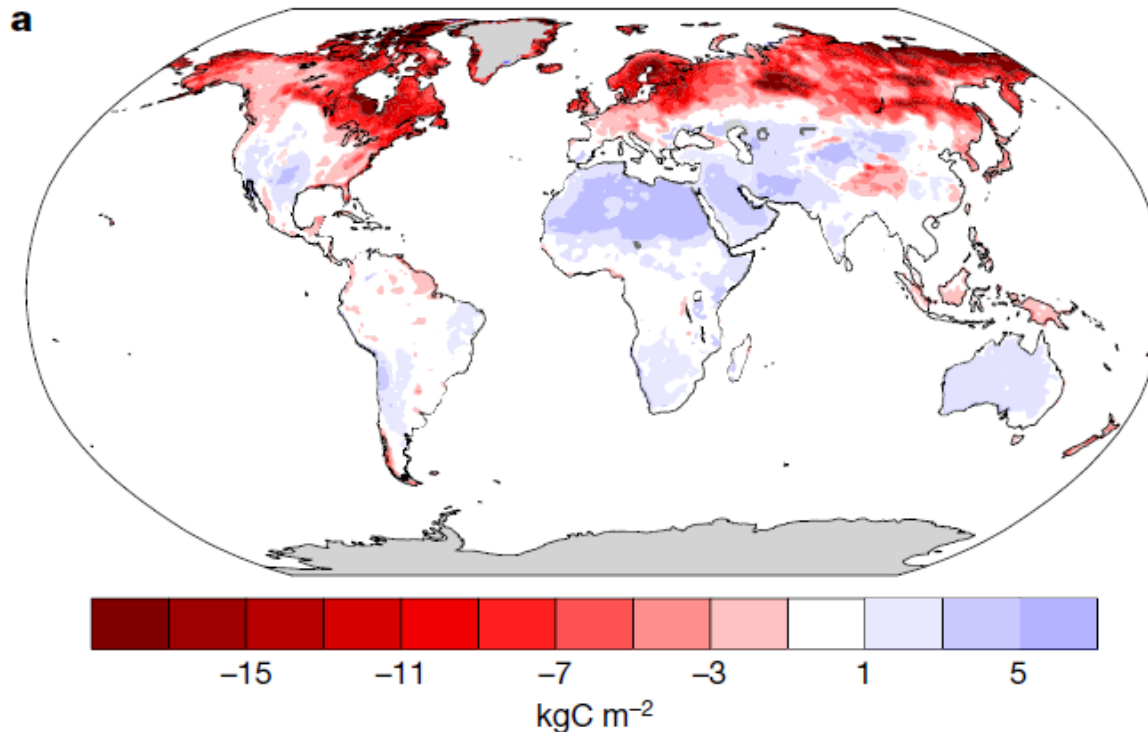


# Webcam observations of forest canopy and understory in connection to forest floor respiration

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# Introduction: Boreal forest soil C

Crowther et al., 2017, Nature



” soils would lose globally -200 PG Carbon in 20 years if climate is warmer by +2 °Celsius”

# Introduction: forest growth and respiration

- Forest canopy and understory provide input of organic material for decomposition and soil carbon sequestration
- input include mainly foliage, fineroots, root exudates
- Foliage fenology can be monitored by webcams



## AIMS:

Examine relations of forest canopy and understory and forest floor respiration

(1) relative influences and (2) the functional response forms of

drivers:

soil temperature, moisture, GPP,

webcam greenness of canopy and understory (GCC)

to

respiration:

total R.co, trenched R.tr (no living tree roots),

tree roots autotrophic R.aut (R.co - R.tr)

# Materials and Methods

## Field measurements on four sites

CO<sub>2</sub> flux data

Soil moisture and temperature

Green Chromatic Coordinate (GCC)

### Three R fluxes

$R_{ff} = R_a + R_h$  (controls)

$R_h$  (trenched plots)

