



## **Nitrogen uptake in temperate heath vegetation and soil microbes is influenced by elevated temperature, CO<sub>2</sub> and drought**

**Andresen, L.C.; Michelsen, Anders; Johansson, Sven; Beier, Claus; Ambus, Per**

*Publication date:*  
2009

[Link back to DTU Orbit](#)

### *Citation (APA):*

Andresen, L. C., Michelsen, A., Johansson, S., Beier, C., & Ambus, P. (2009). *Nitrogen uptake in temperate heath vegetation and soil microbes is influenced by elevated temperature, CO<sub>2</sub> and drought*. Poster session presented at BIOGEOMON 2009, University of Helsinki (FI), 29 Jun - 3 Jul.

---

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



BIOGEOMON 2009

# Nitrogen uptake in temperate heath vegetation and soil microbes is influenced by elevated temperature, CO<sub>2</sub> and drought

<sup>1</sup>Louise C. Andresen, <sup>1</sup>Anders Michelsen, <sup>1</sup>Sven Jonasson, <sup>2</sup>Claus Beier, <sup>2</sup>Per Ambus

<sup>1</sup> University of Copenhagen, Denmark; [louisea@bio.ku.dk](mailto:louisea@bio.ku.dk) and [loand@life.ku.dk](mailto:loand@life.ku.dk)

<sup>2</sup> Risø National Laboratory for Sustainable Energy, Technical University of Denmark, Denmark



