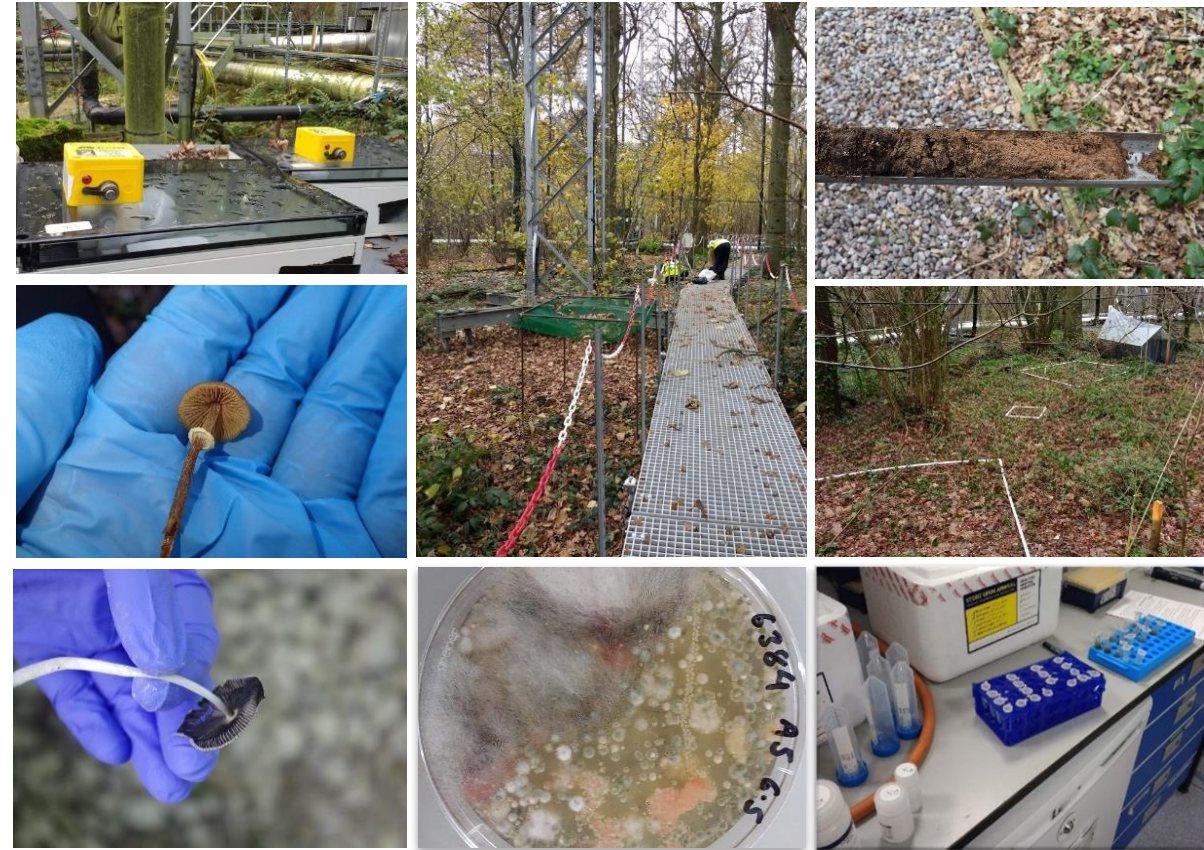


Fungi of the

future:

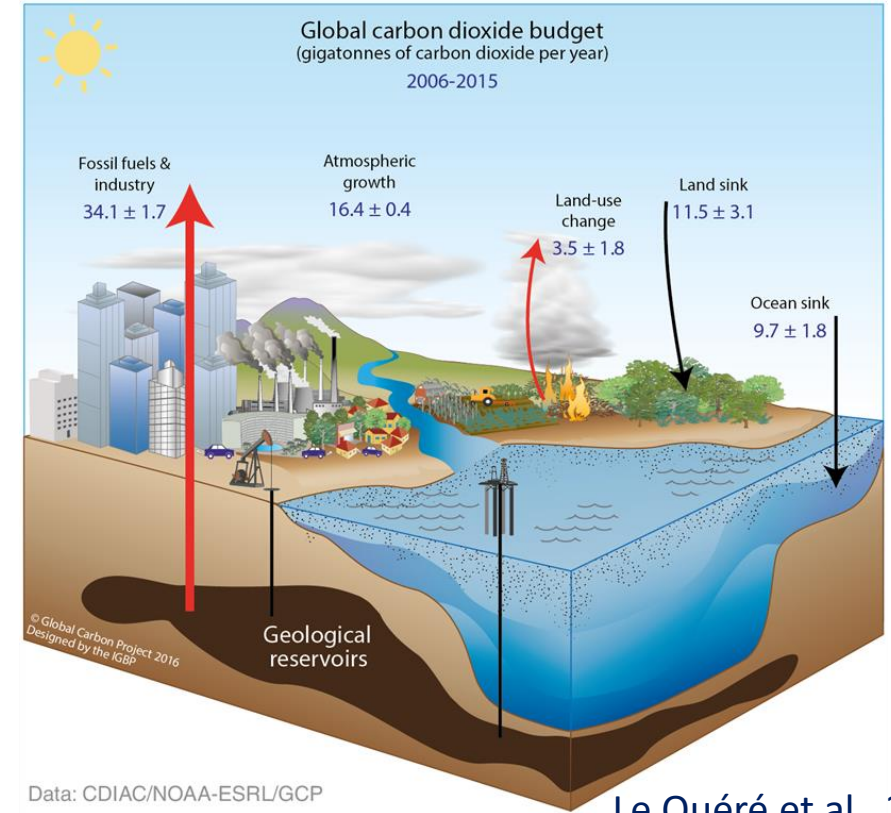
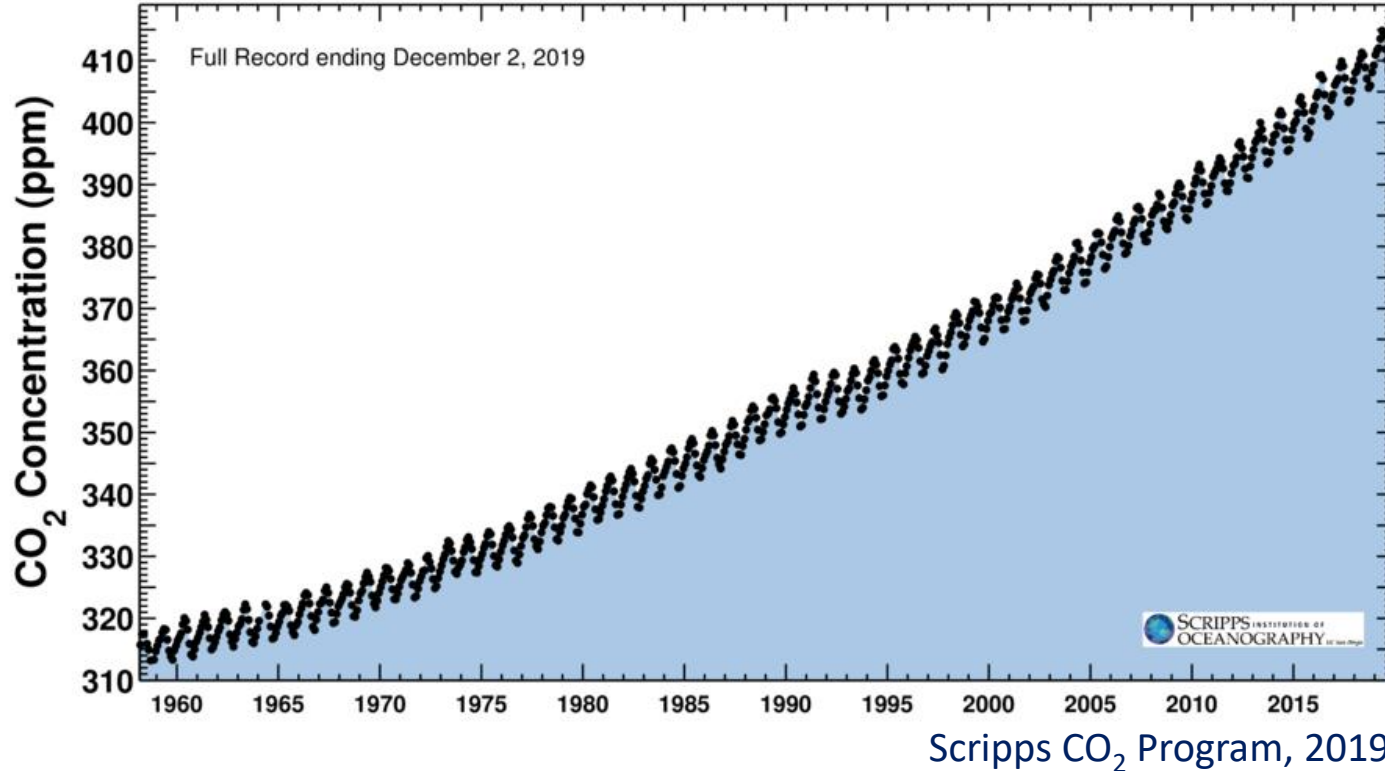
Effects of enriched CO_2 on fungal populations in a temperate forest



