

# Methane emissions and origin in tree stems in an upland forest

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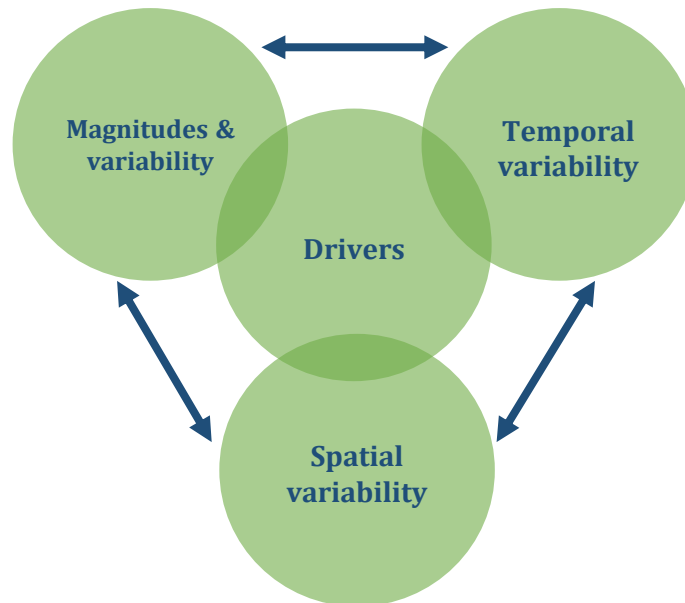




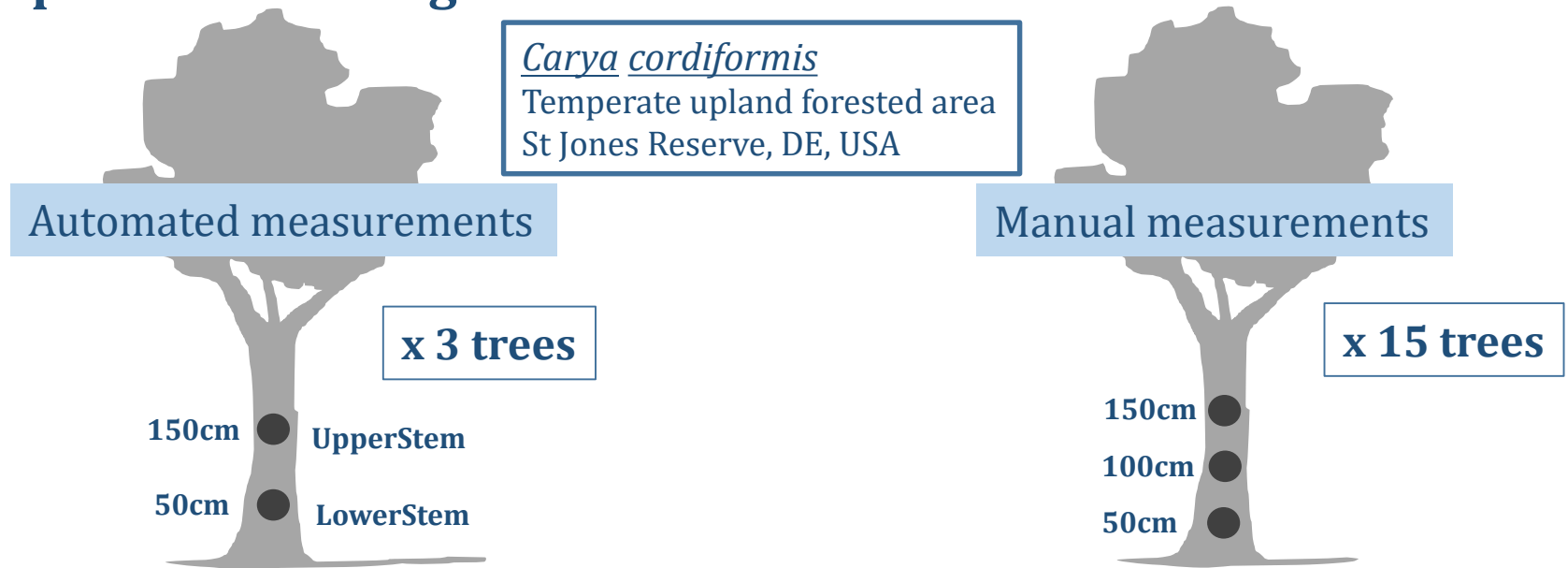
# Study aims

Measure of  $\text{CO}_2$  and  $\text{CH}_4$  to...