clima!te



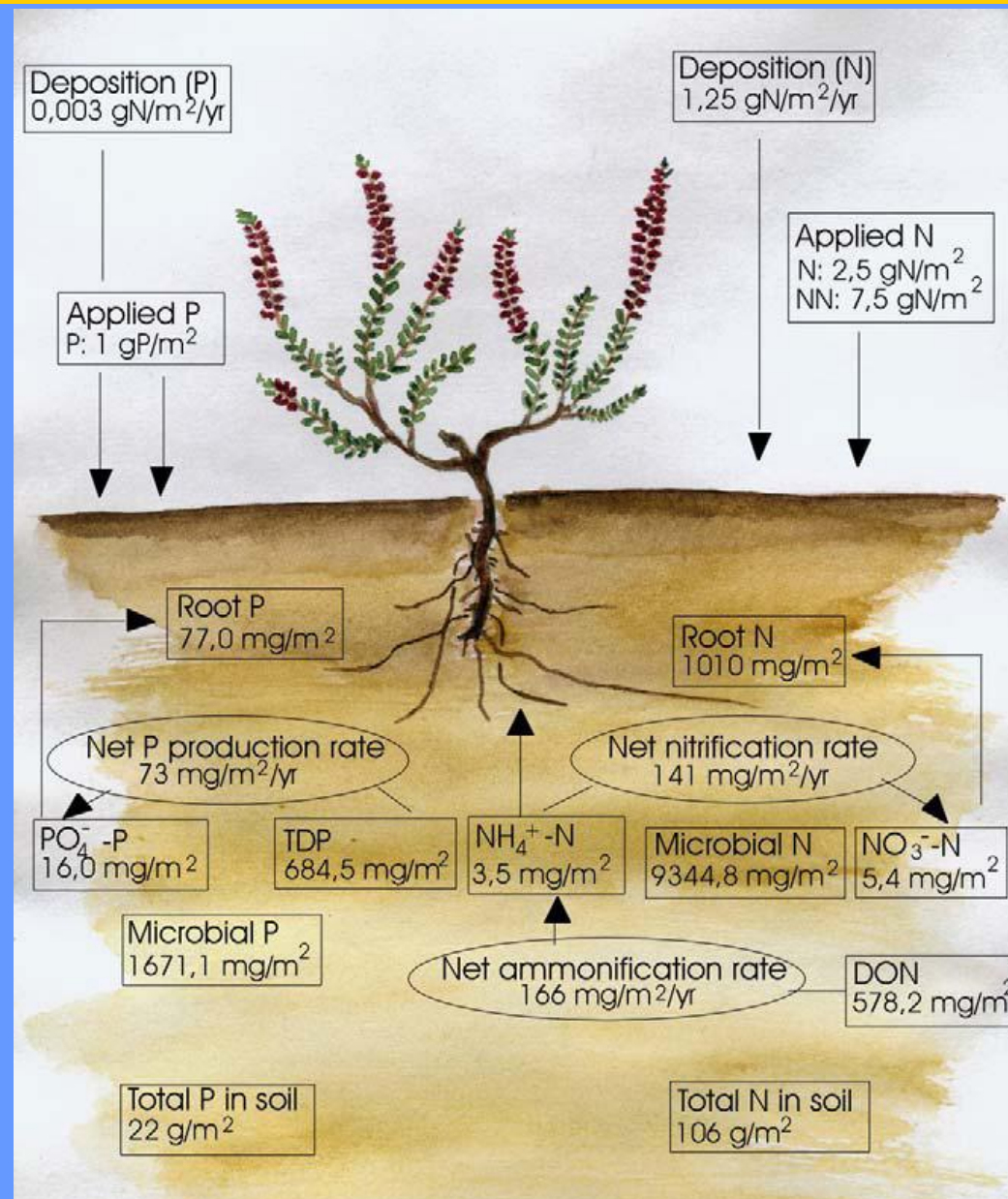


**Micobes: no effect  
from fertilization**

**Roots increase in  
biomass with N and  
NNP**

Applied Soil Ecology  
(2009); vol 42 279 – 287

Nielsen, Andresen,  
Michelsen, Schmidt and  
Kongstad

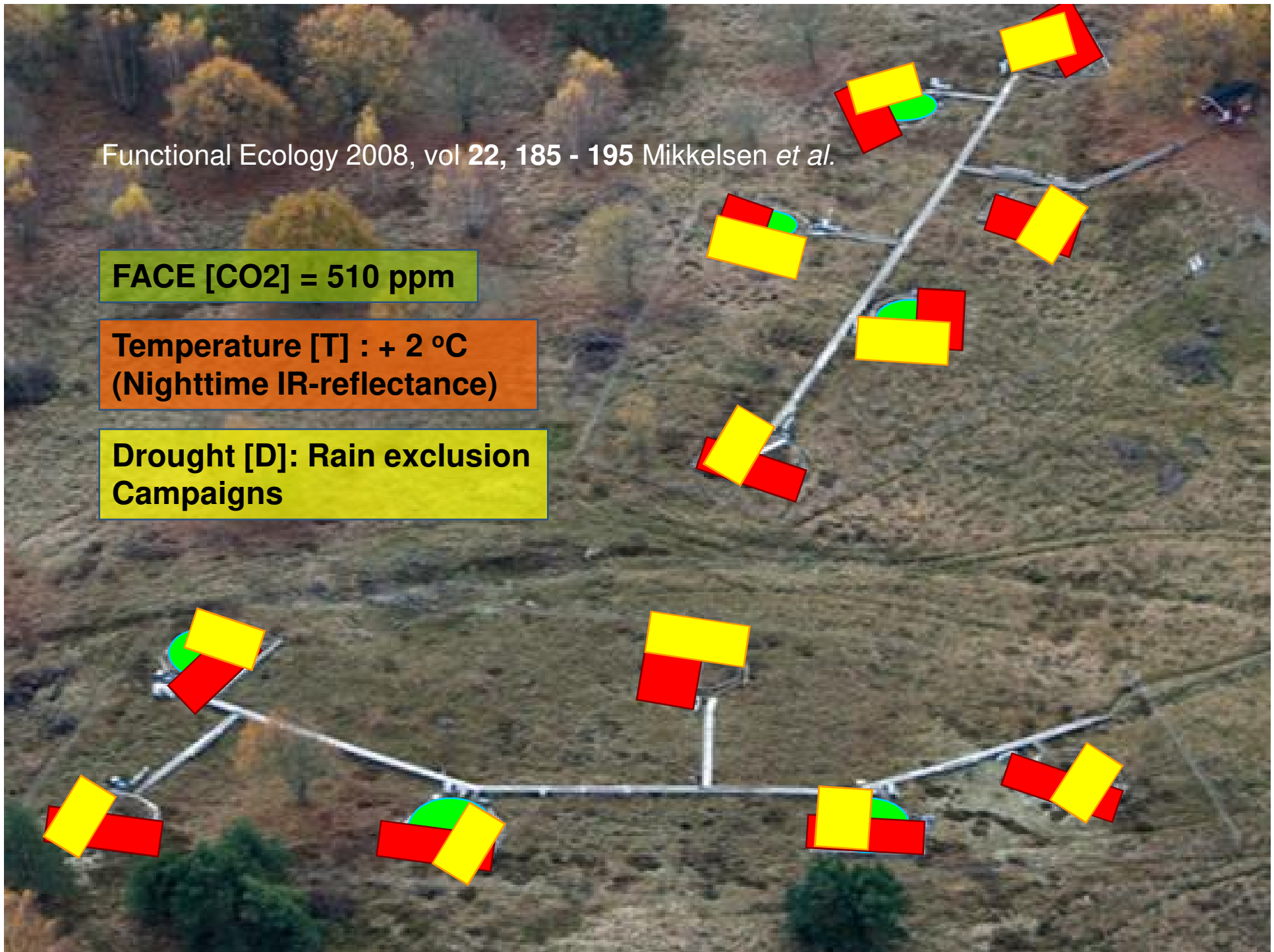


