration at NT

MaNiP

A big thanks to the whole MaNiP team and all collaborators for the hard work during the last 6 years