Climate change & CO₂



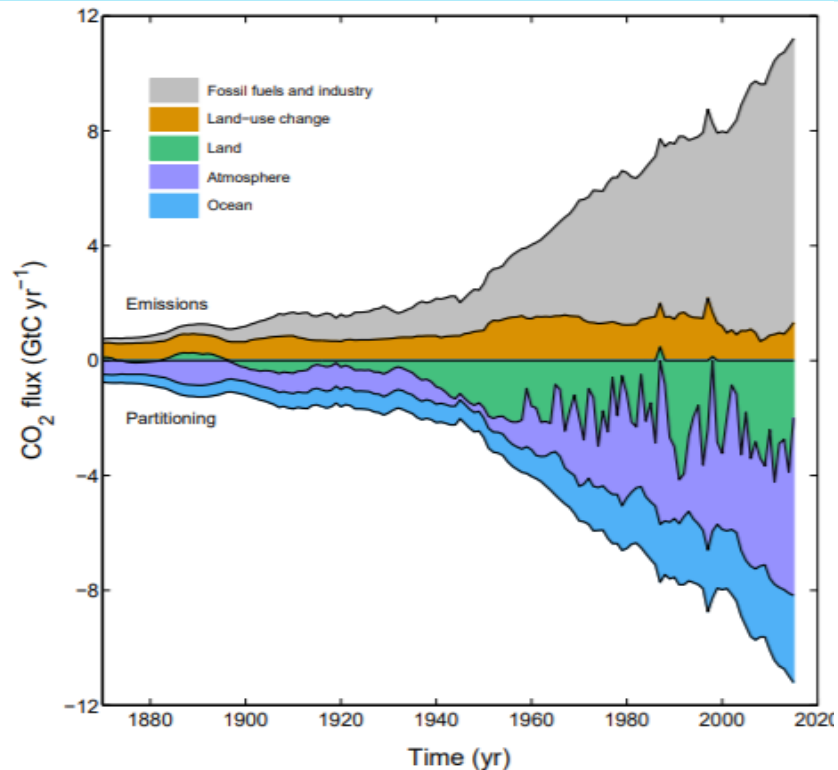
Carbon dioxide concentration at Mauna Loa Observatory



