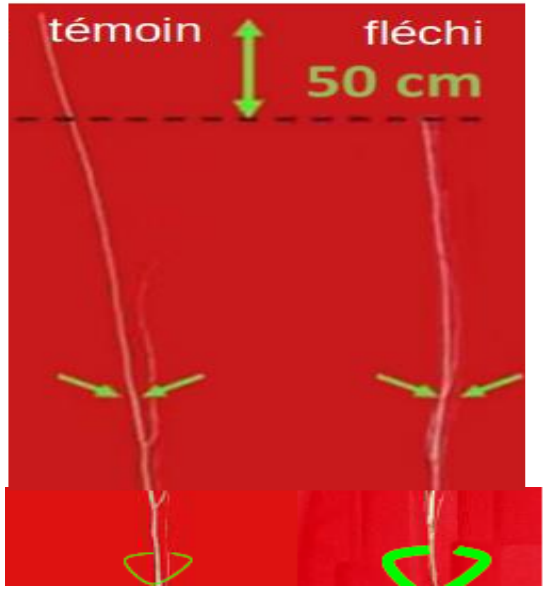
What happens to growth of beech poles when controlling wind sways?

Dongmo Joël[1], Constant Thiéry[1], Ningre François[1], Farré Etienne[1], Fournier Meriem[1],Dlouha Jana[1]

[1] Université de Lorraine, AgroParisTech, INRAE, Silva, Nancy 54000, France;

Introduction

- During its whole life, tree acclimates to its environment (light, nutrients, drought,wind)



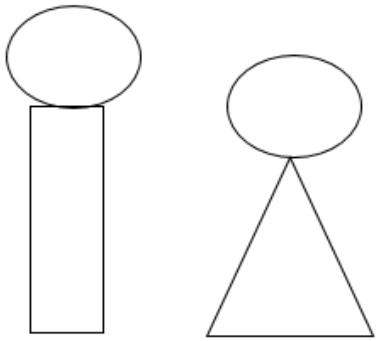
(Coutand et al., 2008)

- Forest tree under wind sways:

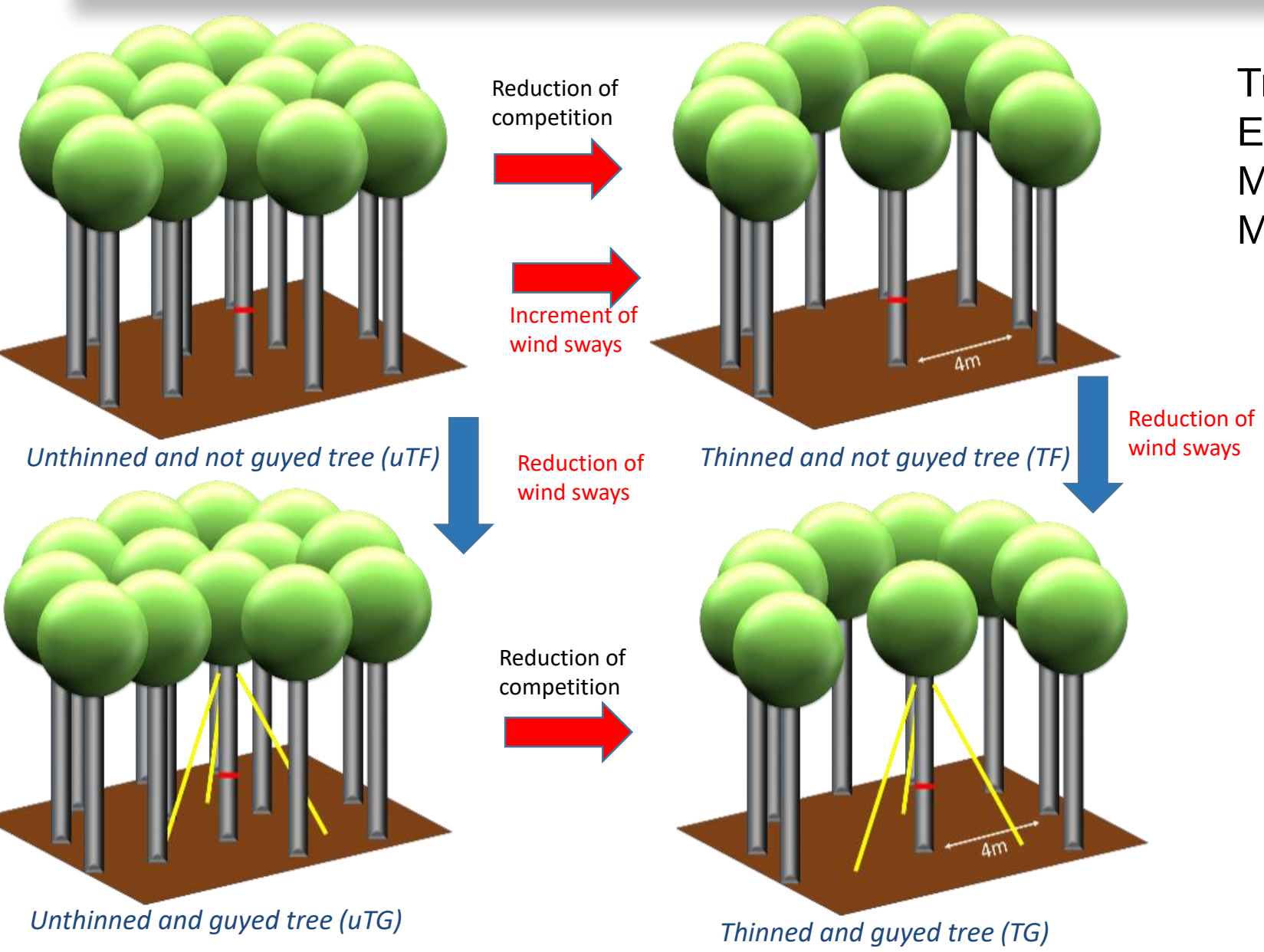
  - increase in radial growth (Nicoll et al., 2019; Bonnesoeur et al., 2016; Fournier et al.,2015 ; Meng et al.,2006)

  - reduction of axial growth (Nicoll et al., 2019; Meng et al.,2006)

Which impact on radial growth distribution along the tree height (Pressler's law)?



Plant material



Tree specie: Beech (*Fagus sylvatica L.*)
Even age stand of 30 years old
Mean of tree height: 14 m
Mean diameter: 13 cm