Functional Ecology 2008, vol 22, 185 - 195 Mikkelsen *et al.*

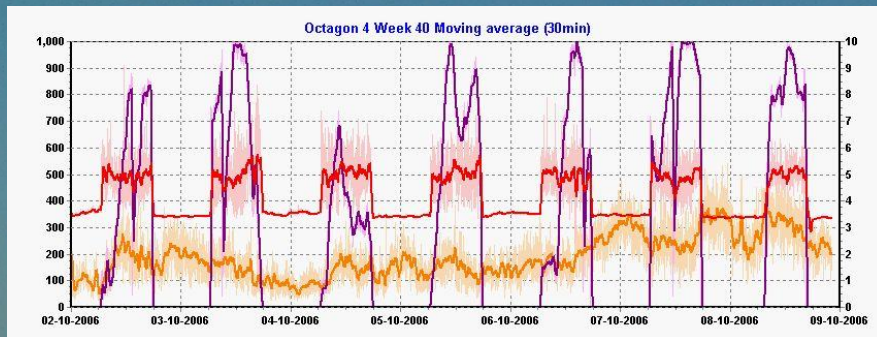
**FACE [CO<sub>2</sub>] = 510 ppm**

**Temperature [T] : + 2 °C  
(Nighttime IR-reflectance)**

**Drought [D]: Rain exclusion  
Campaigns**





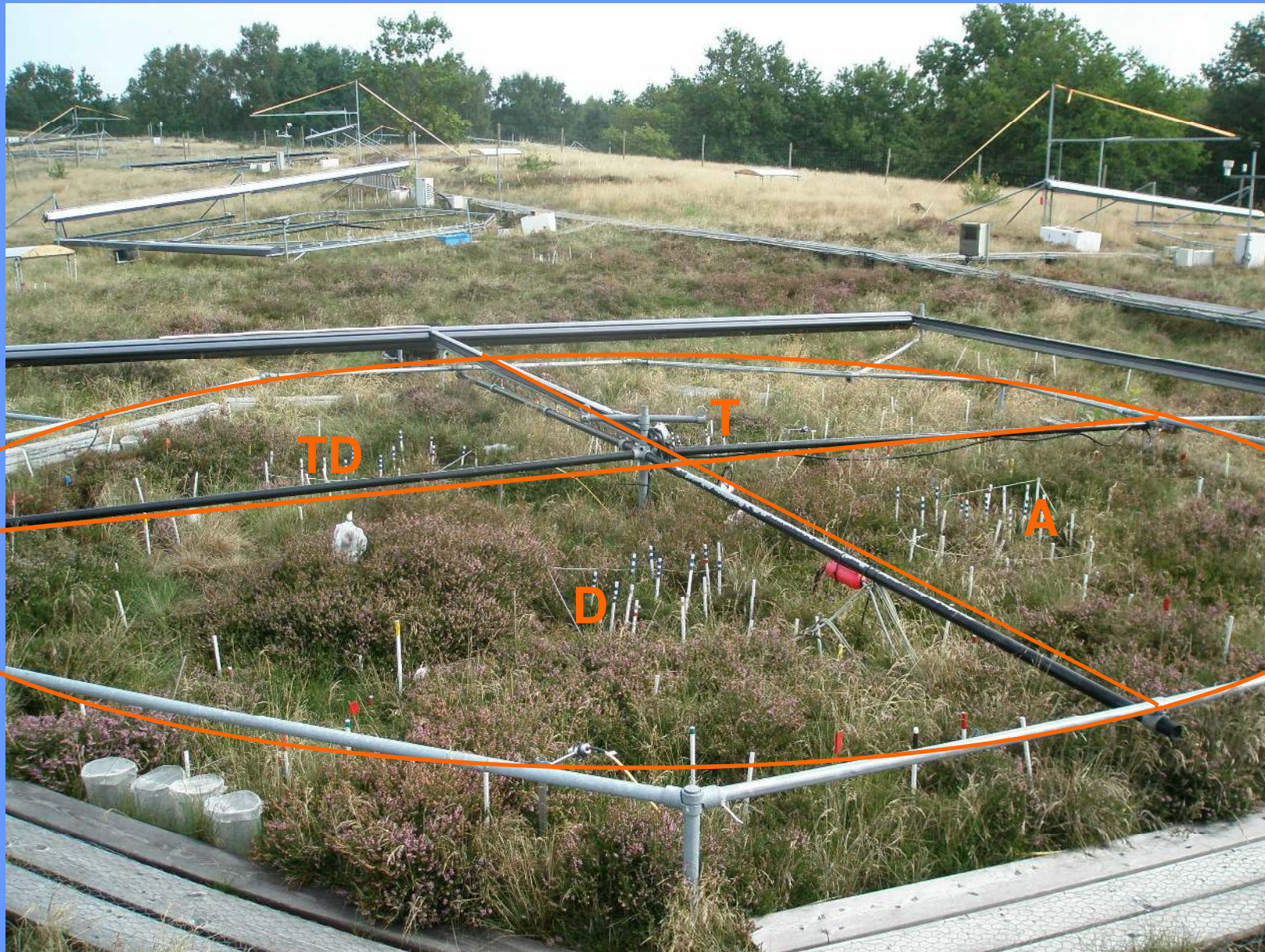