$R_a = R_{ff} - R_h$

### **GCC = $G / (G + B + R)$**

GCC Tree canopy (web cameras)

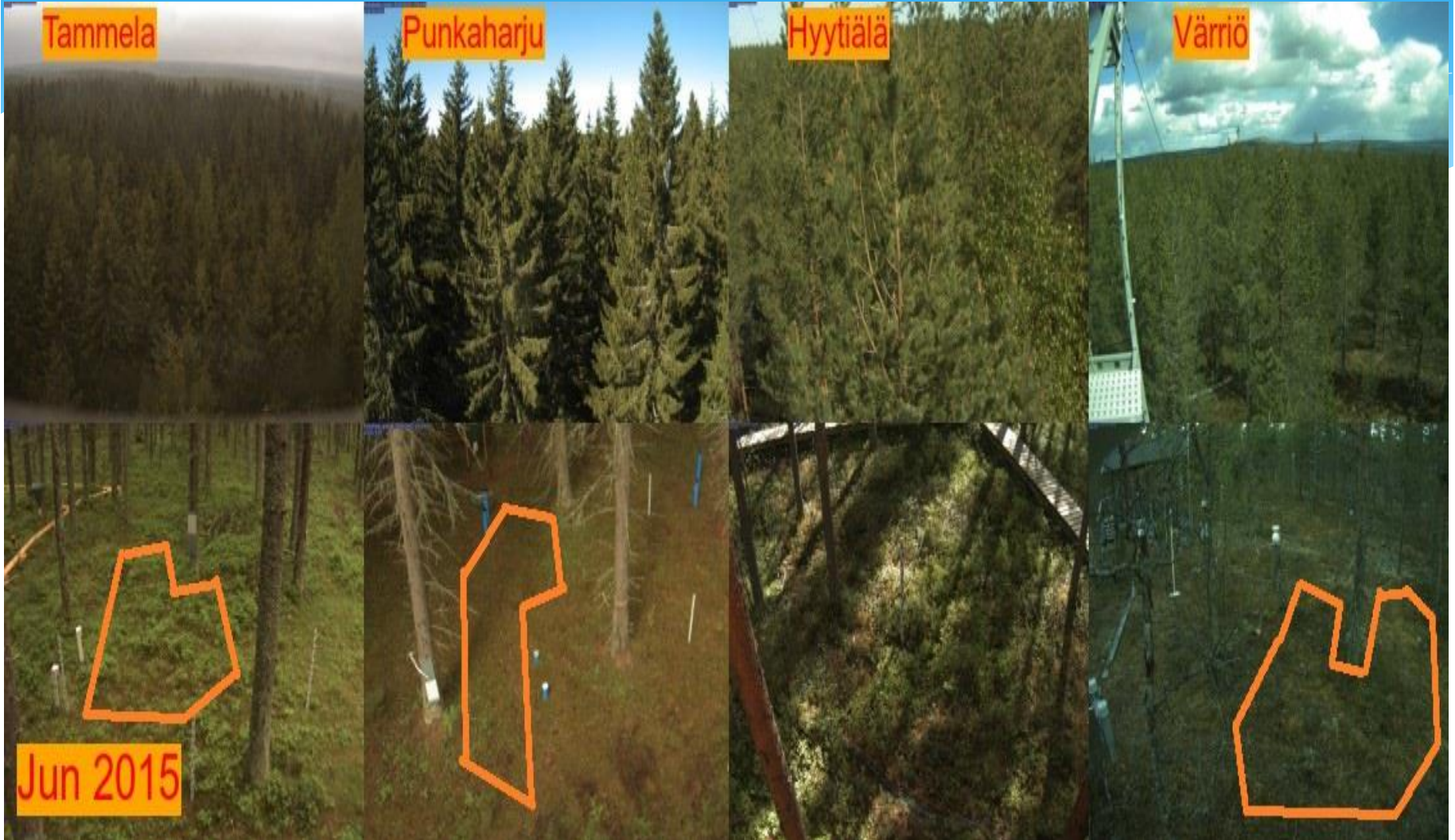
GCC Understory vegetation  
(web cameras)

