



Fungi of the future

Assessing the effects of elevated CO₂ on forest fungal communities

1. Why study forest fungi?

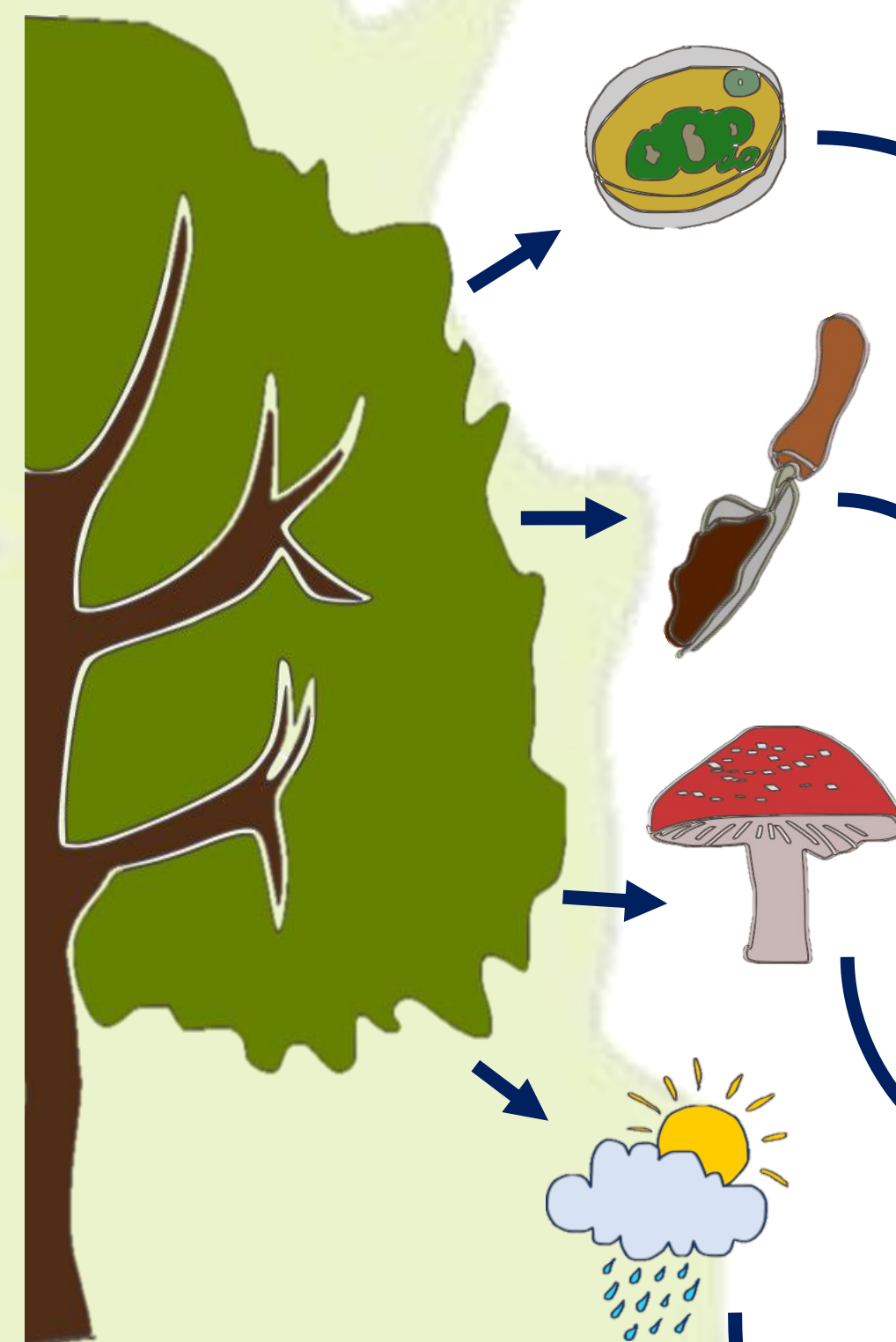
The aim of the Birmingham Institute of Forest Research (BIFoR) Free Air Carbon dioxide Experiment (FACE) is to investigate how temperate forests will respond to elevated CO₂ (eCO₂). Fungi play critical roles in C and N cycling, and in plant and human health; however, we do not understand how eCO₂ will affect their communities.

