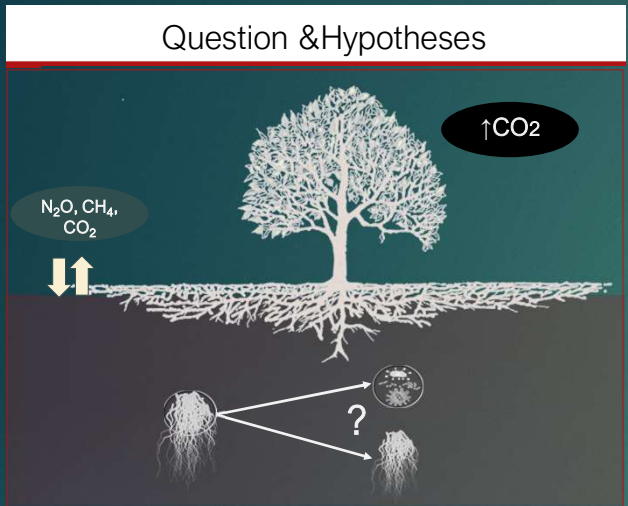


# At the interface of soil and air; What happens under future climates?



Douwes Dekker, N.G<sup>1</sup>., Ullah, S, Mackenzie, R., Gauci, V. (2021)



What happens to soil GHG emissions under elevated CO<sub>2</sub>? (figure 1)

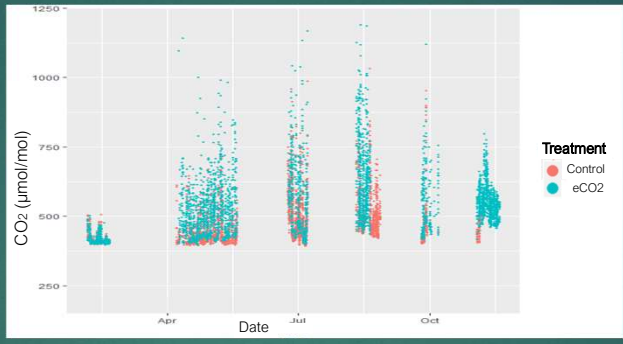
- More C allocation belowground; increase in microbial activity (but not growth?) and exp. Increase in respiration under elevated CO<sub>2</sub> (eCO<sub>2</sub>).
- Competition between trees and soil microbes for N; N<sub>2</sub>O expected to increase, but depending on N availability trees may outcompete microbes for N.
- As a result of increased C input (through root exudates) into the soil under eCO<sub>2</sub>, and potential increase in soil moisture due to reduced evapotranspiration, CH<sub>4</sub> emissions expected to increase.

## Experimental set-up

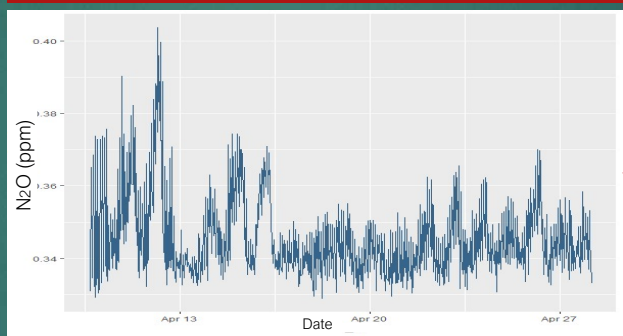
Continuous measurements in the field, measuring CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> fluxes from soil collars.

In the future PLFA-analysis to investigate changes in microbial community.

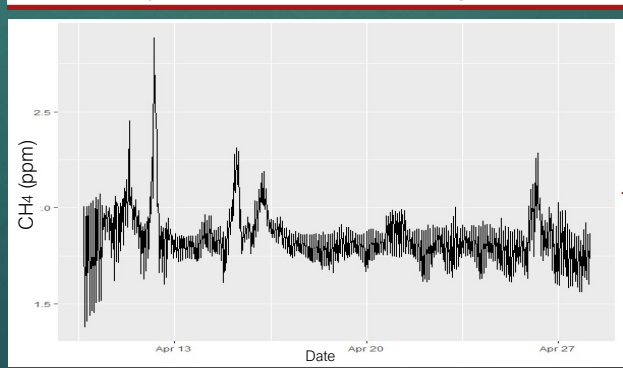
## Early results: CO<sub>2</sub> emissions in 2020



## Early results: N<sub>2</sub>O in spring 2020



## Early results: CH<sub>4</sub> in spring 2020



## Interpreting results and future work

- Data are uncleaned.
- Earlier findings showed a positive effect of eCO<sub>2</sub> on soil CO<sub>2</sub> emissions after 1 year (pers. Comm. Kourmouli, 2021). From the figure, there appears to be a peak concentration of CO<sub>2</sub> under eCO<sub>2</sub> compared to the control.
- This might suggest relatively higher fluxes on average from the eCO<sub>2</sub> plots.
- A more detailed analysis, including all plots, will be performed to confirm flux dynamics over time.
- These will ascertain if elevated fluxes under eCO<sub>2</sub> in the initial years of fumigation are sustained.
- N<sub>2</sub>O and CH<sub>4</sub> Fluxes are from treatment (eCO<sub>2</sub>) array; trace gasses can be detected. Interesting to consider temperature and soil moisture (i.e., oxygen levels) effects, as well as the effect of eCO<sub>2</sub> on soil emissions.

## Implications of research

- Understanding how CO<sub>2</sub> down- and upregulates other GHG fluxes allows understanding the possibilities and limits of carbon storage in forests across the globe.
- Considering the role of the microbial community will help understand what regulates these fluxes.

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