

From branch to forest to globe: how do tree choices regarding growth change forest response to eCO₂?

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Background & implications

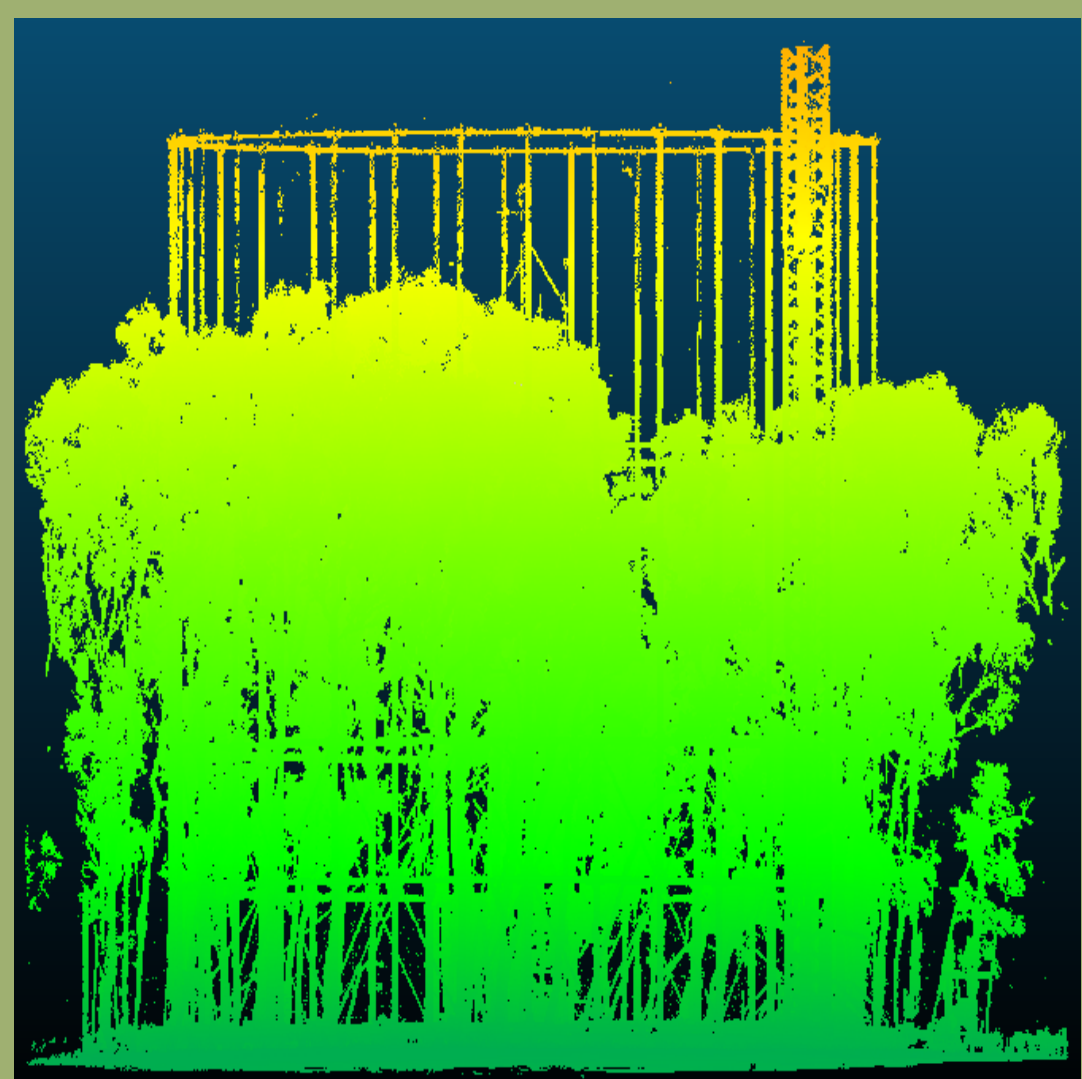
The fate of carbon following increased photosynthetic activity under elevated carbon dioxide (eCO₂) is uncertain in mature forests [1]. Models predict a large fraction of C to be stored in wood [2], underlining the importance of the global forest sink. Branch and fine wood compartments are often neglected in forest research, so this project will break open black box of woody carbon dynamics by looking into biomass distribution and potential changes in turnover rates in the forest of the future.