10 trees per treatment

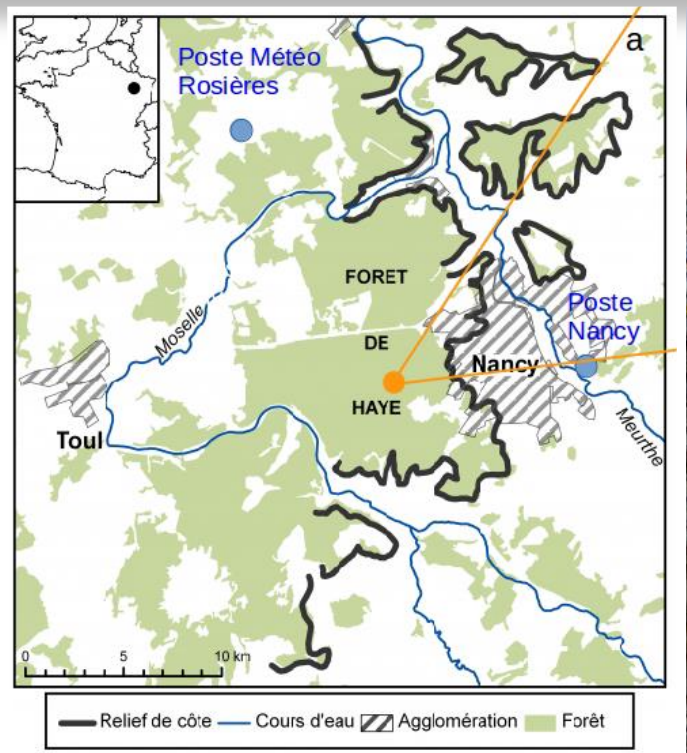
↓

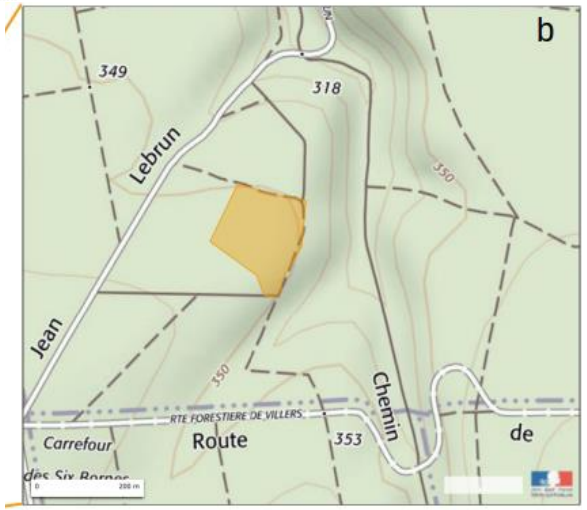
40 studies trees

Thinning radius: 4 m

Guying height: 7 m

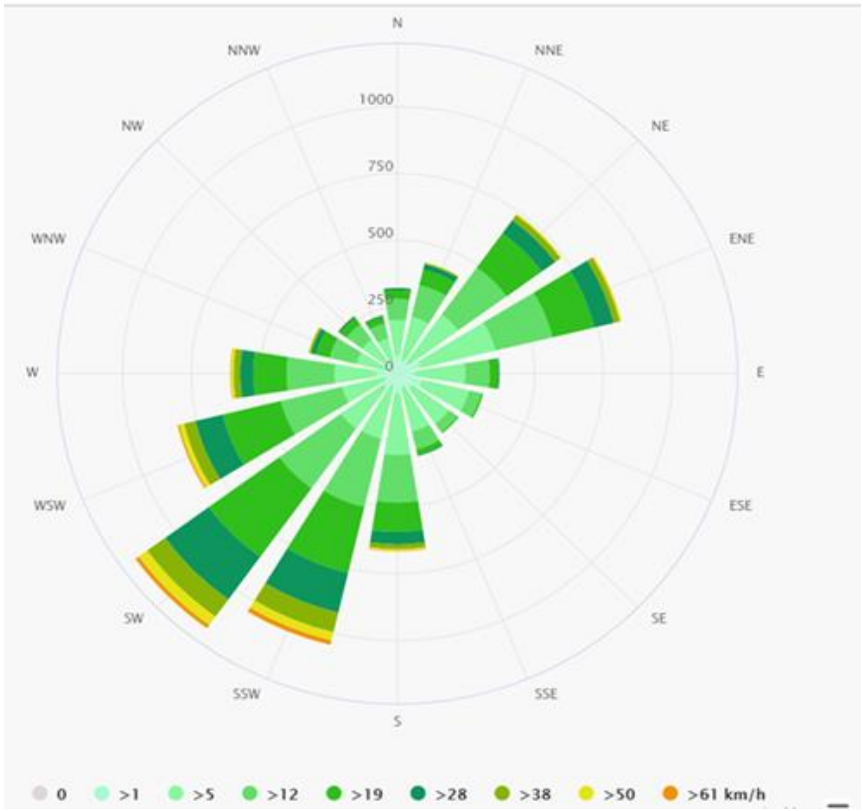
Study site





Soil pit

Soil type: Rendosol
Soil depth :30 to 60 cm
Rainfall: 775 mm
Mean temperature: 10°C
Maximum wind speed: 100 km/h



Wind Rose for the last 30 years (meteoblue)

