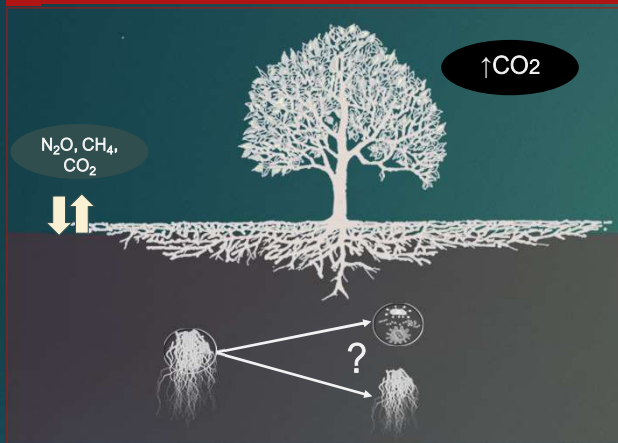


At the interface of soil and air; What happens under future climates?

Douwes Dekker, N.G¹., Ullah, S, Mackenzie, R., Gauci, V. (2021)



Question & Hypotheses



What happens to soil GHG emissions under elevated CO₂? (figure 1)

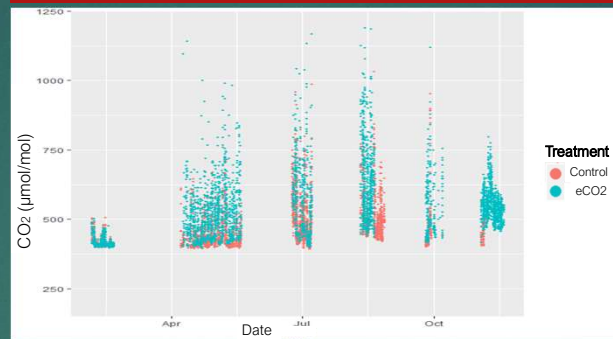
- More C allocation belowground; increase in microbial activity (but not growth?) and exp. Increase in respiration under elevated CO₂ (eCO₂).
- Competition between trees and soil microbes for N; N₂O expected to increase, but depending on N availability trees may outcompete microbes for N.
- As a result of increased C input (through root exudates) into the soil under eCO₂, and potential increase in soil moisture due to reduced evapotranspiration, CH₄ emissions expected to increase.

Experimental set-up

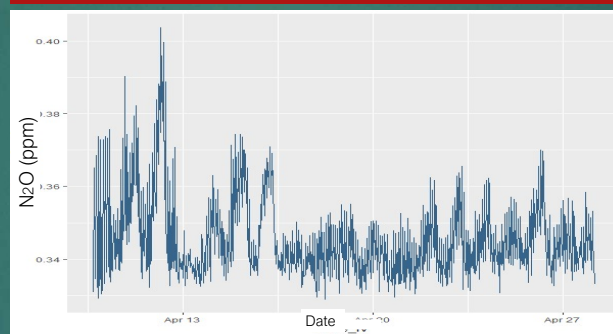
Continuous measurements in the field, measuring CO₂, N₂O and CH₄ fluxes from soil collars.

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

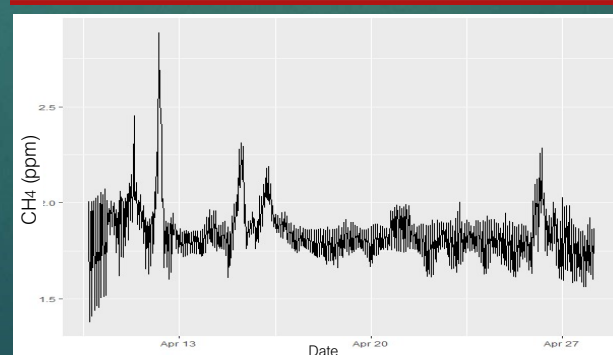
Early results: CO₂ emissions in 2020



Early results: N₂O in spring 2020



Early results: CH₄ in spring 2020



Interpreting results and future work

- Data are uncleaned.
- Earlier findings showed a significant positive effect of eCO₂ on soil CO₂ emissions after 1 year (pers. Comm. Kourmouli, 2021). From the figure, there appears to be a peak concentration of CO₂ under eCO₂ compared to the control.
- This might suggest relatively higher fluxes on average from the eCO₂ plots.
- A more detailed analysis, including all plots, will be performed to confirm flux dynamics over time.
- These will ascertain if elevated fluxes under eCO₂ in the initial years of fumigation are sustained.
- N₂O and CH₄ Fluxes are from treatment (eCO₂) array; trace gasses can be detected. Interesting to consider temperature and soil moisture (i.e., oxygen levels) effects, as well as the effect of eCO₂ on soil emissions.

Implications of research

- Understanding how CO₂ 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.

¹About the author

After finishing my MSc Earth and Environment at Wageningen University (The Netherlands) I worked as a consultant in agriculture, with a focus on sustainable soil management. Email: nxd934@student.bham.ac.uk; Twitter: @Nine_mtjan