Project overview

Collecting and comparing data from two second-generation Free Air Carbon Enrichment (FACE) experiments.

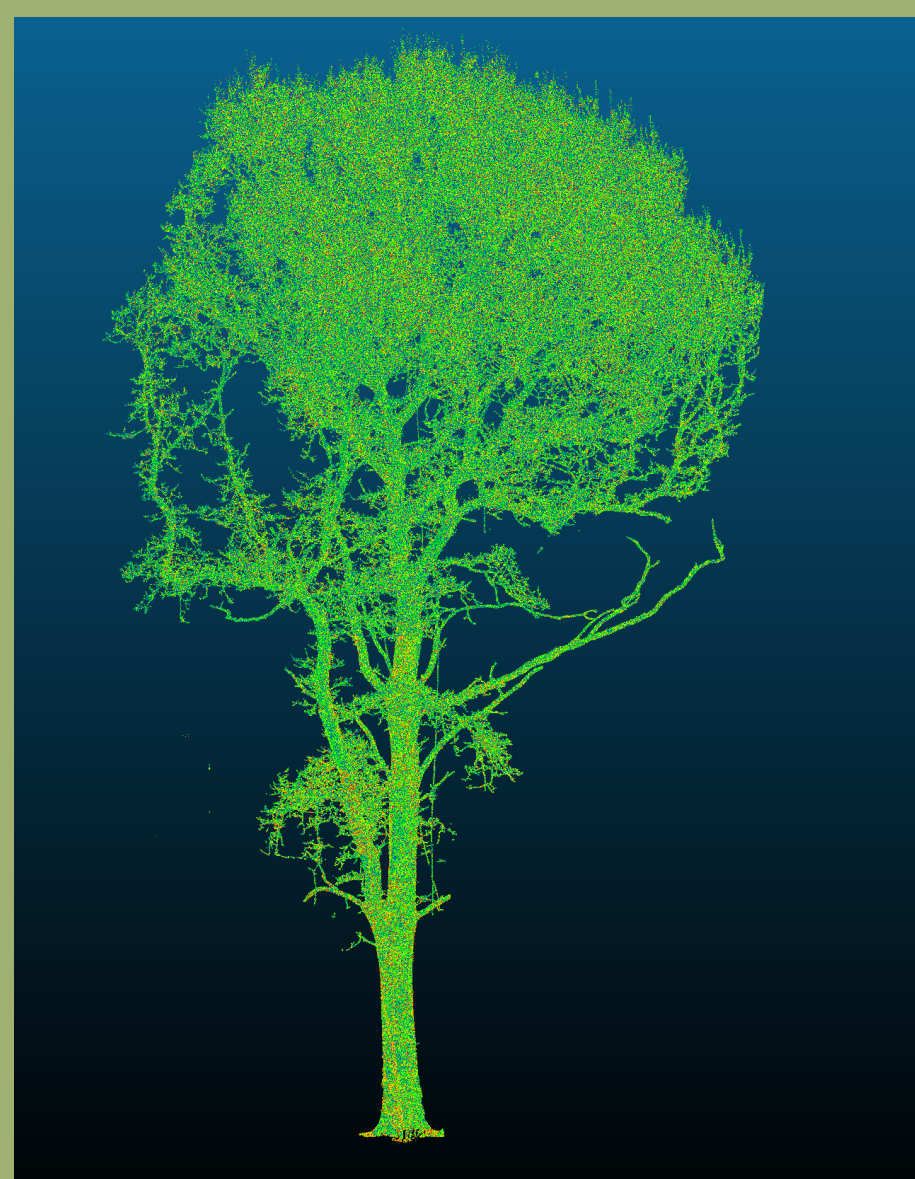
- BIFoR FACE - Oak-dominated forest in Staffordshire, United Kingdom.
- EucFACE - Native Eucalyptus-dominated forest in Sydney, Australia.