Growth measures

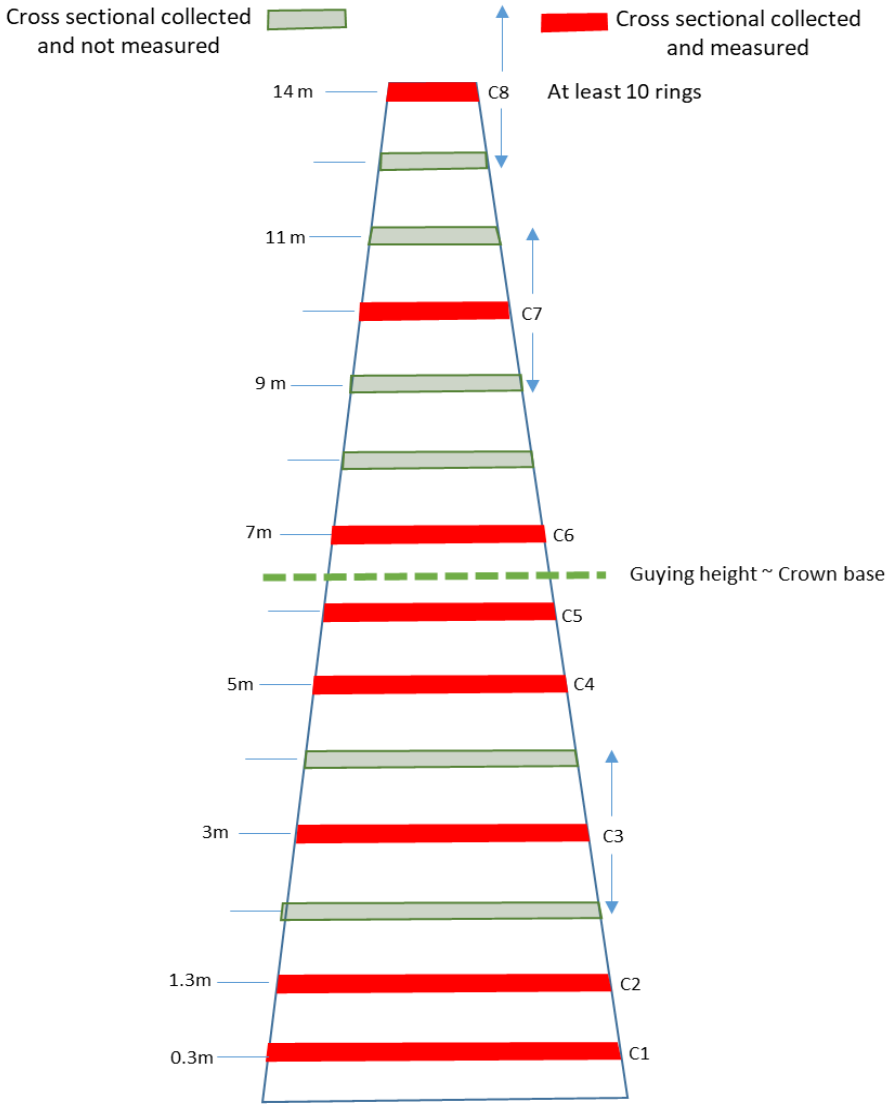
Identification of growth unit for axial growth

For each tree, 8 growth unit were identified: 4 before treatments and 4 after treatments