Glycine  $^{15}\text{N}$   $^{13}\text{C}_2$   
addition







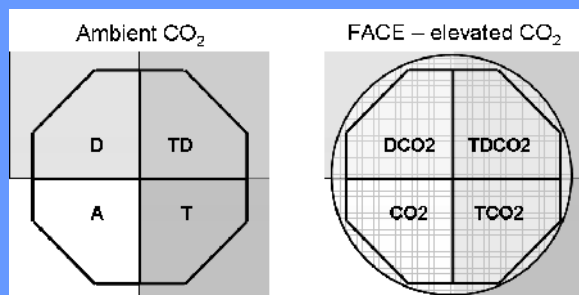




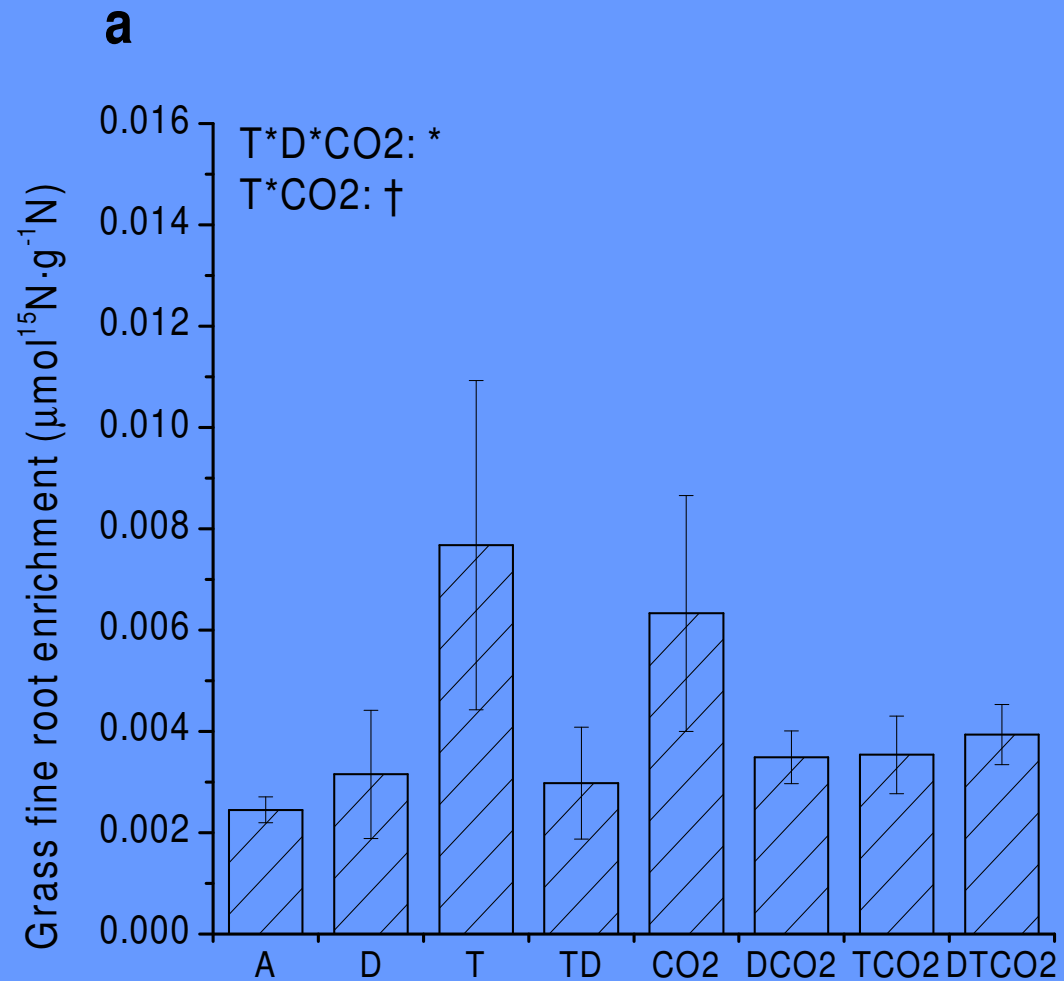
## Immediate root $^{15}\text{N}$ uptake:

T ↑

CO<sub>2</sub> ↑

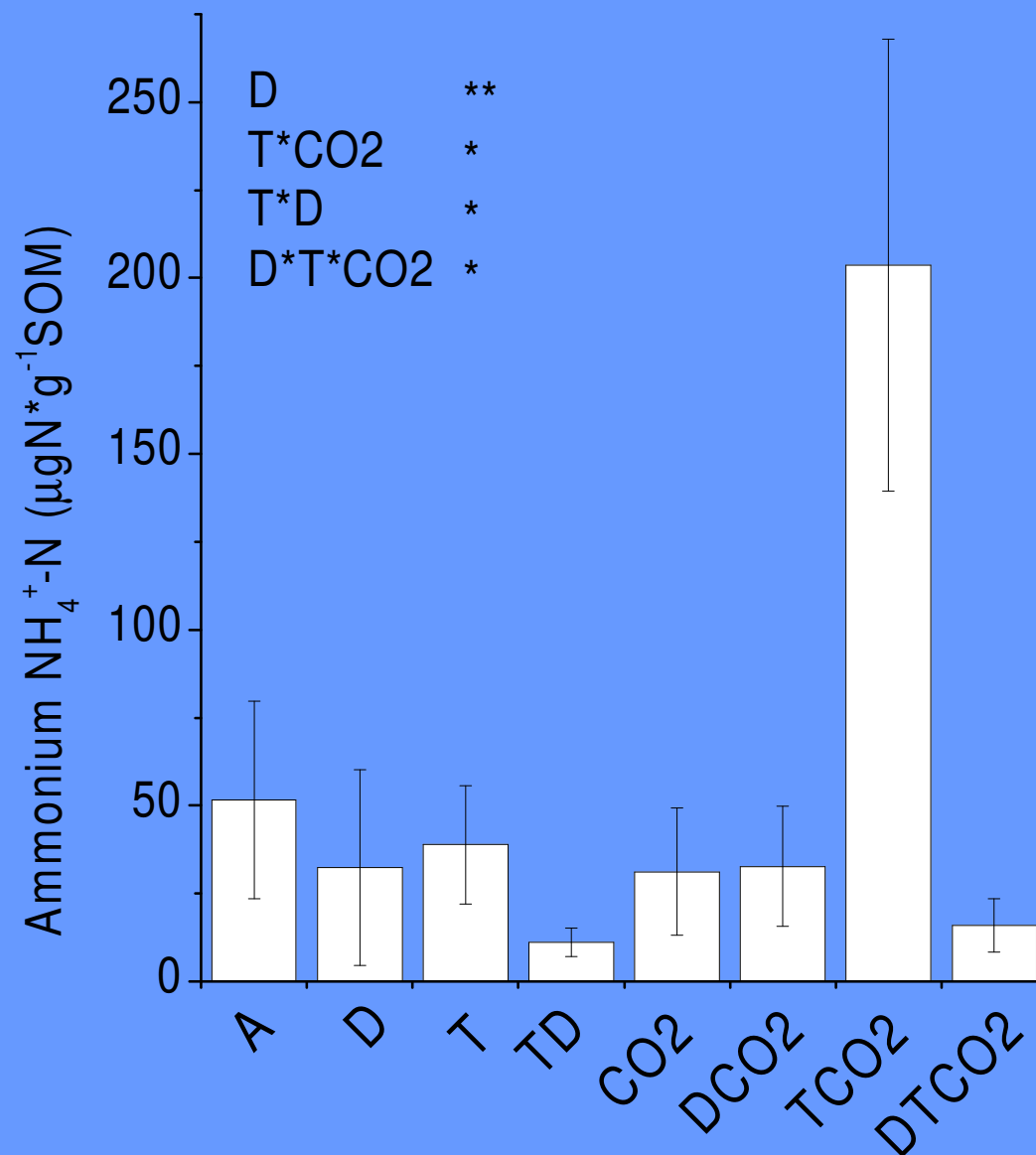
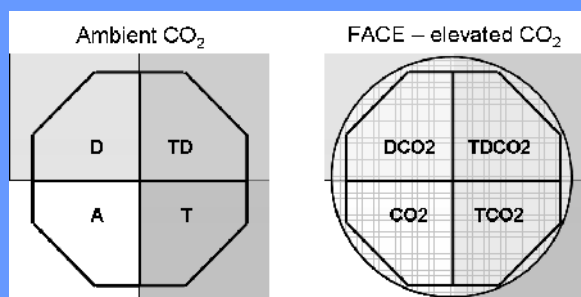