- quantify **magnitudes** and **variability** of stem emissions
- understand **temporal** and **spatial** variability
- describe **drivers**
- bring some light on the **origin**



# Experimental design



## CO<sub>2</sub> and CH<sub>4</sub>

Every hour during a growing season  
(April – December 2017)

- Sap flow
- Stem and soil temperature
- Soil water content
- Meteorological variables

## CO<sub>2</sub> and CH<sub>4</sub>

Every 2 weeks during a growing season  
(April – December 2017)

- Stem temperature
- Meteorological variables

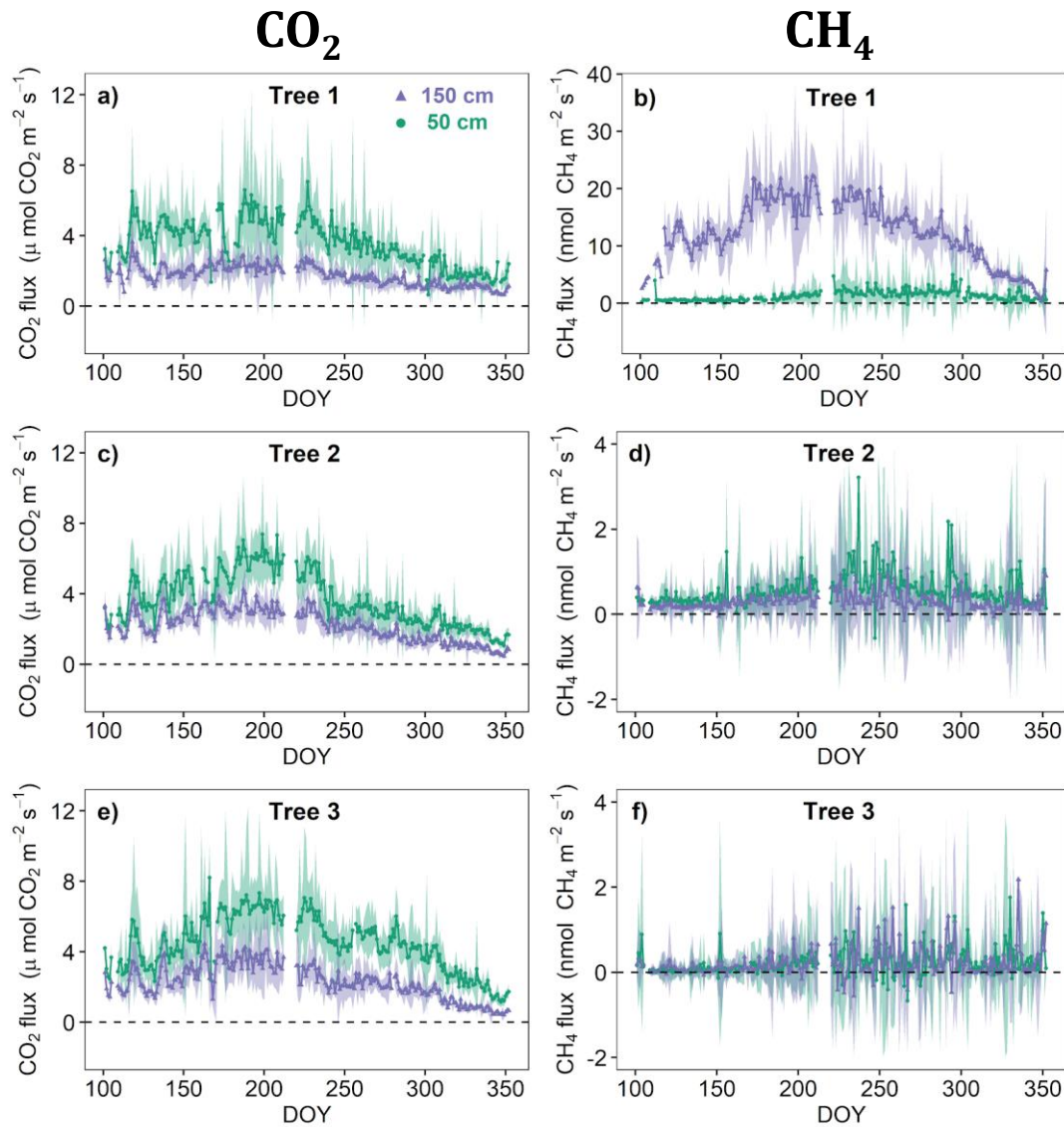
### Additionally...