Circumference measure for radial growth

We follow tree circumference during the 4 years after treatment

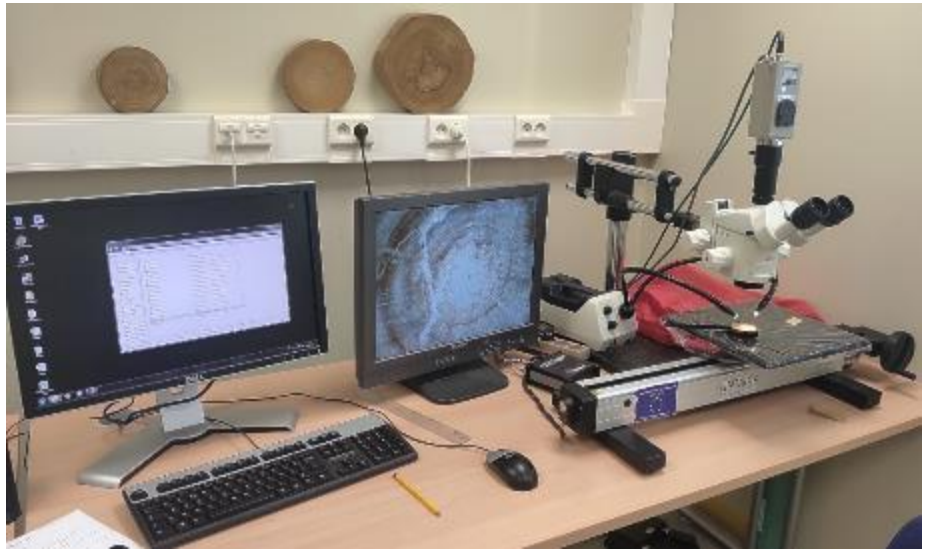
Stem analyses



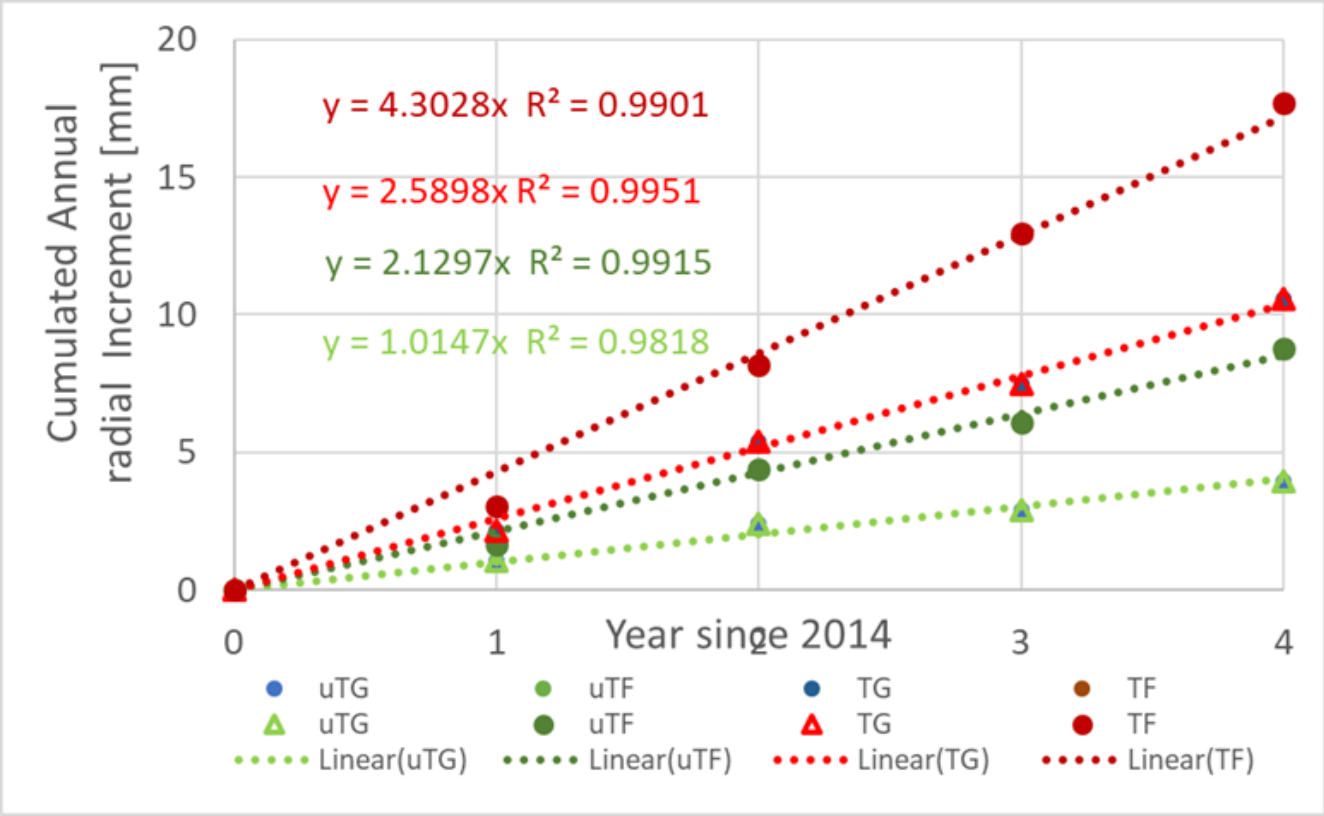
We cut stem tree in to log with 1 m lenght