**GPP** (Pine – Eddy Covariance,  
Spruce - PRELES, Peltoniemi et al 2015)

**Boosted Regression Trees (machine learning) in R**

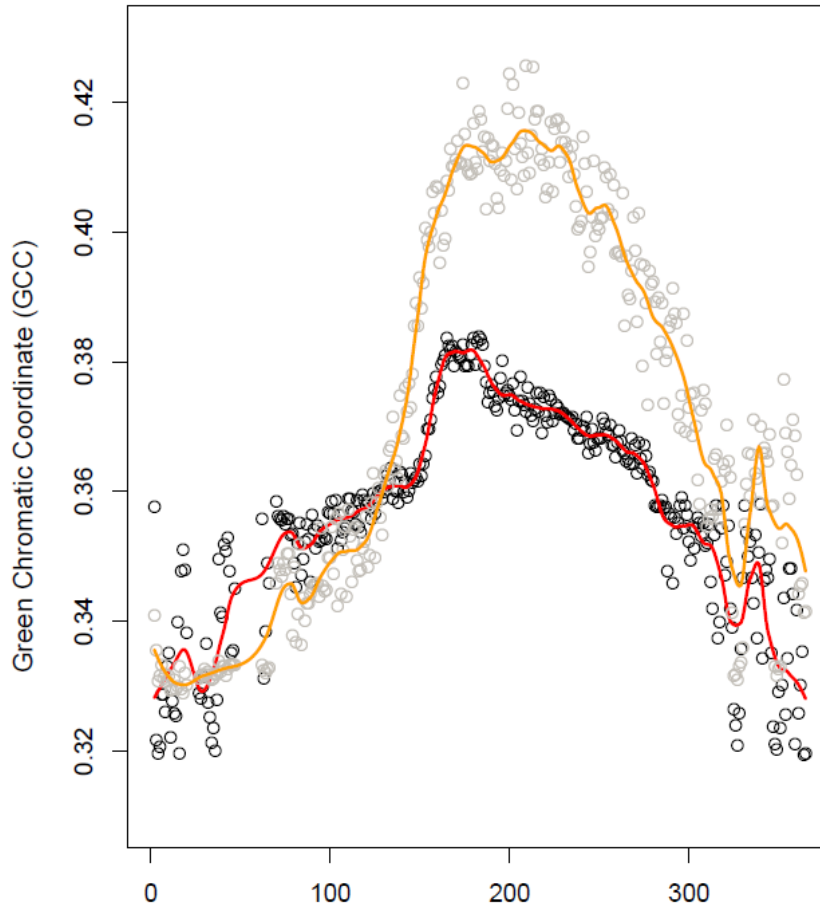


# Methods:

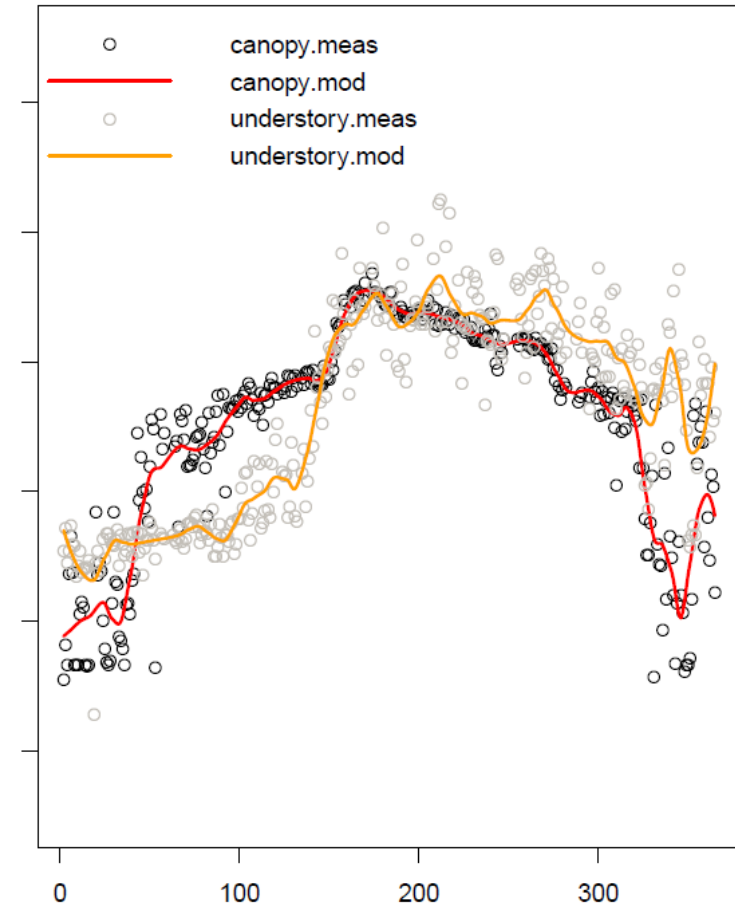


# Canopy and understory