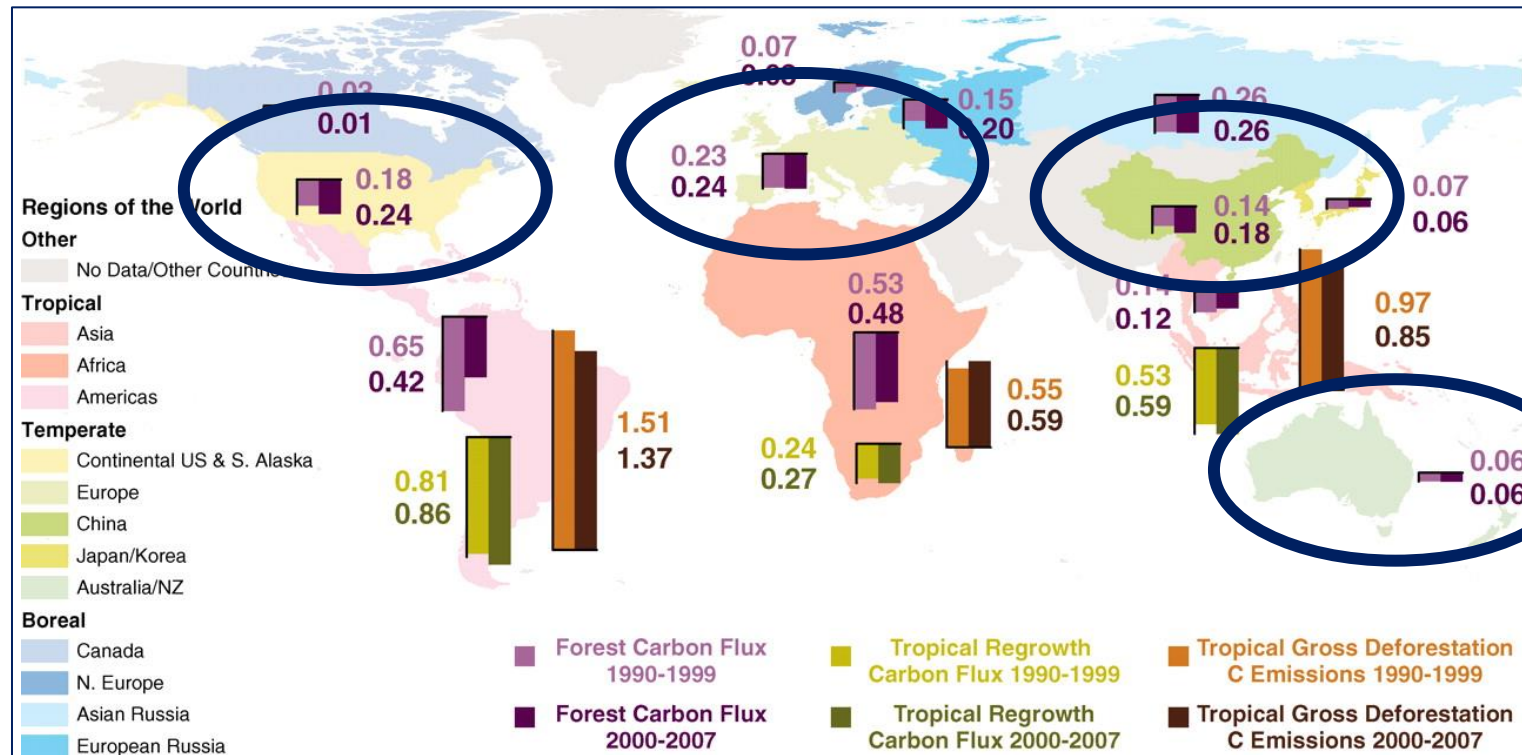
Le Quéré et al., 2016

Land sink: 11.5 +/- 3.1 Gigatonnes CO₂ per year

Climate change & CO₂



Le Quéré et al., 2016

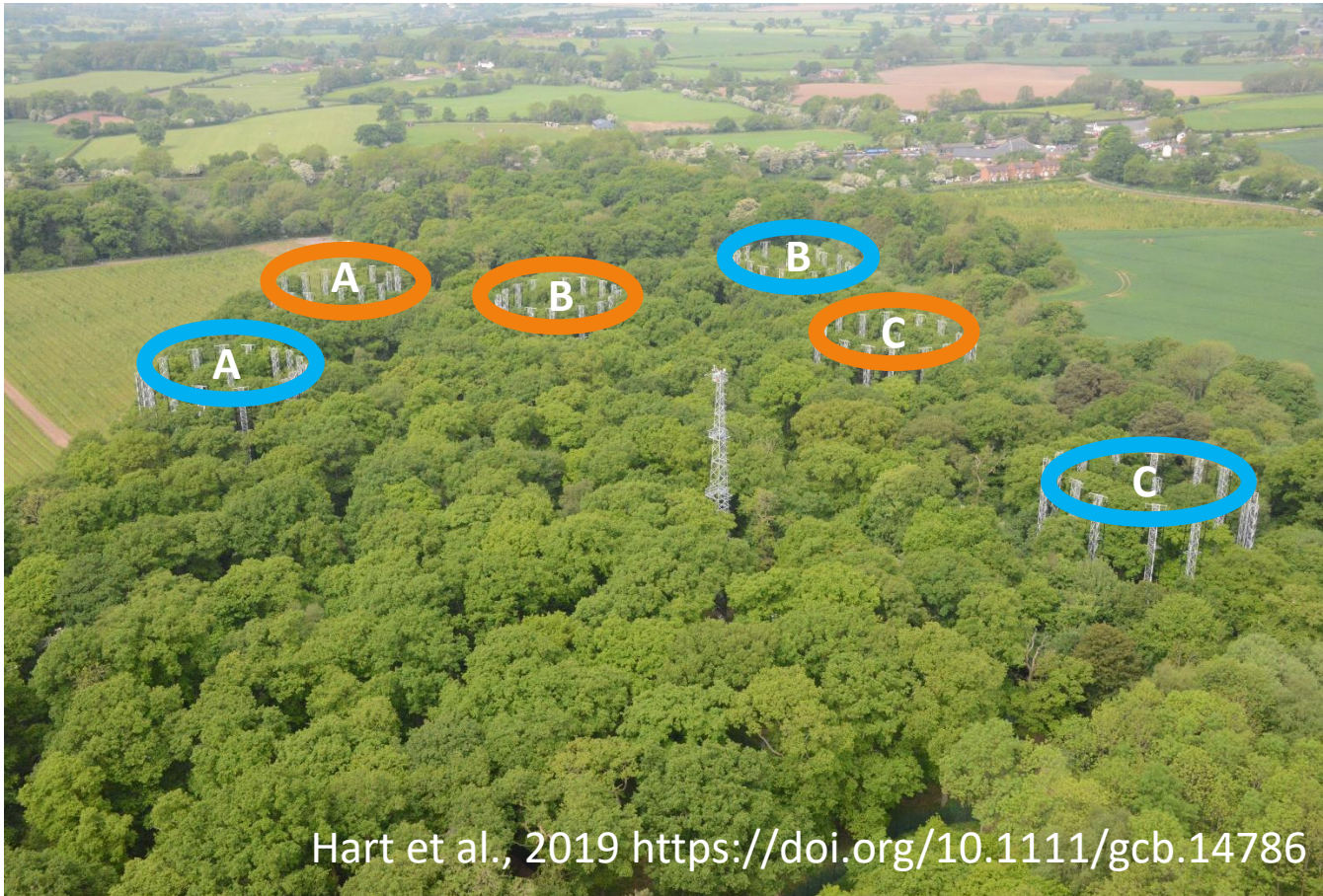


Pan et al., 2011

Temperate forest sink of 0.8 ± 0.1 Carbon per year

BIFoR FACE Experiment

Birmingham Institute of Forest Research
Free Air Carbon dioxide Enrichment



Hart et al., 2019 <https://doi.org/10.1111/gcb.14786>

Mature unmanaged oak woodland

3 x $eCO_2 \sim 550ppm$
3 x **Ambient** $\sim 400ppm$ } 3 pairs

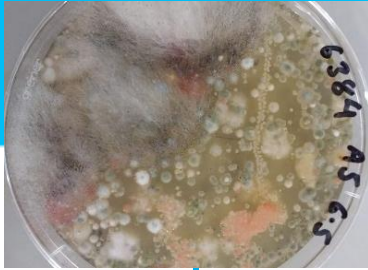
Fumigation: April-Oct

First fumigation year: 2017

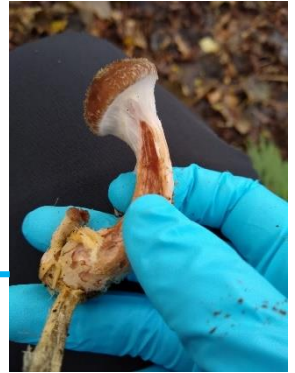
Why fungi?



