Preliminary results from BIFoR FACE core sample collections (SLA & LAI)

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1. Scope

Regular (green and brown) leaf collection is conducted at BIFoR FACE throughout the year to measure fundamental forest parameters (e.g. specific leaf area, **SLA** and leaf area index, **LAI**) and verify if any changes occur during elevated CO_2 conditions (+ 150 ppm above ambient).

2. Methods

$$SLA = \frac{A_{leaf}}{M_{dry\ leaf}} \left[\frac{m^2}{g}\right]$$

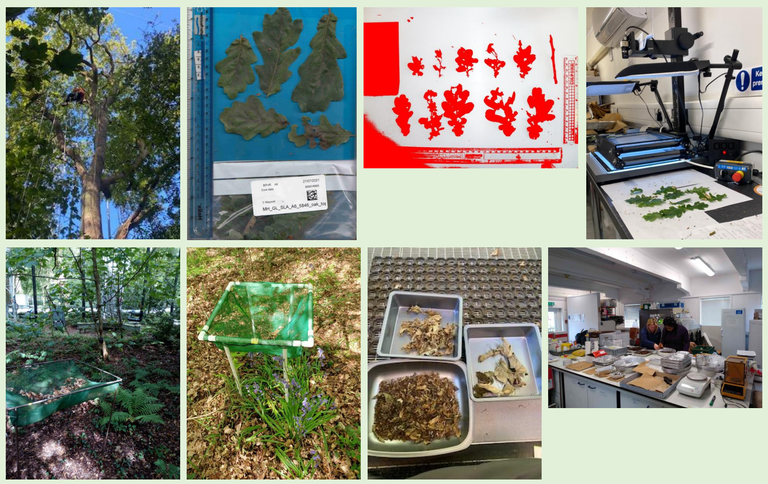
- SLA from green leaves.
- 3 canopy levels (for oaks).
- July and August.
- Pre 2021: Leaf area measured on leaf scans using the ImageJ software. After 2021: leaf area measured with Delta-T WINDIAS leaf area meter.

$$LAI = \frac{SLA \times M_{tot\ leaves}}{A_{tot\ ground}} \left[\frac{\frac{m^2}{g} \times g}{m^2}\right]$$

($A_{tot\ leaves}$)

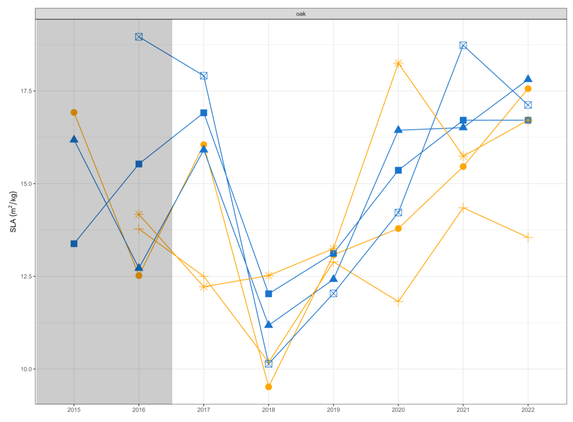
- LAI from cumulative leaf litter mass and SLA (one LAI value per year).
- Pre 2020: 1 to 3 traps per array (1 m^2). From Sep 2020: 6 traps per array (0.25 m^2).
- July and August.

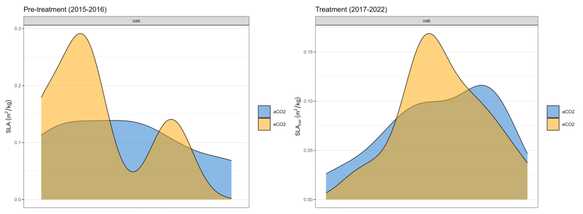
Pre-treatment correction:
- Divide the pre-treatment SLA and LAI values of each array by the pre-treatment mean to find correction factor.
- Divide SLA and LAI of treatment years (2017+) by the correction factor.



3. Preliminary results

treatment	array	species	SLA_cor_fct
<chr>	<chr>	<chr>	<dbl>
eCO2	A1	oak	0.976
aCO2	A2	oak	0.958
aCO2	A3	oak	0.958
eCO2	A4	oak	0.913
aCO2	A5	oak	1.26
eCO2	A6	oak	0.939





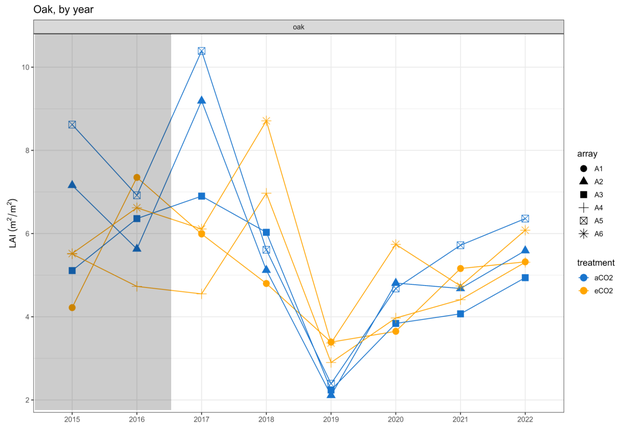
Pre-treatment SLA distributions

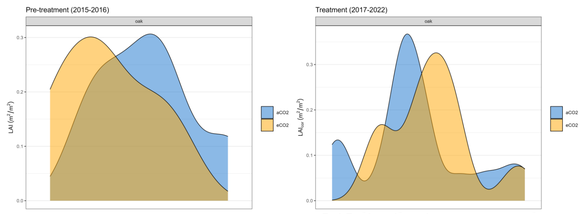
SLA distributions corrected for pre-treatment differences (oak t-test p-value = 0.8267)

4. Key SLA take aways

- There is no clear treatment effect but pre-treatment SLA data is sparse. SLA under elevated CO_2 is usually lower than under ambient conditions.
- SLA drops in 2018 ("Beast from the East" cold spell up to April followed by months of drought + leaf miners infestation).

treatment	array	species	LAI_cor_fct
<chr>	<chr>	<chr>	<dbl>
eCO2	A1	oak	0.941
aCO2	A2	oak	1.04
aCO2	A3	oak	0.933
eCO2	A4	oak	0.833
aCO2	A5	oak	1.26
eCO2	A6	oak	0.988





Pre-treatment LAI distributions

LAI distributions corrected for pre-treatment differences (oak t-test p-value = 0.2967)

5. Key LAI take aways

- $SLA_{green\ leaves} \neq SLA_{leaf\ litter}$ due to mass loss during senescence but no correction has been applied yet.
- There is no clear treatment effect but LAI may be slightly increasing.
- LAI drops in 2019 possibly following the drought + leaf miners infestation in 2018.

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