Soil GHG concentration  
Heartwood GHG concentrations  
Tree cores incubations

# Results

## Automated measurements

*Daily averages*

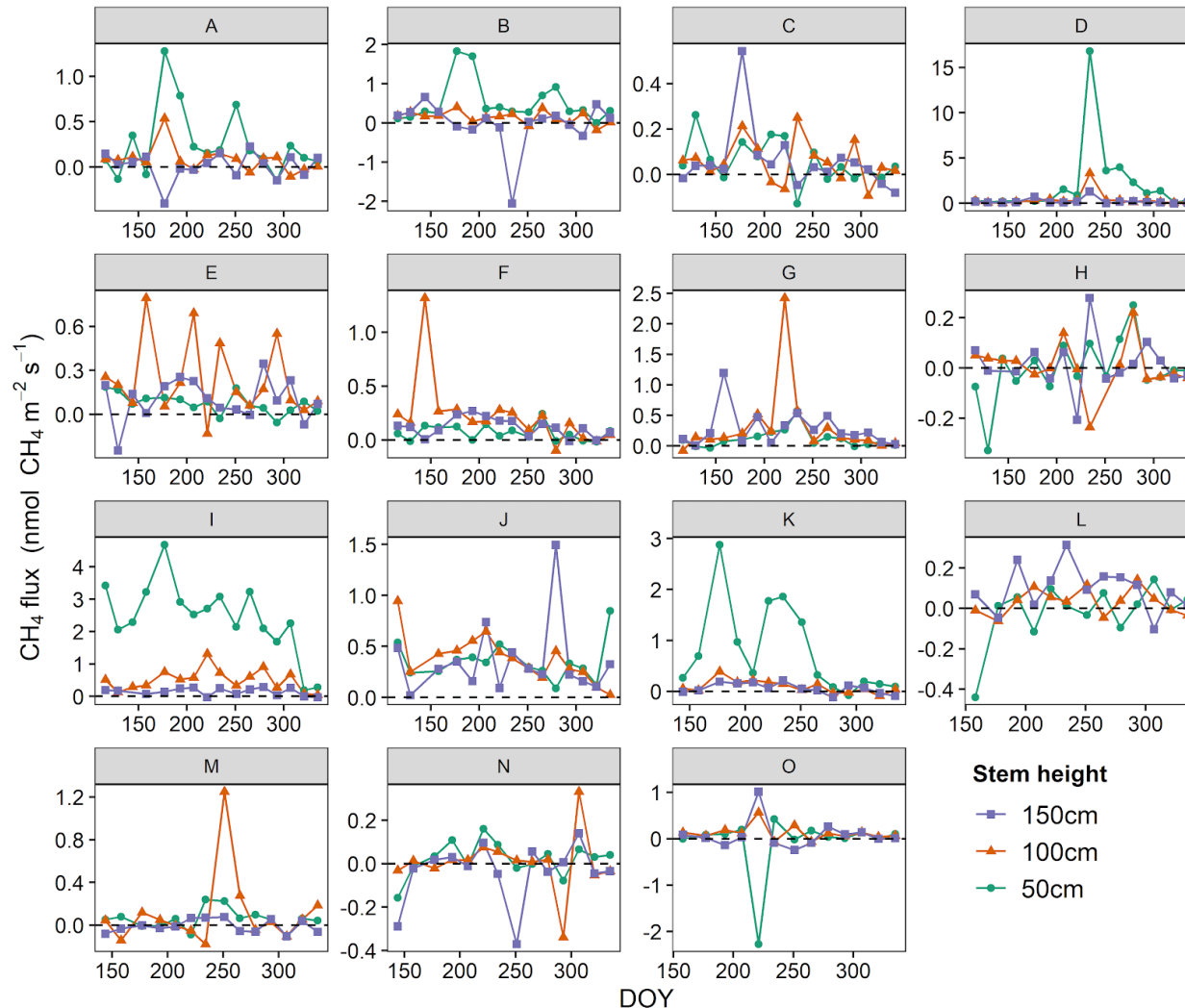


### CH<sub>4</sub> stem emissions

- 1) Seasonal pattern
- 2) High differences between trees
- 3) High differences within trees