Plant growth rates



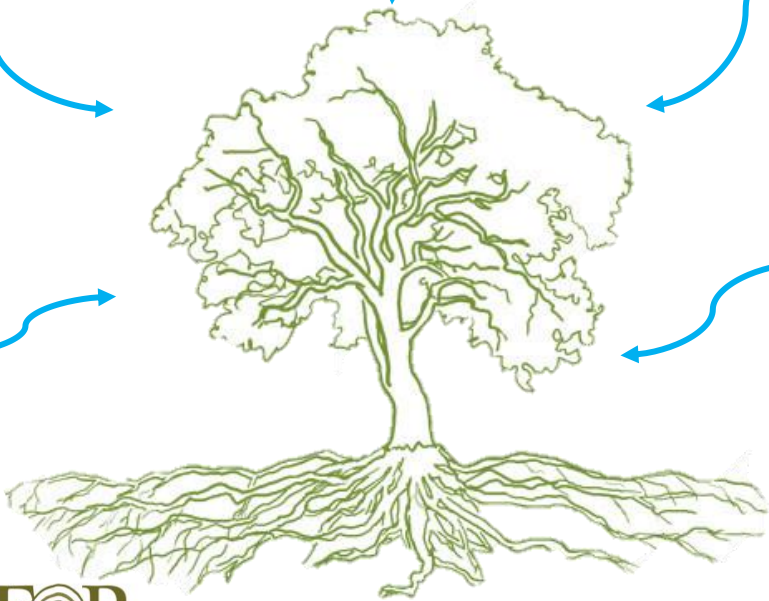
Human health and disease



Plant health and disease



Below-ground carbon cycling & storage



Below-ground nitrogen cycling & storage



Research aims



How are the fungal communities at BIFoR FACE structured?

How are these fungal communities affected by elevated atmospheric CO₂ (eCO₂)?

How could eCO₂ affect fungi?

↑ fungal reproduction rate?

Change in ratios of fungal species?

New fungal species dominating?

↑ fungal biomass?