1.A Is there an effect of eCO₂ on biomass distribution among woody compartments?

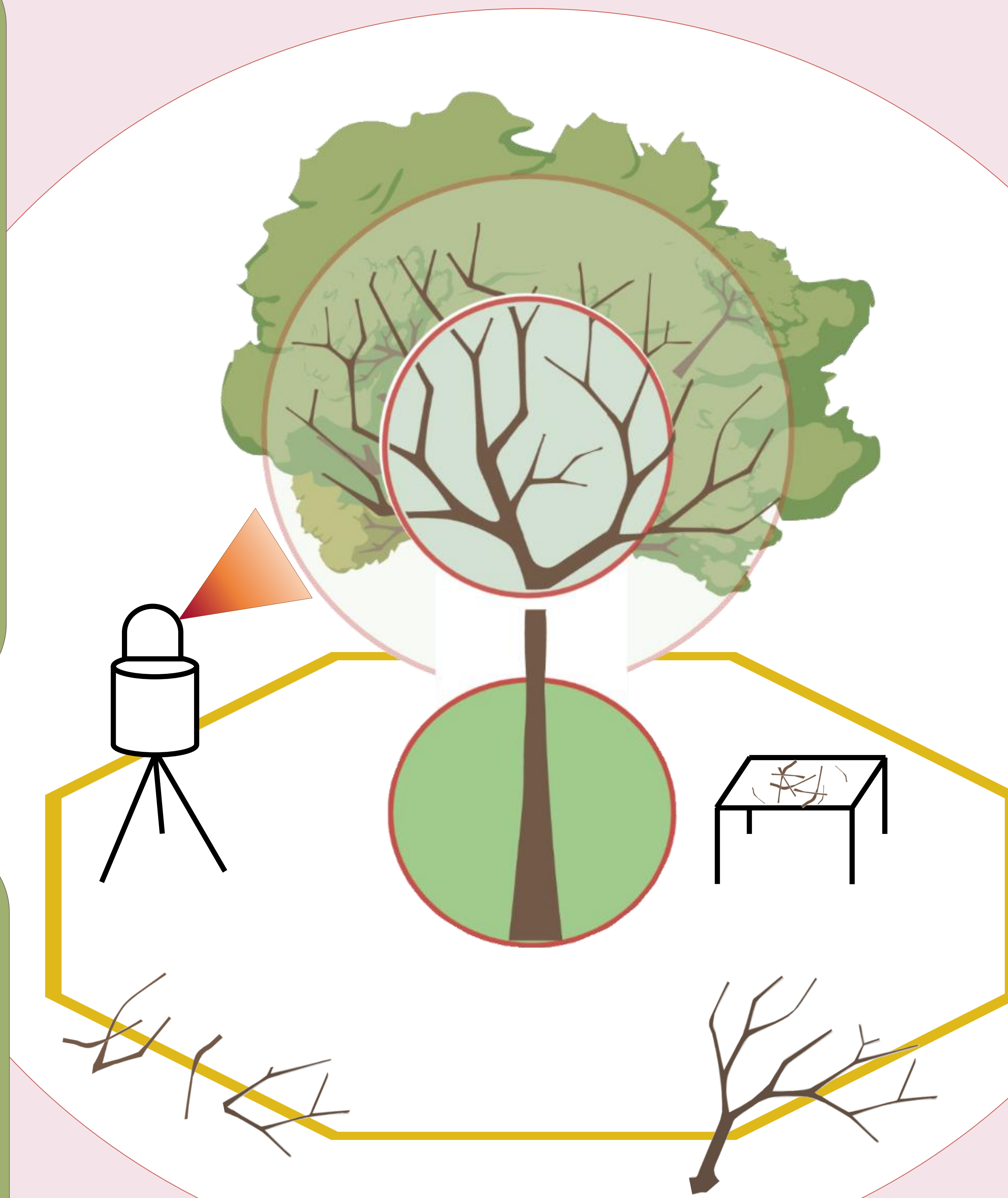


The point clouds derived from scans done at both sites in 2022, provide data on tree and stand level

1.B.