Cross-sectional sample

Device for measuring the tree rings width (LINTAB 6)



Response on radial growth

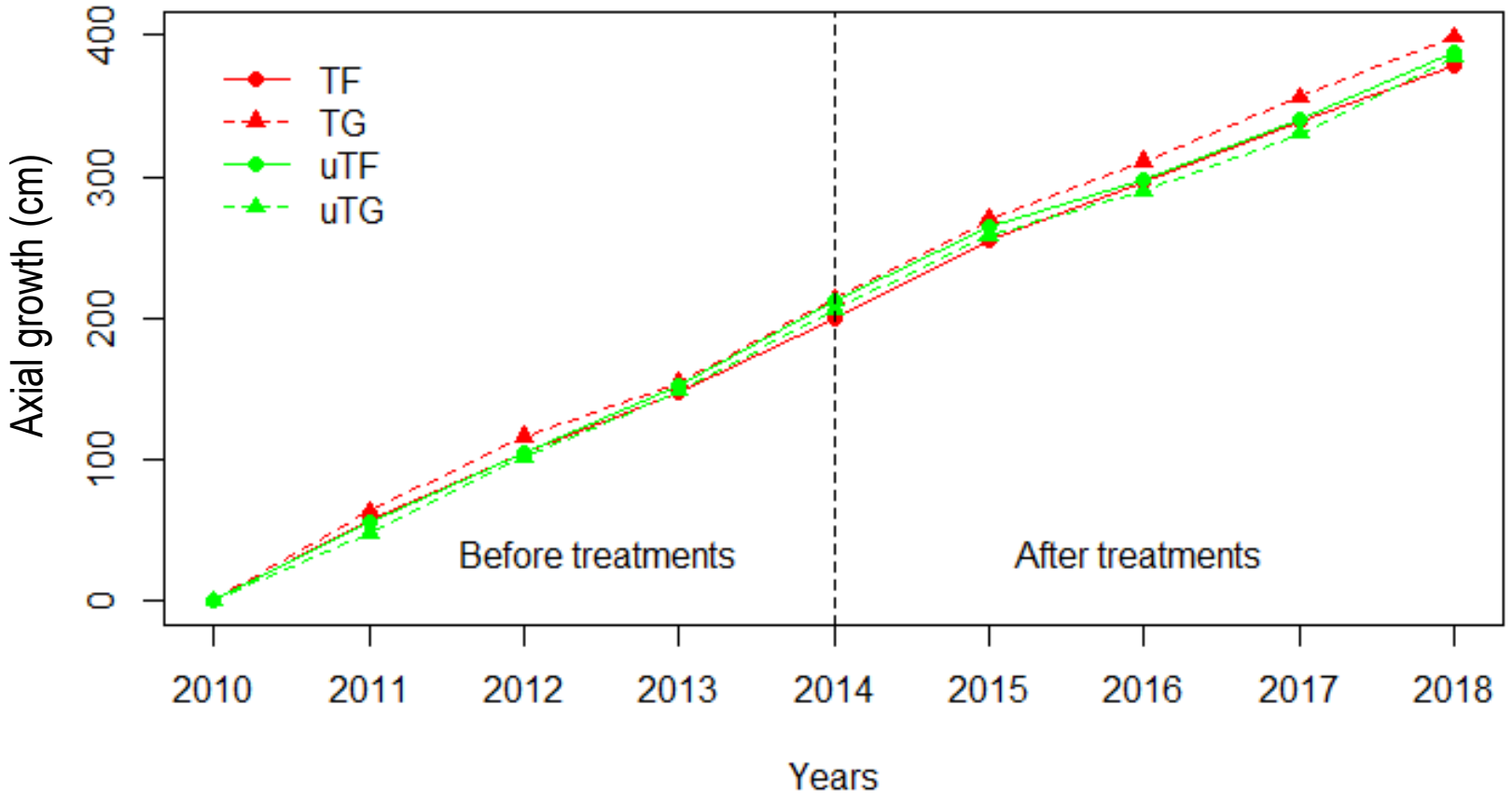


Measures done at breast height

	dR/dt [mm/year]	x Ref_{UTF}
TF	4.3	2.0
TG	2.6	1.2