Macrofungi survey



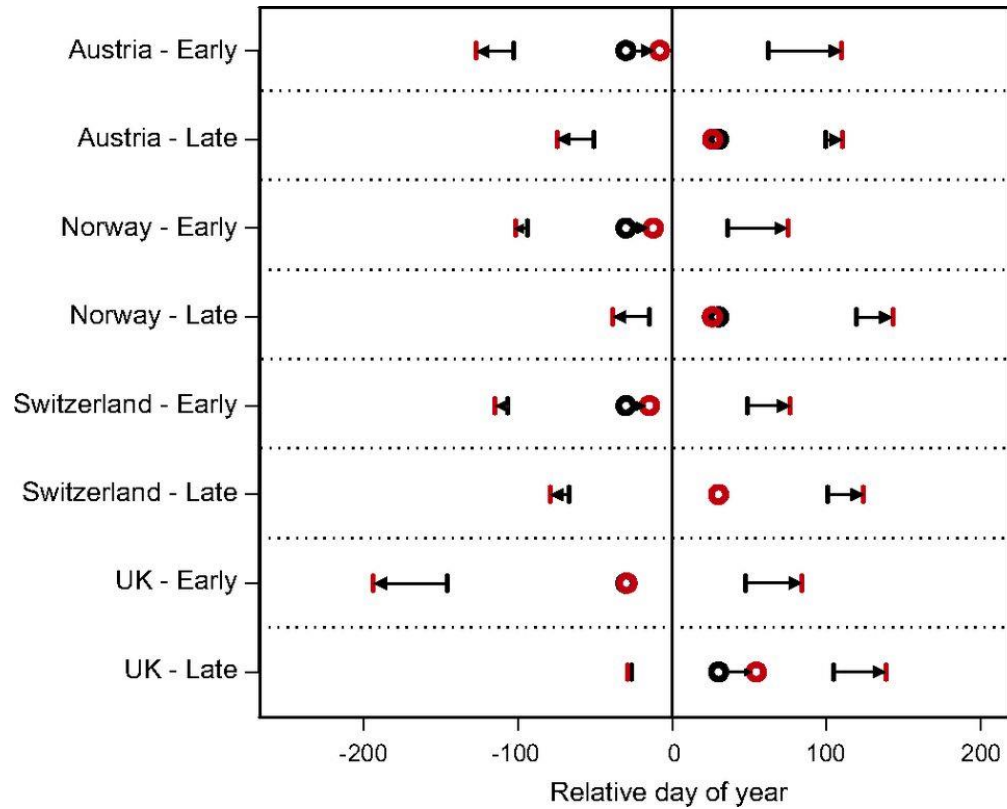
Soil fungal metagenomics



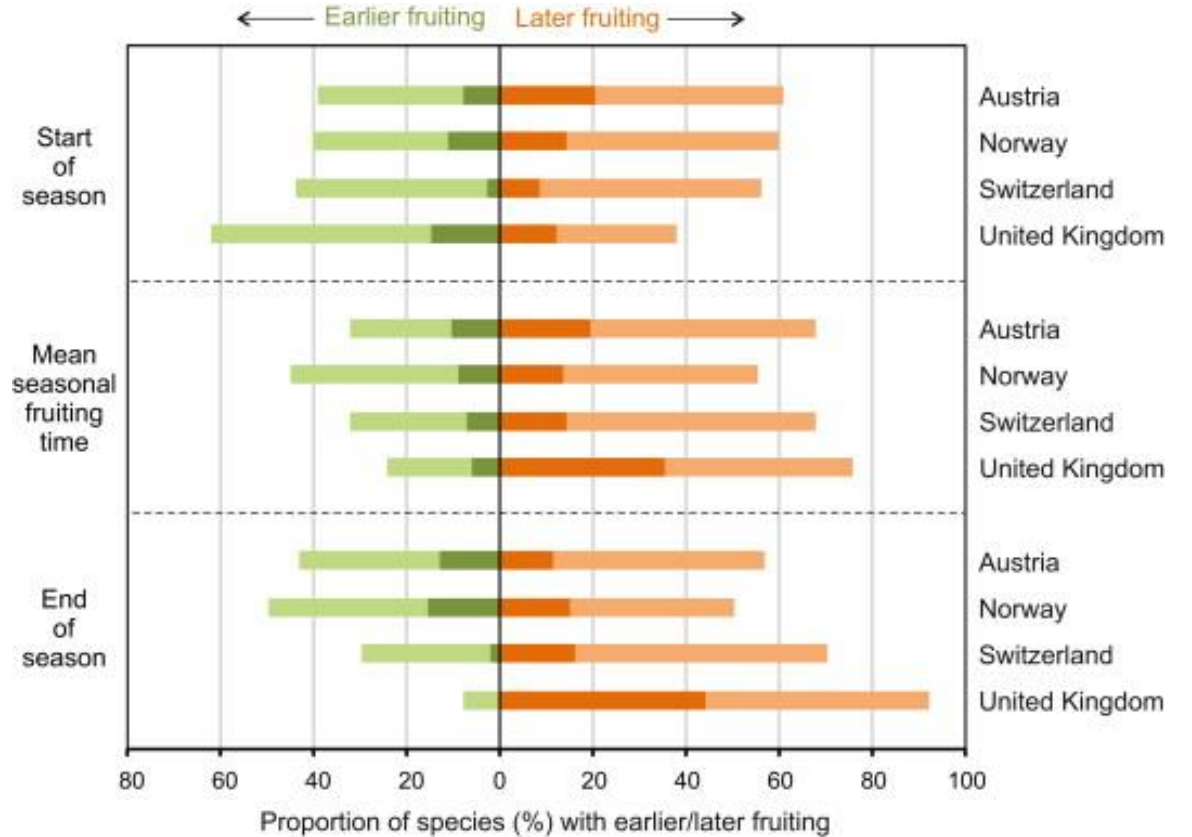
Measuring bioaerosols



Does eCO₂ affect the phenology of macrofungi fruiting?



Kausrud et al. 2012

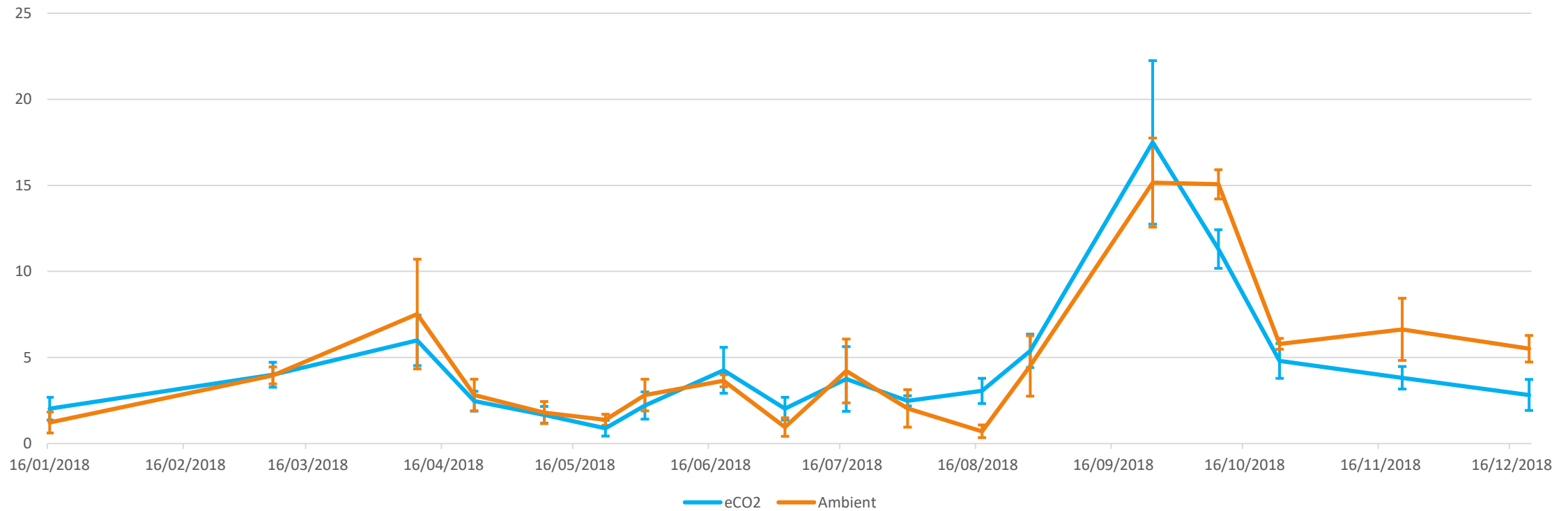


Boddy et al. 2014

Does eCO₂ affect the phenology of macrofungi fruiting?



Number of fungal fruiting species in ambient and eCO₂ arrays March 2018-January 2019



Does eCO₂ change fungal communities in the soil?