Submitted to Acta Oecologica (2009)  
Andresen, Michelsen, Jonasson, Ambus,  
Beier





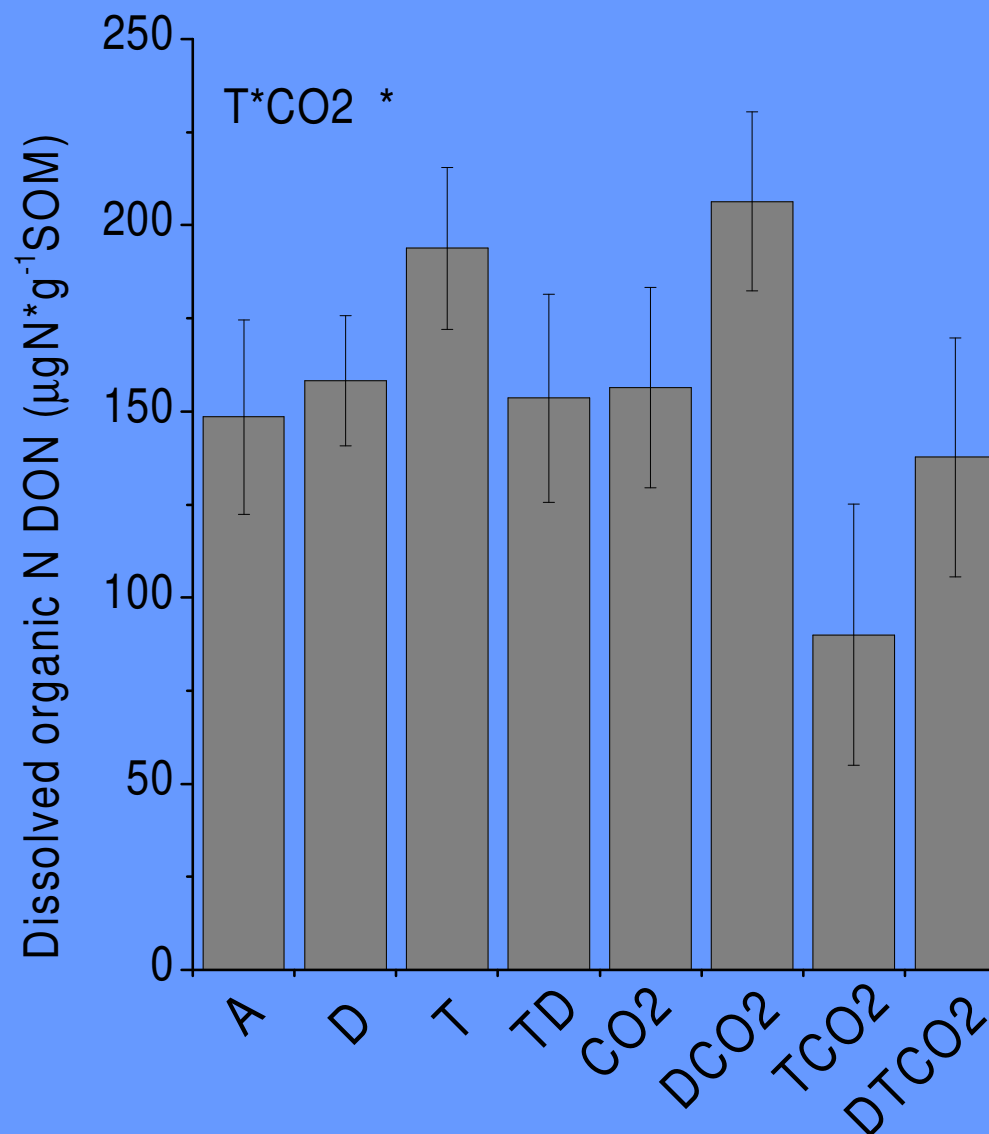
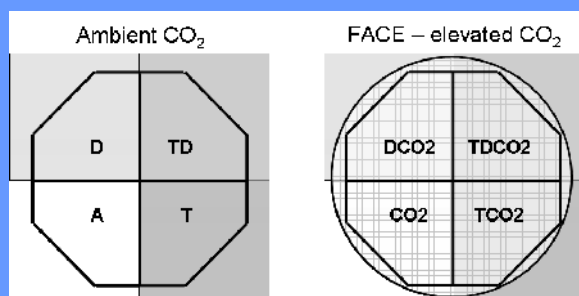
Ammonium  
concentration:  
TCO<sub>2</sub> ↑