uTF	2.1	1.0
uTG	1.01	0.5

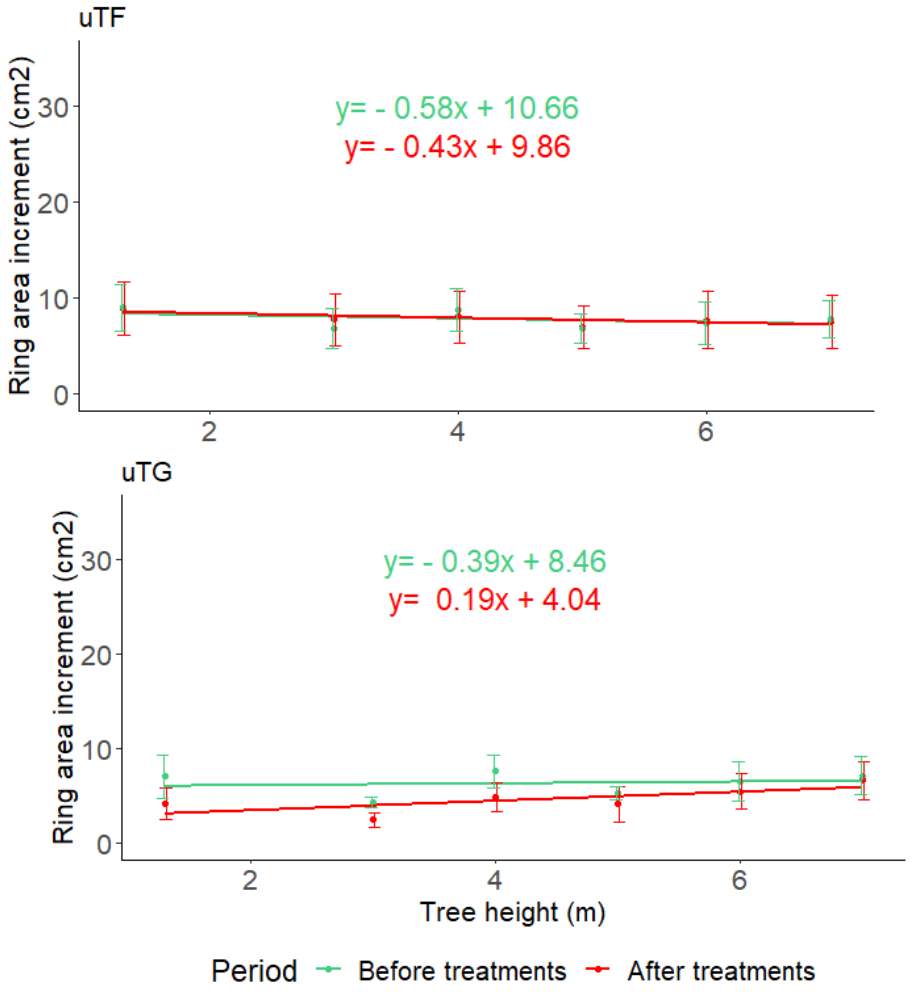
- 80% of radial growth increase after the thinning is due to wind sways increment (TG = uTF)!
- Reduction of wind sways in unthinned trees reduce their radial growth of 50%