phenology

Tammela.spruce



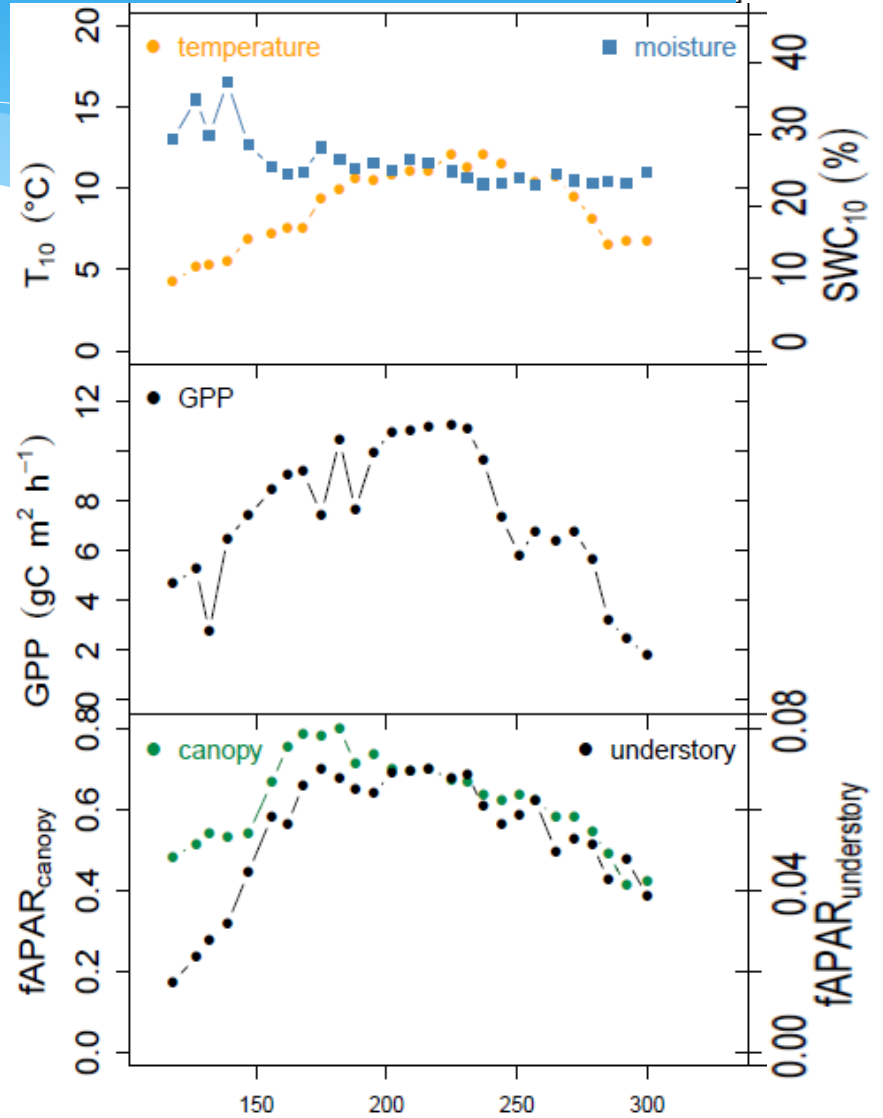
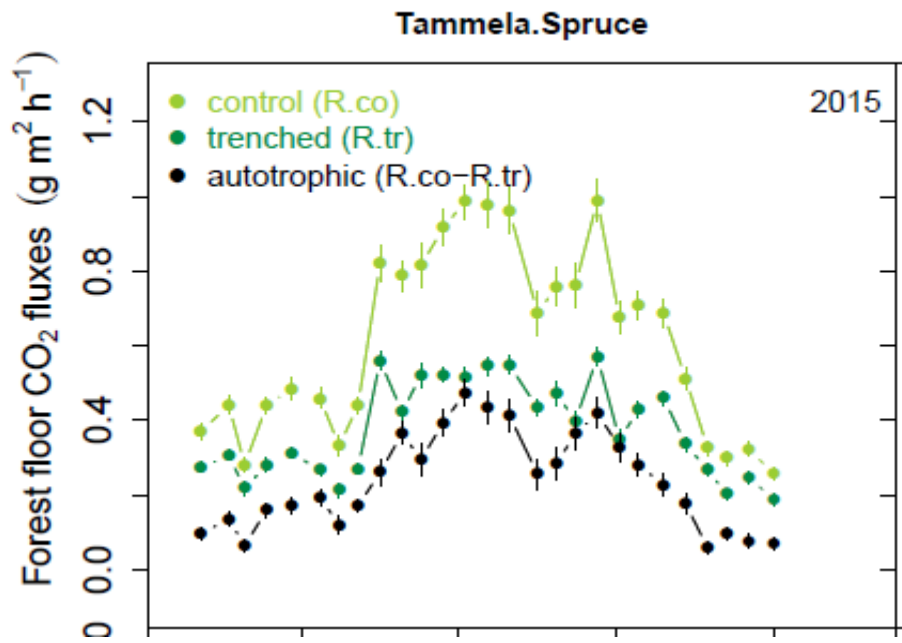
Punkaharju.spruce