DON:  
TCO<sub>2</sub> ↓



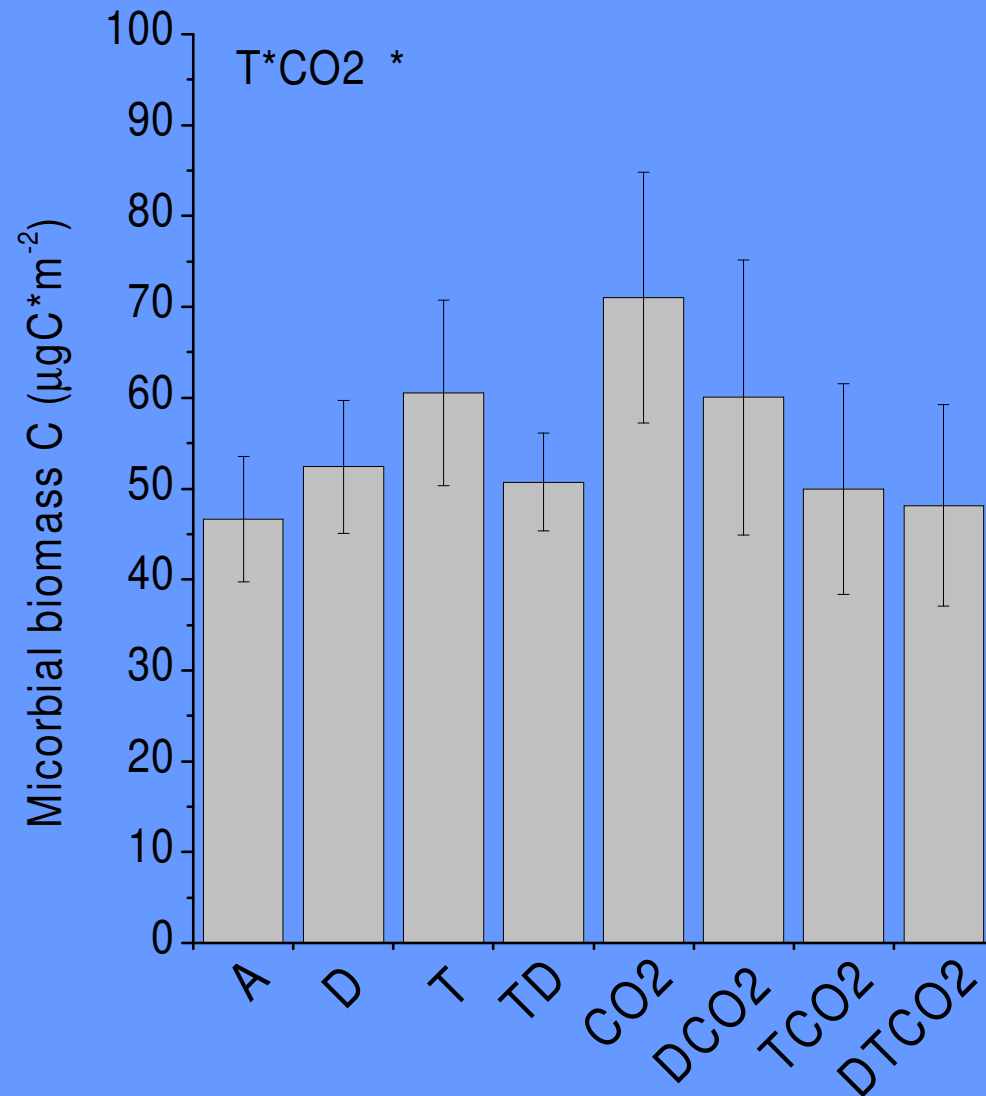
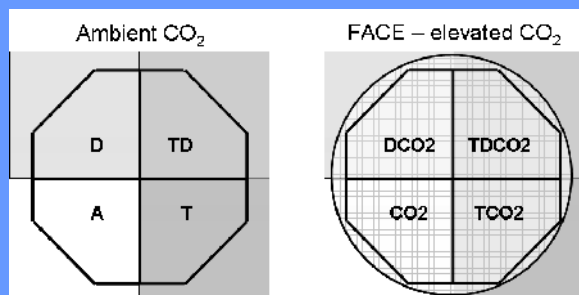