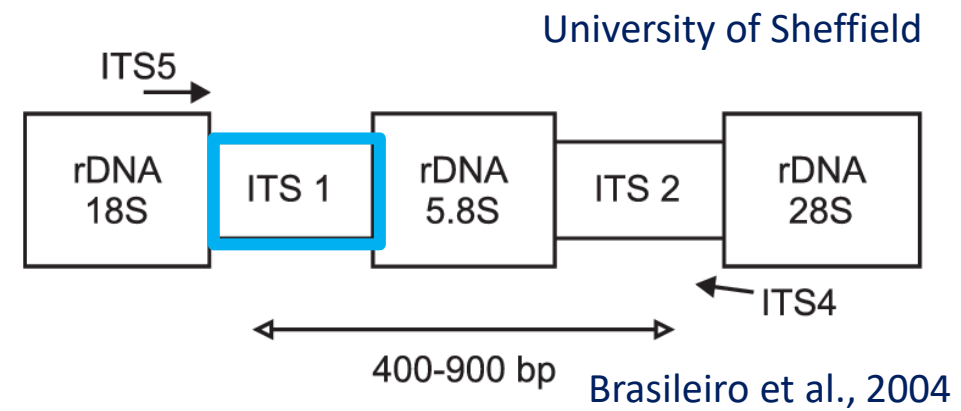
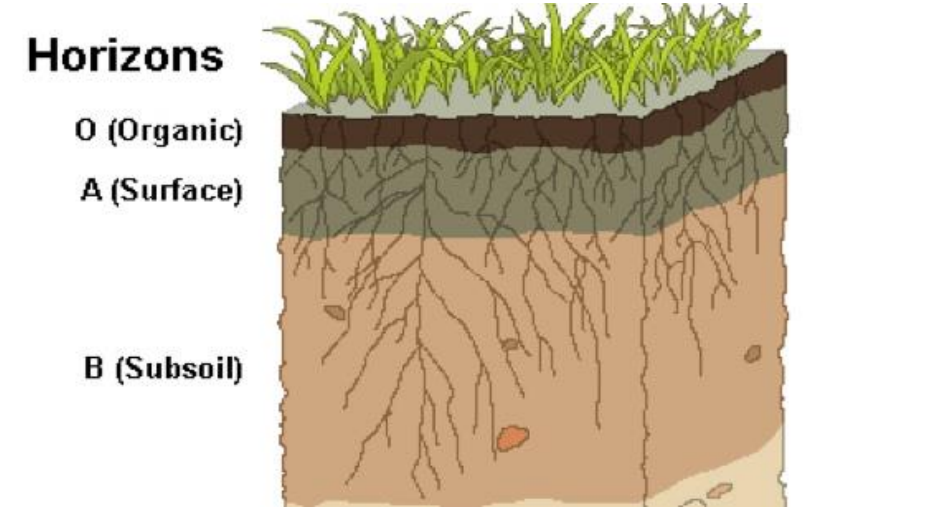


SOIL SAMPLING

- March 2017 & March 2018
- 30cm cores, divided into 3 soil layers (O, A, B)
- O & A soil layers used

METAGENOMICS

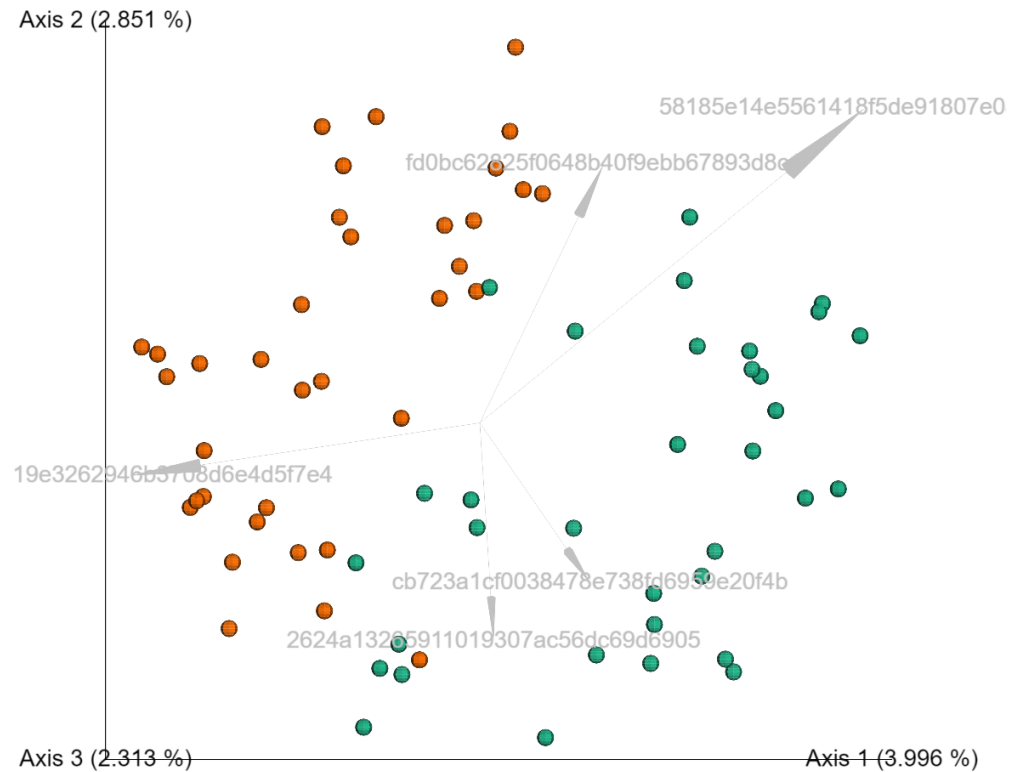
- Qiagen PowerSoil kit extraction (with added bead beating step)
- ITS1 fungi specific primers, Epp. et al 2012.
- Illumina MiSeq @ NBAF facility, University of Liverpool



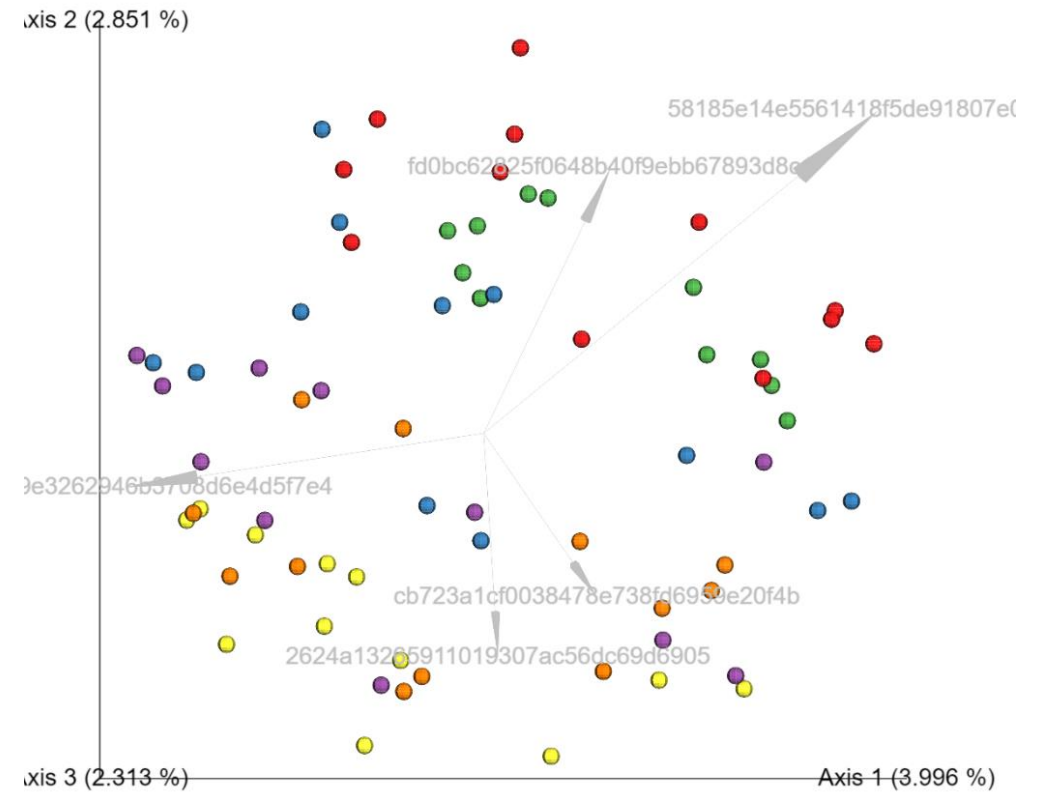
Does eCO₂ change fungal communities in the soil?