The single tree point clouds will be the base for cylinder fitting, which will provide detailed volume and subsequent biomass numbers. To bridge the gap between the smallest diameter detectable in the canopy with scans (~5cm \varnothing) and smaller material found on the transects, extra scans and measurements will be made of fallen branches.



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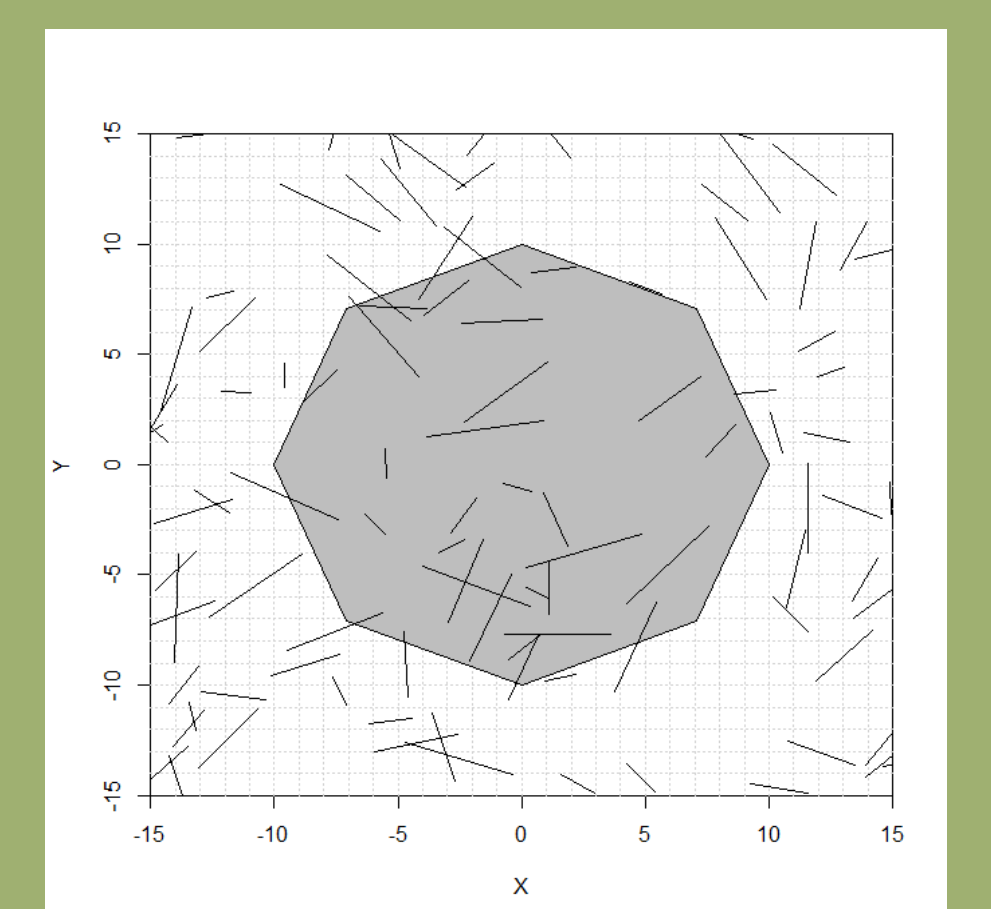
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3. How do environmental factors impact distribution and turnover under eCO₂?

By using years of abiotic measurements at the only two second-generation FACE experiments in mature forest stands in the world, I will compare and determine any changed trends in distribution and turnover under eCO₂.