## Microbial carbon:

T ↑

CO<sub>2</sub> ↑

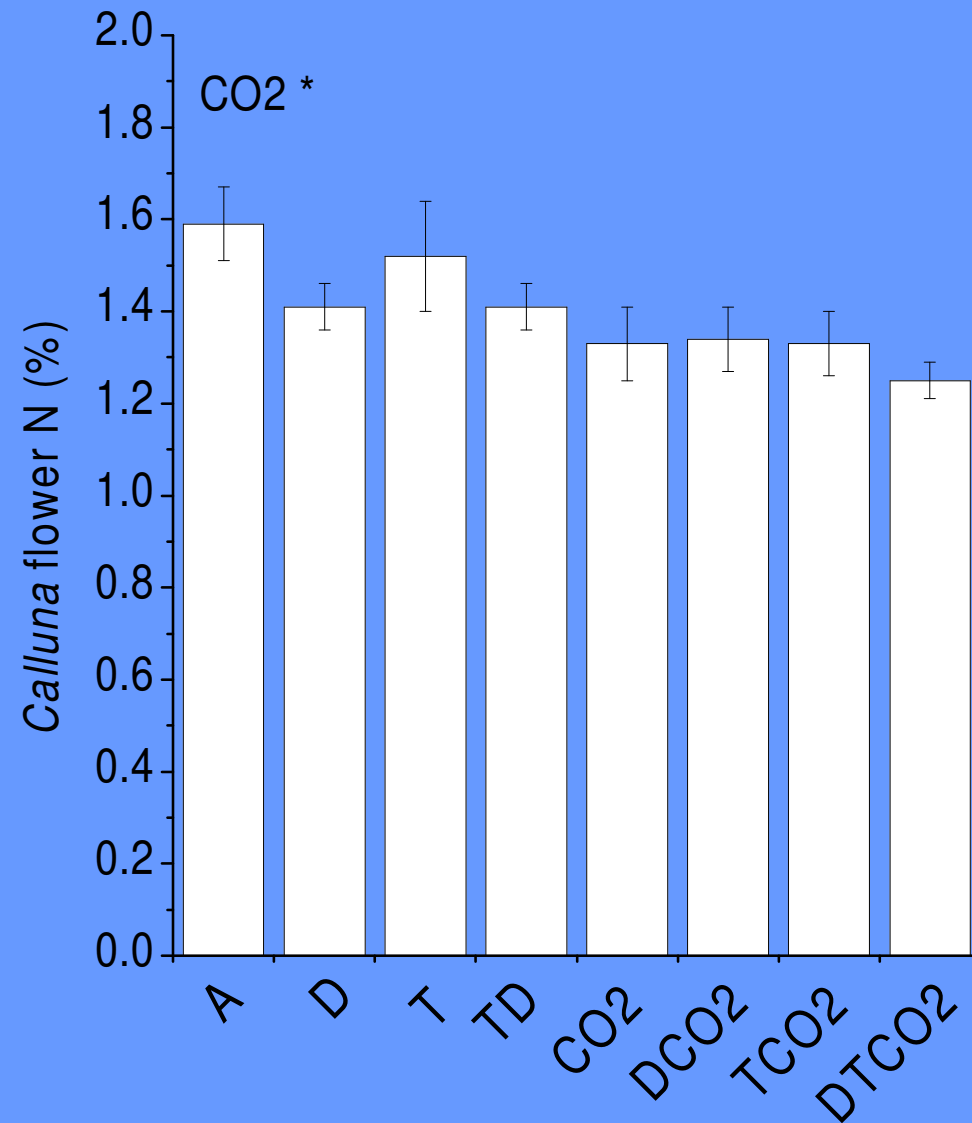
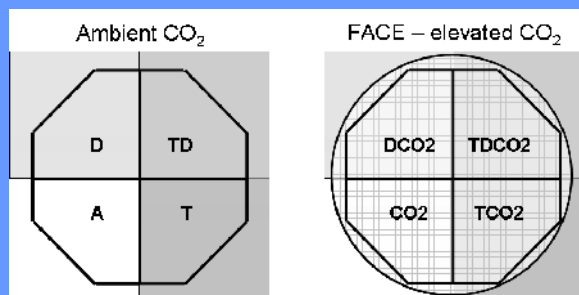
TCO<sub>2</sub> --







Heather  
flower N %:  
CO<sub>2</sub> ↓

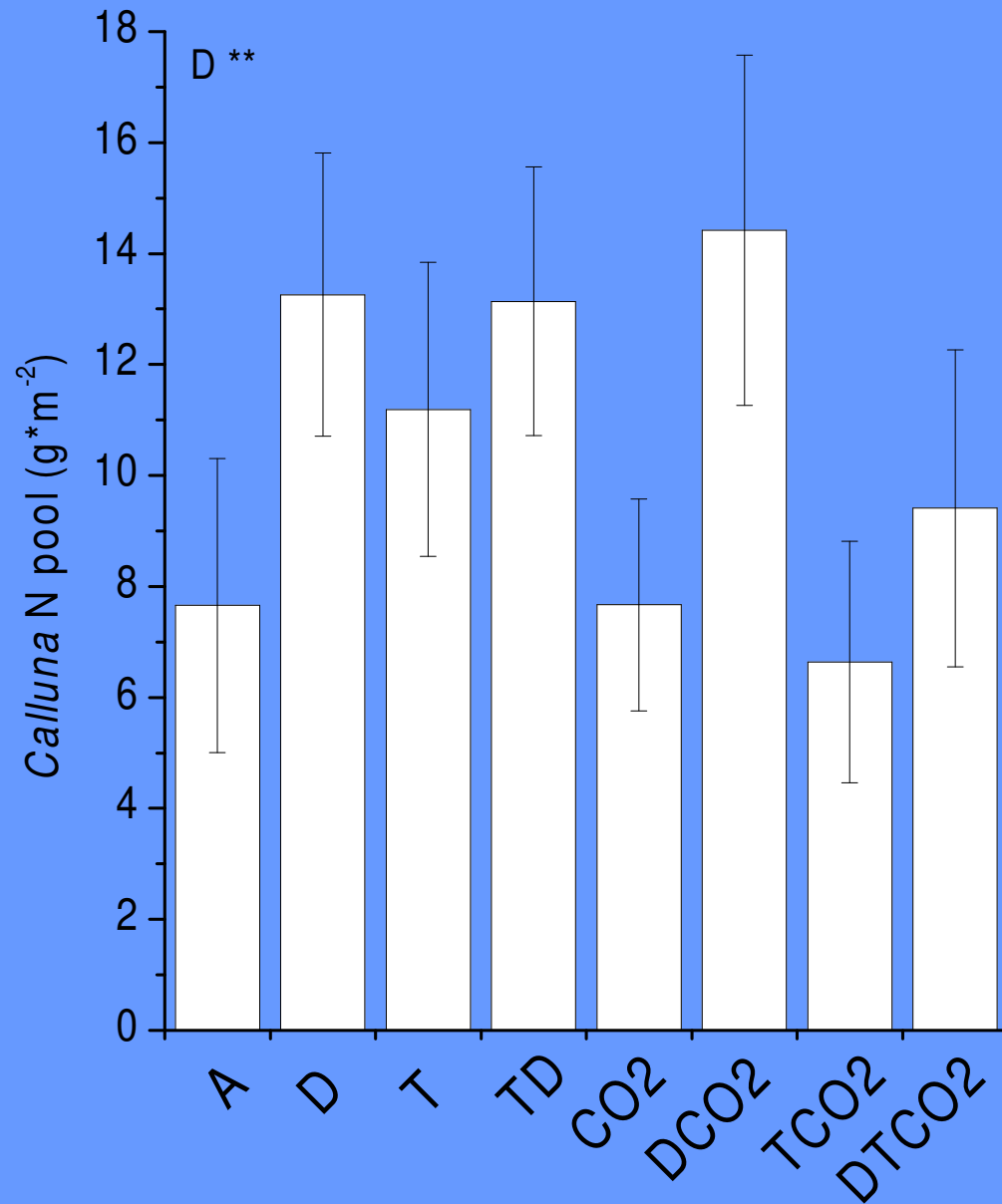
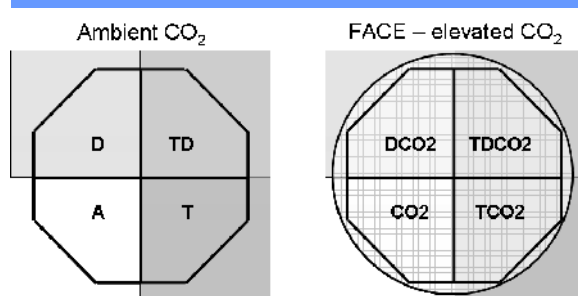