○ canopy.meas  
— canopy.mod  
○ understory.meas  
— understory.mod

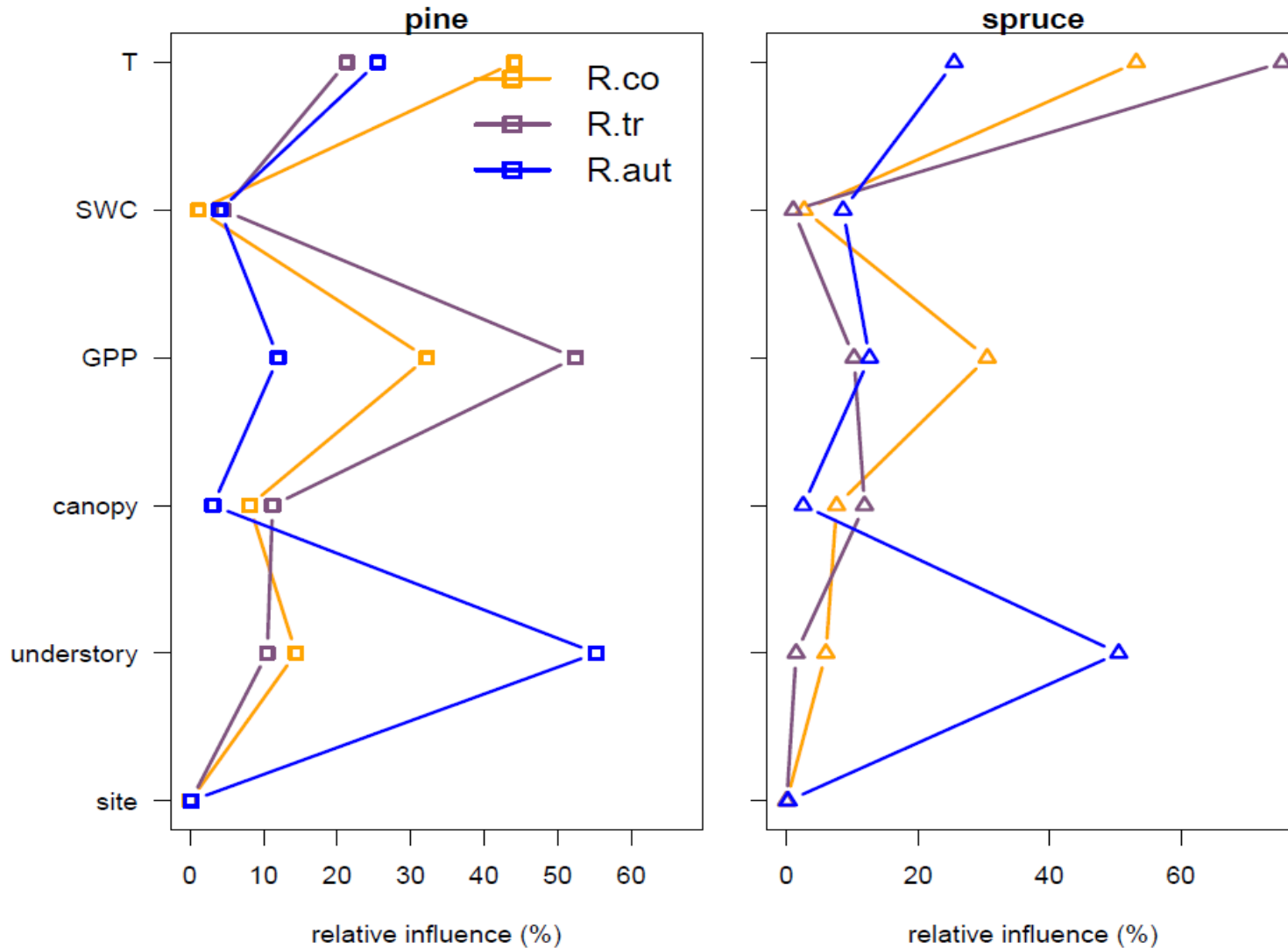
Day of Year

# Materials: measurements

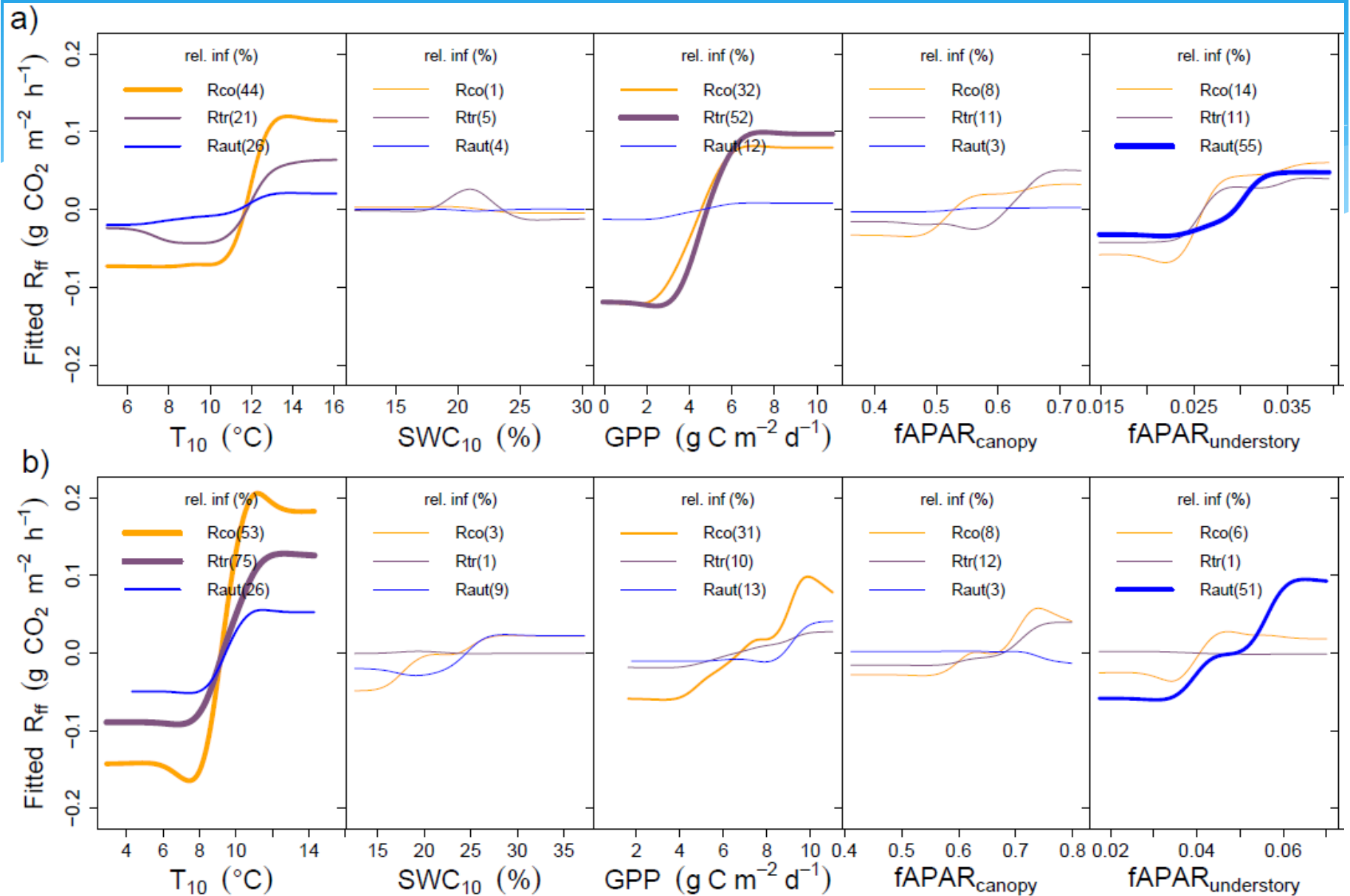




# Results: relative influences of main drivers



# Results: relative influences and forms



# Conclusions

- \* Cameras clearly detect leaf development. Phenology of understory showed spring delay compared to canopy.
- \* Relation of camera derived leaf phenology and forest floor respiration was mixed with ecosystem GPP
- \* Camera signal from understory could be related to phenology of tree roots?

# Conclusions

- \* Ecosystem GPP correlated with undisturbed forest floor respiration but correlation was stronger for understory plots without tree roots. Thus GPP of understory contributed more to autotrophic respiration than GPP of tree canopy, suggesting differences in the storage mechanisms of photosynthates.
- \* Autotrophic respiration of tree roots correlated with understory phenology suggesting that tree roots phenology could have similar delay and peaks as understory. This need further investigation with cameras monitoring tree roots.