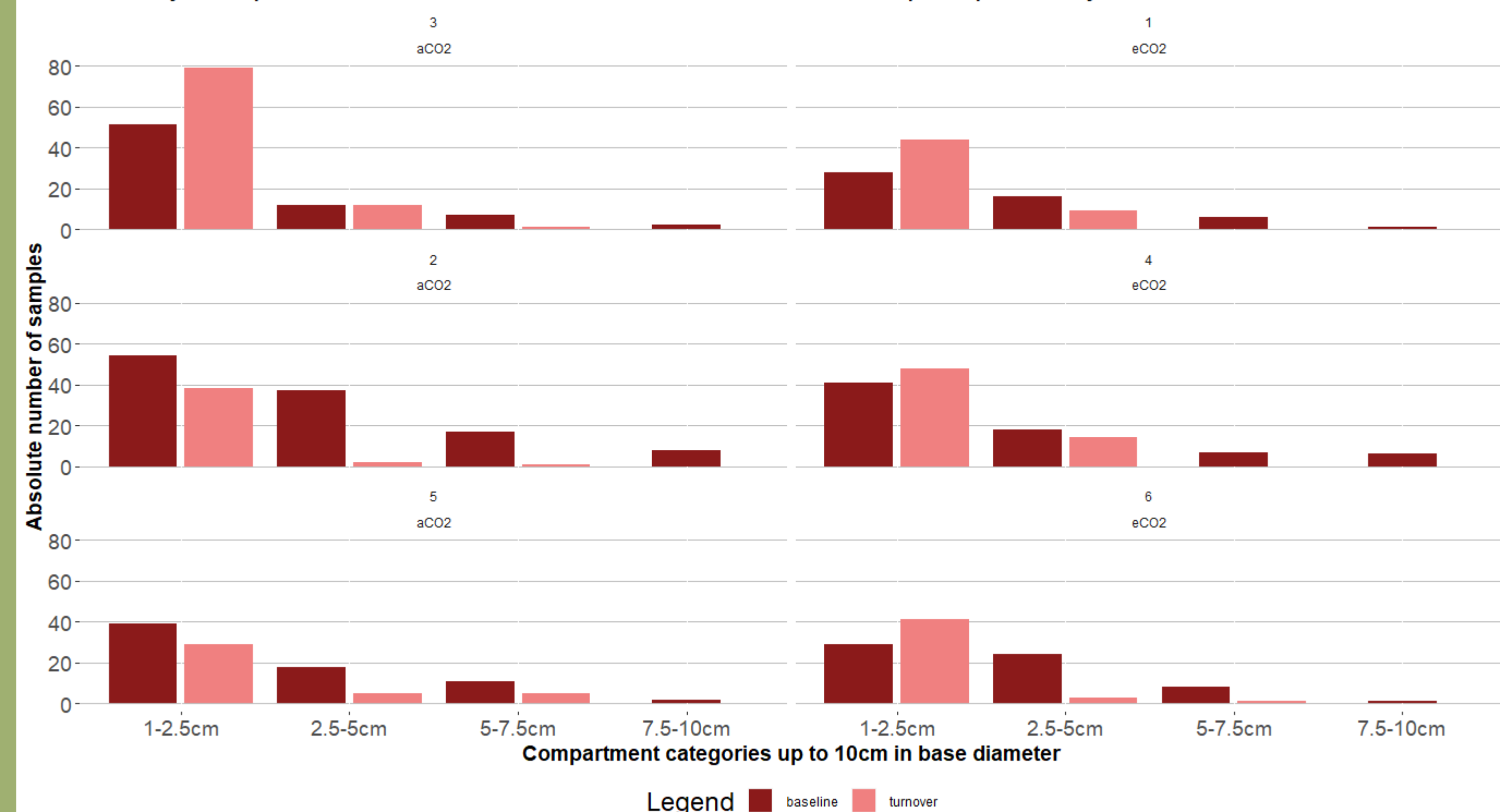
2. Is there an effect of eCO₂ on turnover of woody compartments?

Inventory of all woody debris (>1cm \varnothing) intersection with the transect lines in each array at BIFoR FACE.



In order to expand this to a stand level turnover rate, an expansion factor is being made, differentiating between compartment lengths and diameters.

Preliminary comparison of numbers baseline and turnover samples per array & treatment at BIFoR FACE



References:
1. Jiang et al (2020). 2. Walker et al (2019).
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