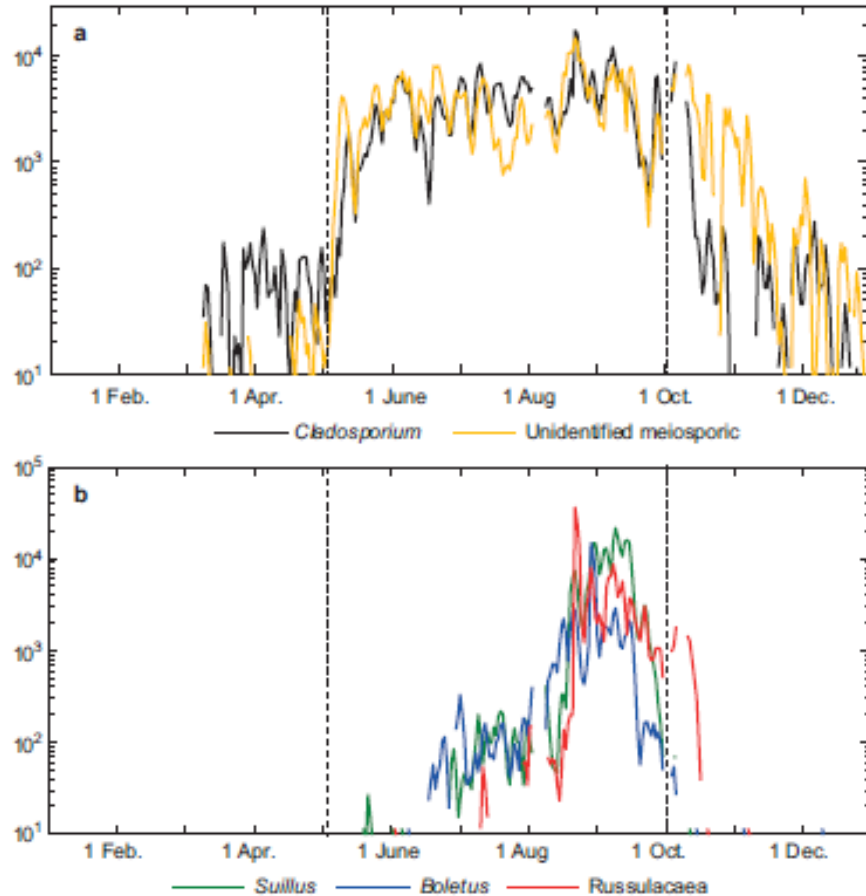
Separation of communities in O and A soil layers



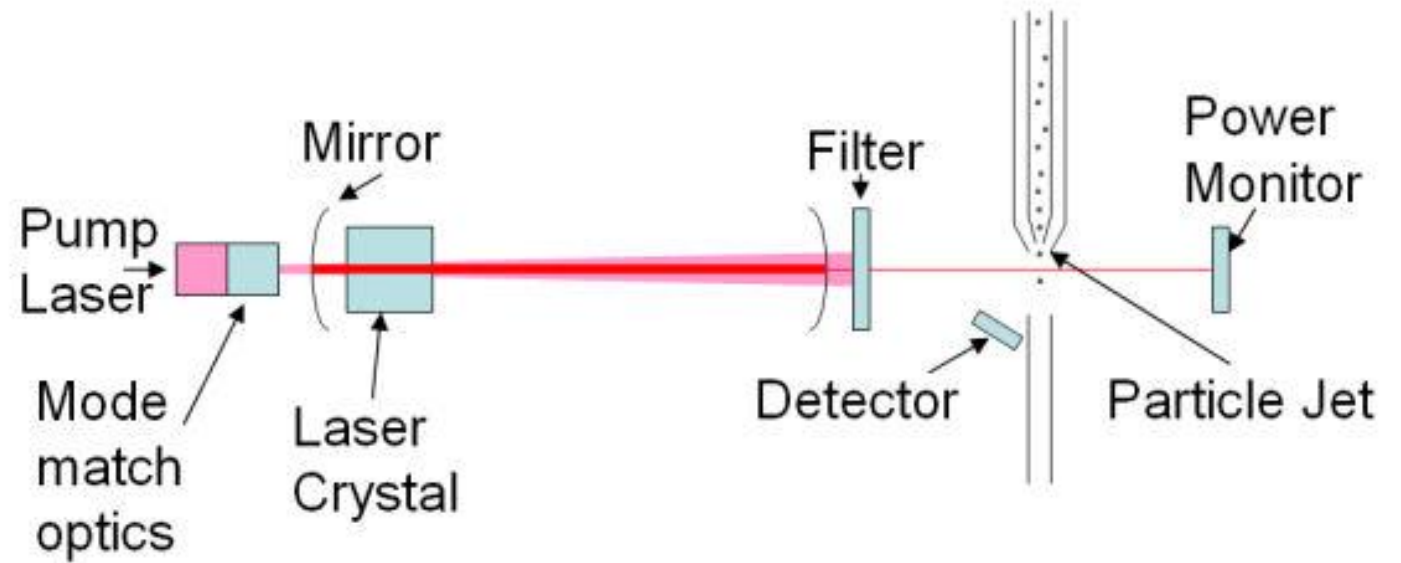
Overlap in fungal communities between Array pairings



Does eCO₂ change bioaerosol concentrations?