# Thank you!



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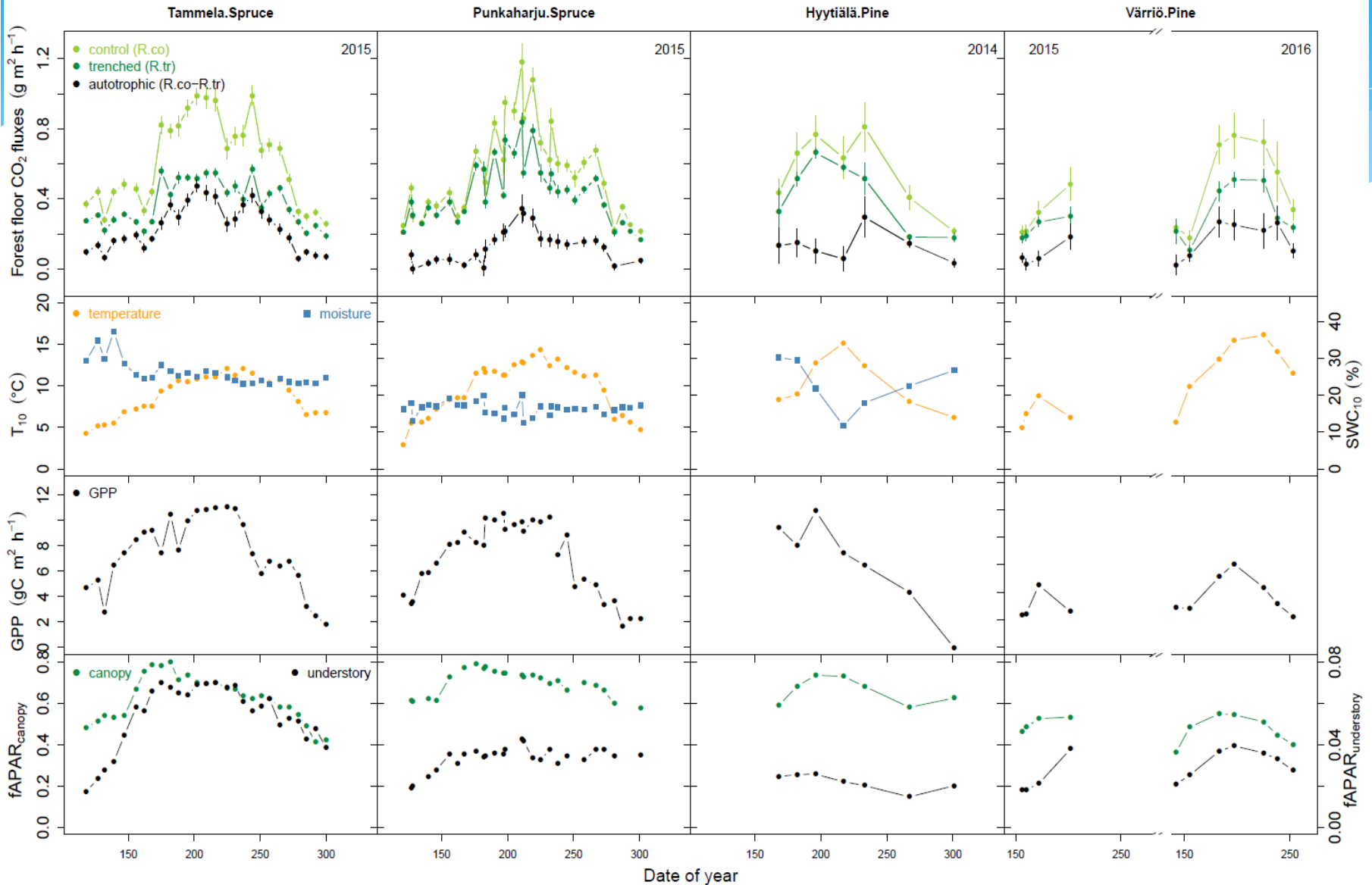
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# Materials: measurements



# Results: influence and forms, GPP-1d