2. BIFoR FACE

Located in Norbury Park, Staffordshire, an ancient oak woodland is studded with 25m high metal towers. The towers encircle the trees, creating 25 m diameter “rings”.

There are 9 rings in total:

- 3 elevated CO₂ (eCO₂) rings (~555 ppm)
- 3 ambient CO₂ rings (~405 ppm)
- 3 “ghost” rings without towers and at ambient CO₂



3. Research questions

How do fungal communities (the ratios and combinations of different fungal species) change...

...Across the area of a woodland?

...Over the seasons & with changing weather?

...With time?

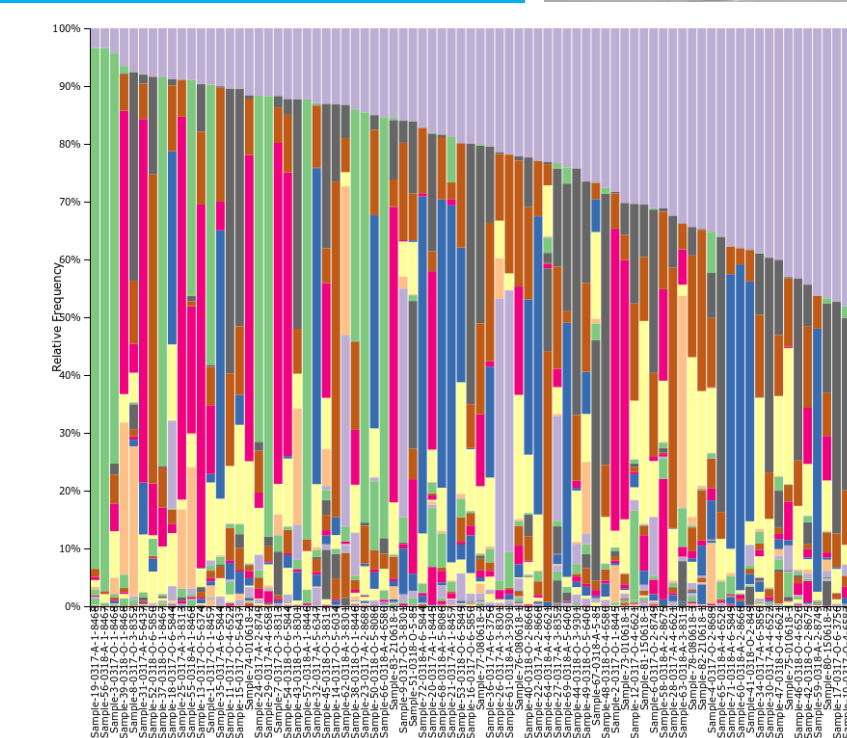
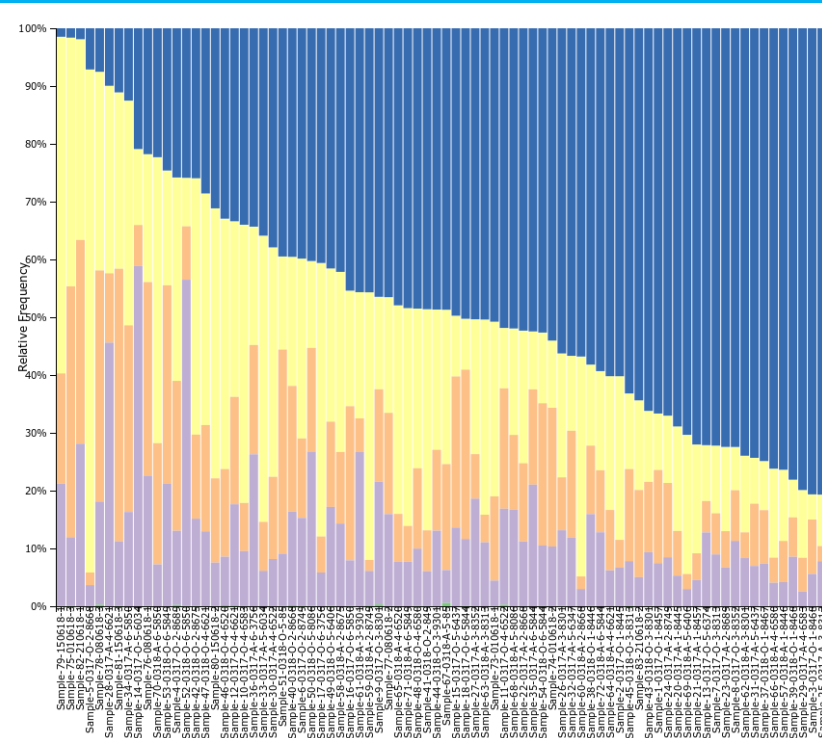
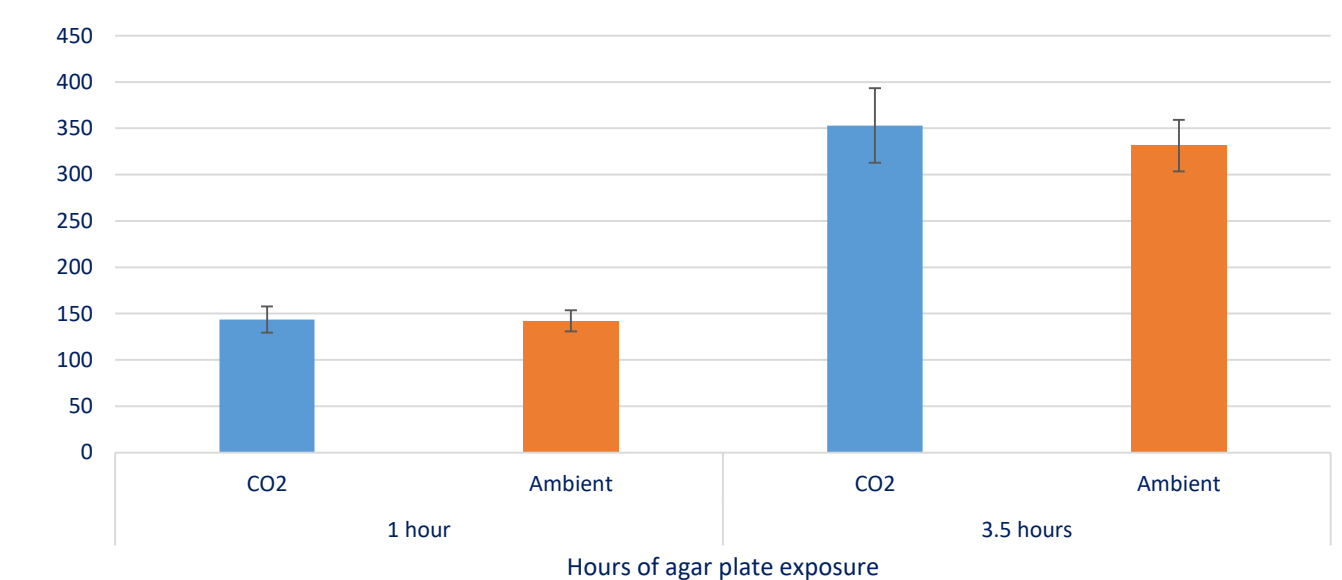
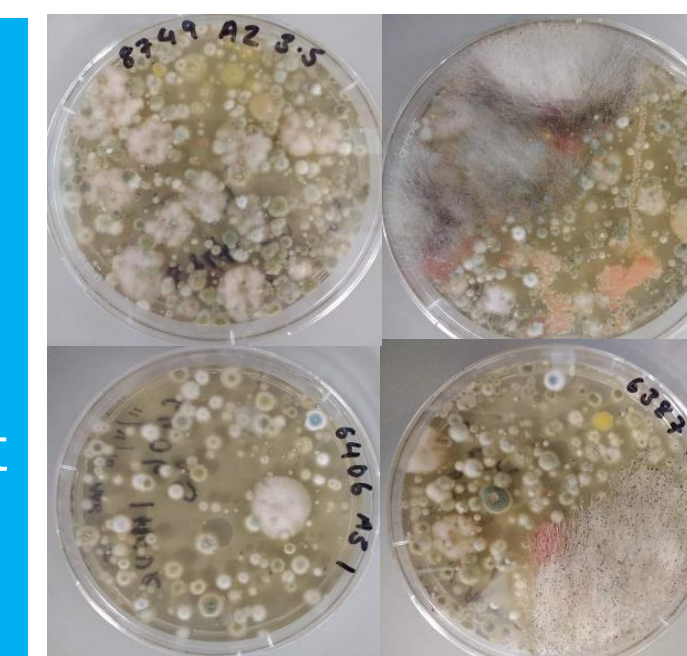
...With increased CO₂?