# Results

## Automated measurements



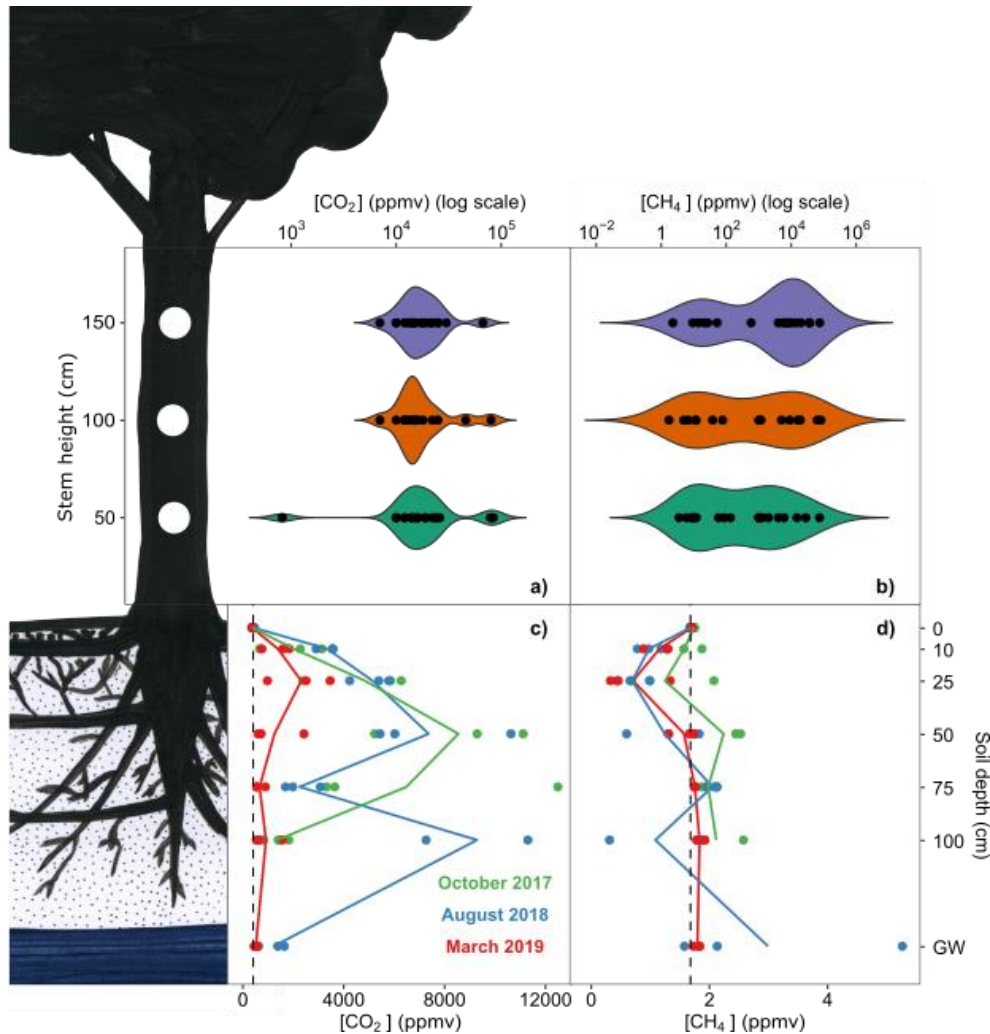
Different letters denote different trees

### CH<sub>4</sub> stem emissions

- 1) All trees emitted CH<sub>4</sub> at a certain point
- 2) No seasonal pattern
- 3) No relation with stem height
- 4) No relation with stem diameter
- 5) No consistency within stems
- 6) Net CH<sub>4</sub> uptake in 23% of the measurements

# Results

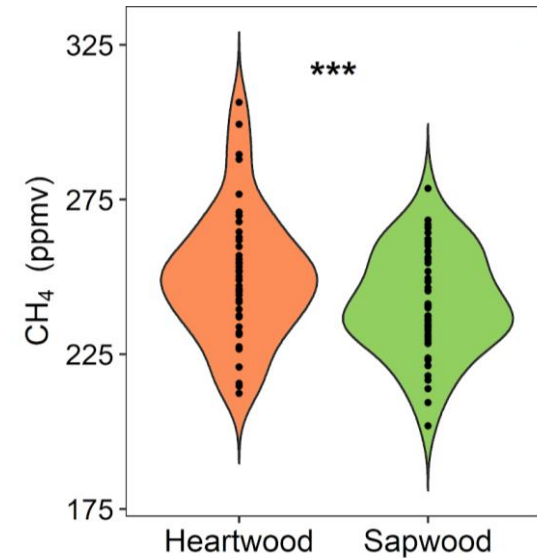
## CH<sub>4</sub> origin



a) Heartwood [CO<sub>2</sub>]  
b) Heartwood [CH<sub>4</sub>]

c) Soil [CO<sub>2</sub>]  
d) Soil [CH<sub>4</sub>]

## Tree core incubations under anoxic conditions



- 1) Very high heartwood [CH<sub>4</sub>]
- 2) Soil [CH<sub>4</sub>] around atmospheric concentrations
- 3) Stem wood produces CH<sub>4</sub> under anaerobic conditions

**EMITTED CH<sub>4</sub> IS PRODUCED WITHIN TREES**