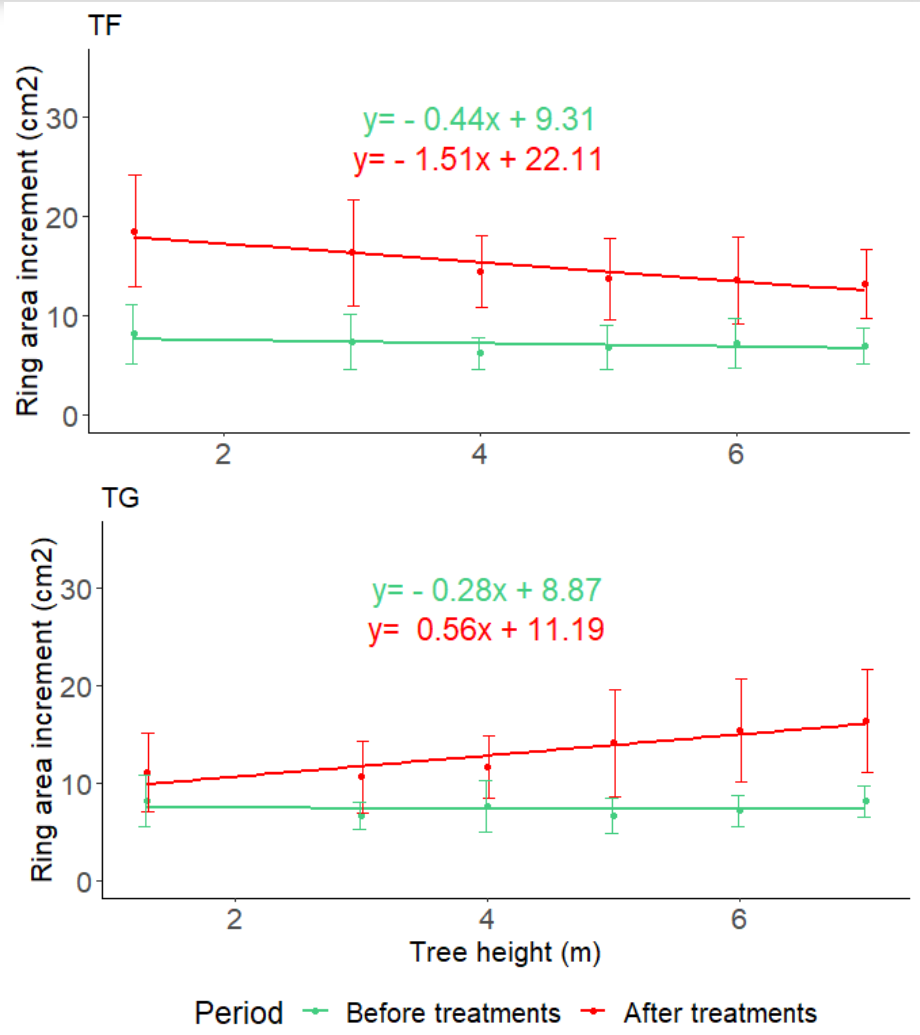
Response on axial growth



- Nor wind sways neither competition release has affected the axial growth of beech poles
- Lower apical control in hardwoods?

Distribution of the tree ring area along the tree height





Conclusion

- Axial growth in beech pool is not affected by wind sways and competition
- Wind sways strongly affect radial growth at breast height (effect of wind >> effect of competion)
- In trees submitted to sways, biomass is preferentially allocated to the bottom of the stem

Thank you!!