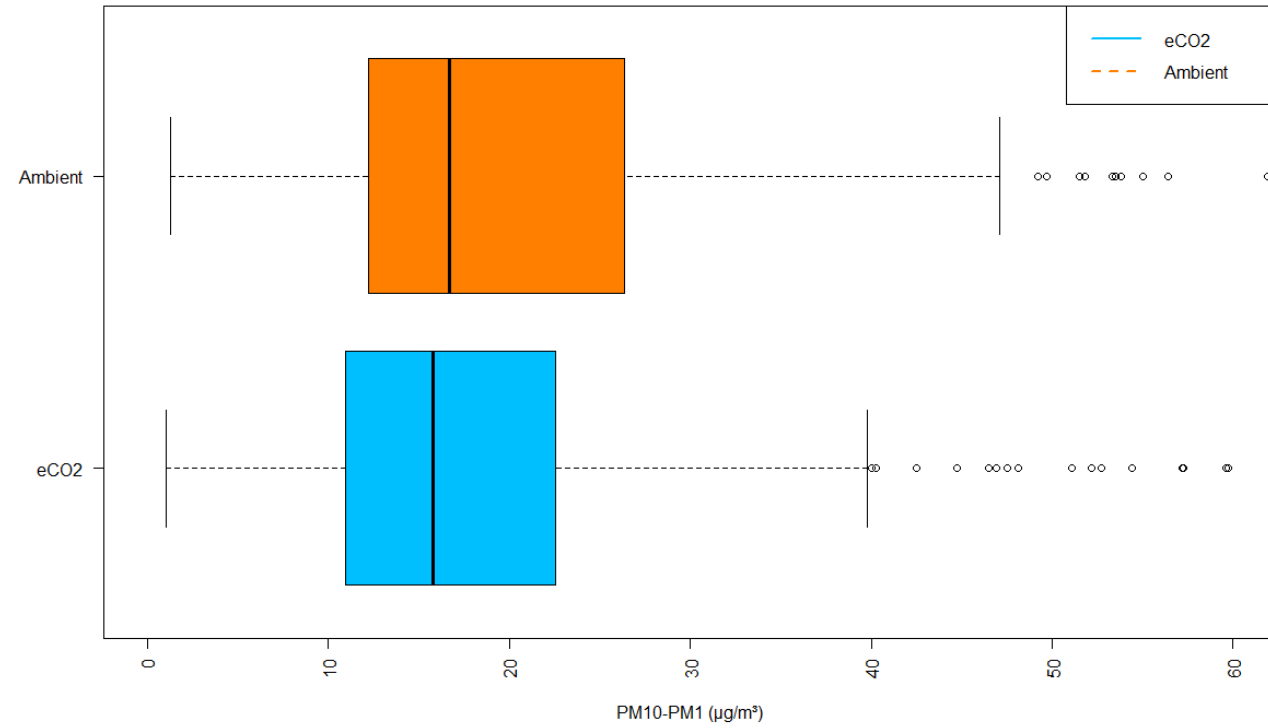
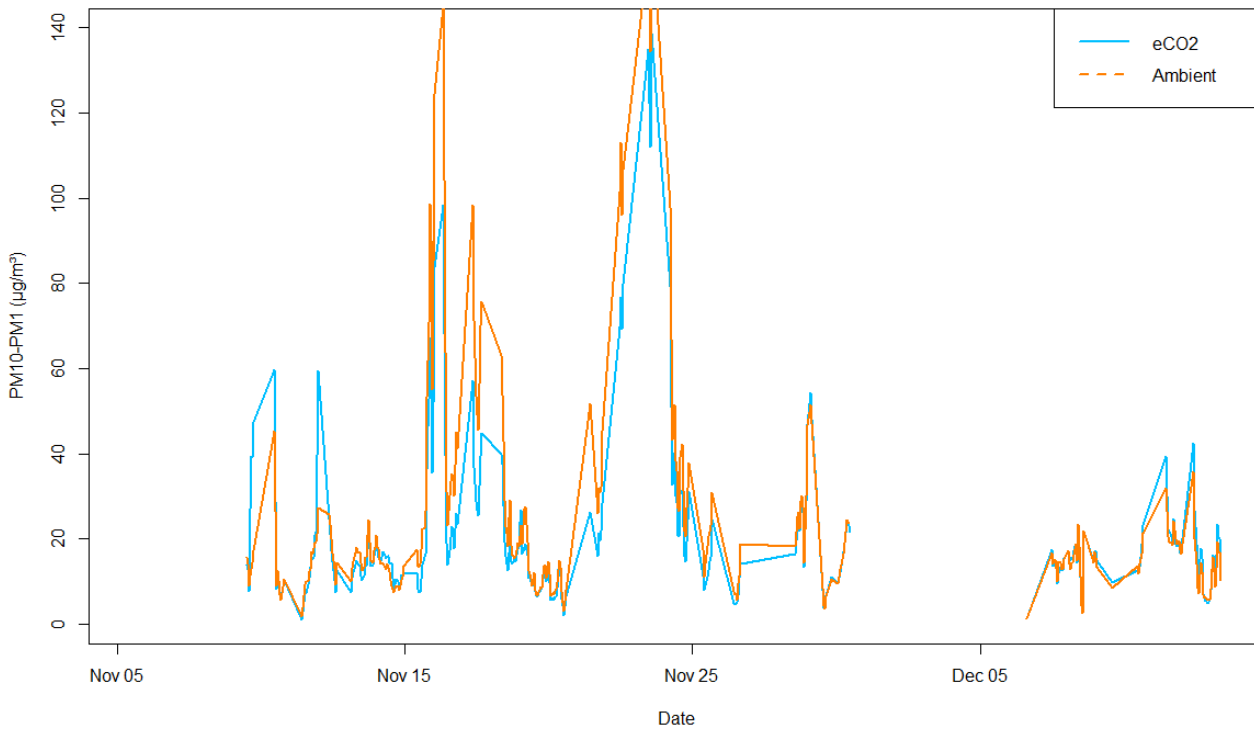


Manninen et al. 2014



Centre for Atmospheric Science,
University of Manchester

Does eCO₂ change bioaerosol concentrations?



How could eCO₂ affect fungi?



MACROFUNGI

- 2 years of detailed monitoring
- No early effect of eCO₂ on fruiting



SOIL FUNGI

- Significant differences in community composition between O and A layers
- Paired arrays have fungal community overlap



BIOAEROSOLS

- No significant difference in medium-large bioaerosol concentrations between eCO₂ and Ambient conditions

- NERC funding via DREAM CDT
- Supervisors: Francis Pope & Robin May
- BIFoR Team
- Rachael Antwis - Uni of Salford
- HAPI lab
- Estrella Luna Diez & Graeme Kettles
- David Tubbs
- Bioinformatics team @ Uni of Liverpool



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Salford
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