How might these fungal community changes affect the response of the woodland as a whole?

4. Methods & Preliminary Results

Bioaerosol recording & sampling

- We sampled & cultured fungal aerosols over a 3 week period in Autumn 2018
- Initial results show no significant difference between 3 ambient and 3 eCO₂ arrays. We have also collected 2 additional datasets not presented here which use Optical Particle Counters (OPCs).

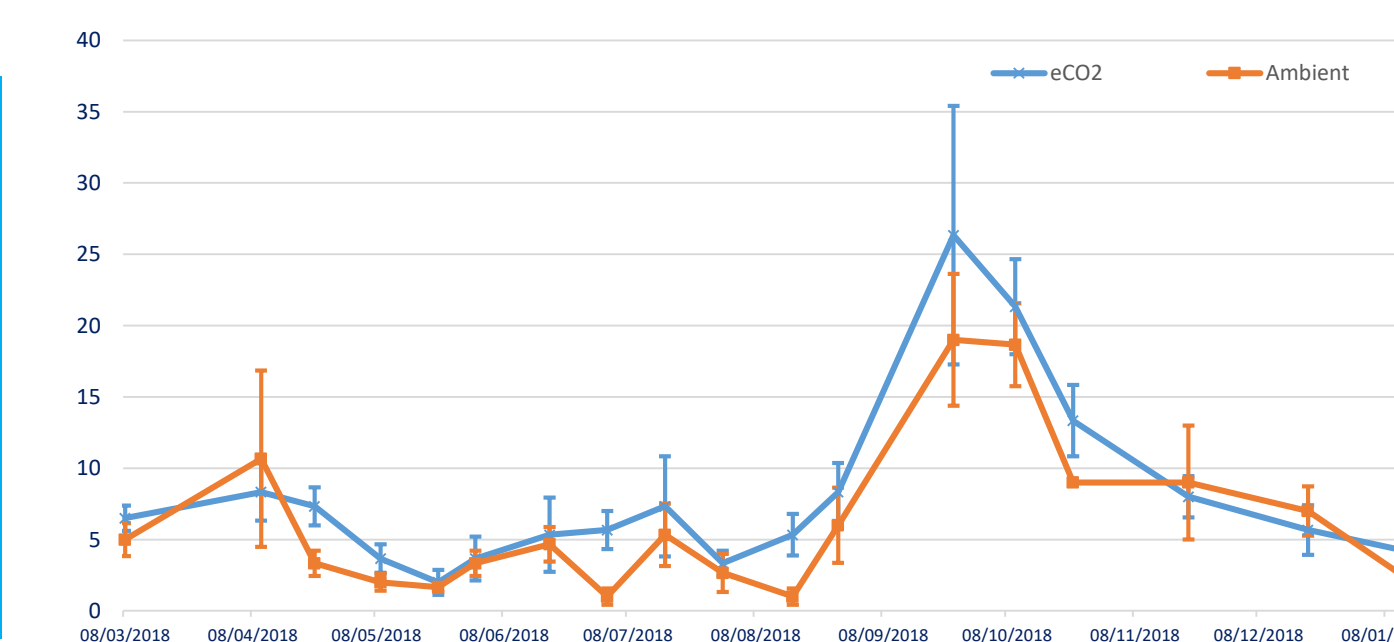


Soil metagenomics

- We extracted total DNA from BIFoR soil samples taken in March 2017 & 2018 across all 6 arrays.
- We then isolated, and sequenced, a fungal-specific section of the genome called ITS1.
- ITS1 can be used to identify the fungal species
- The graphs (left) show the level of complexity in this dataset- further analysis is needed on this data to see if CO₂ has altered the fungal populations.

Fungal fruiting body survey

- Monthly survey of regions within 3 treatment & 3 ambient arrays
- 10 months of survey completed
- Working on analysis of number of fruiting bodies & improved species ID



5. The next steps

- Integrate fungi data with environmental data
- In-depth analysis of soil metagenomic dataset
- 2019 sampling season

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BIFoR
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DREAM
DATA, RISK & ENVIRONMENTAL ANALYTICAL METHODS

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