Heather

N pool:

D ↑



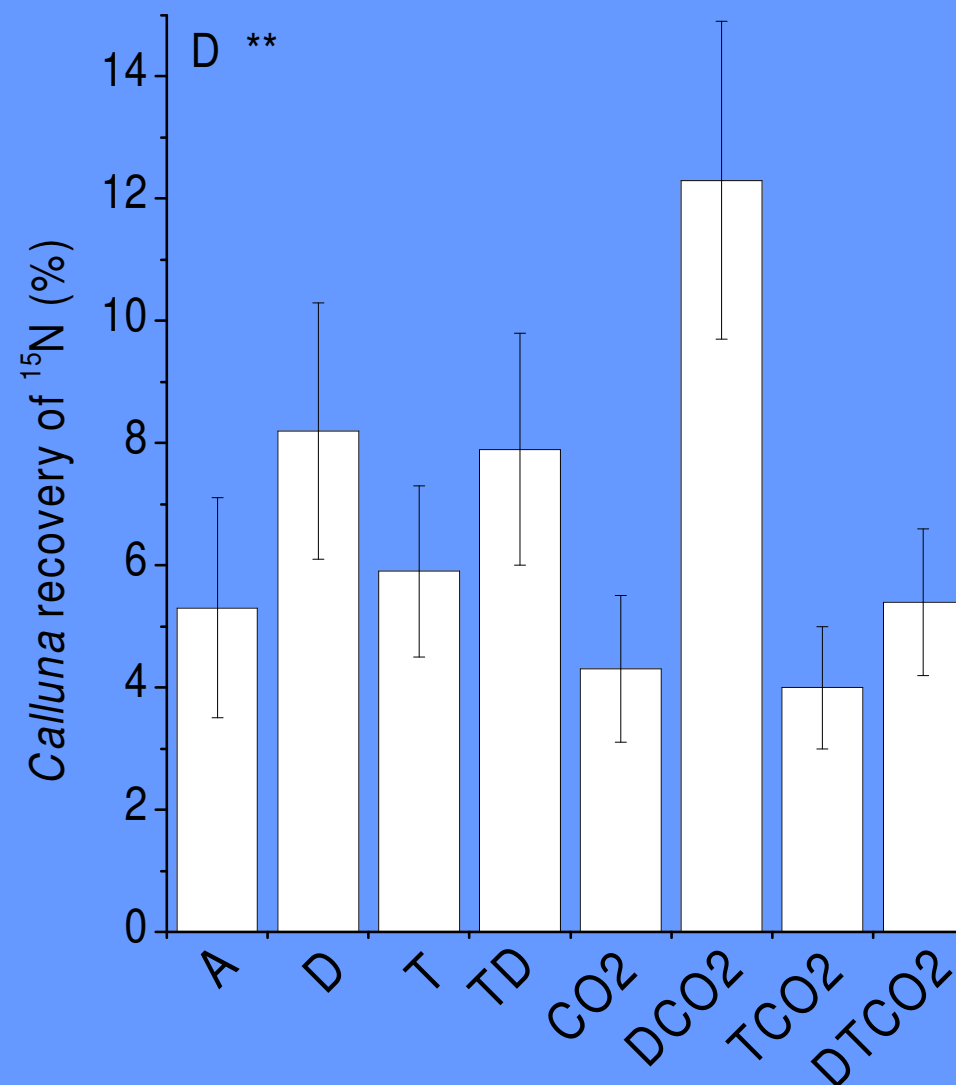
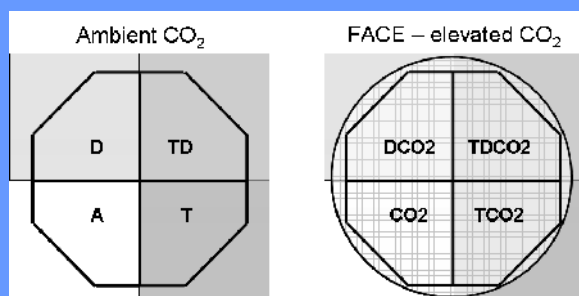




# Heather

$^{15}\text{N}$  recovery:

D ↑





Nitrification

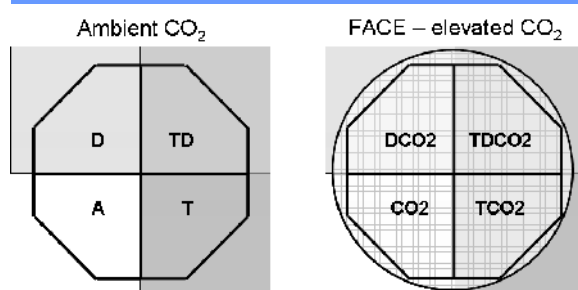
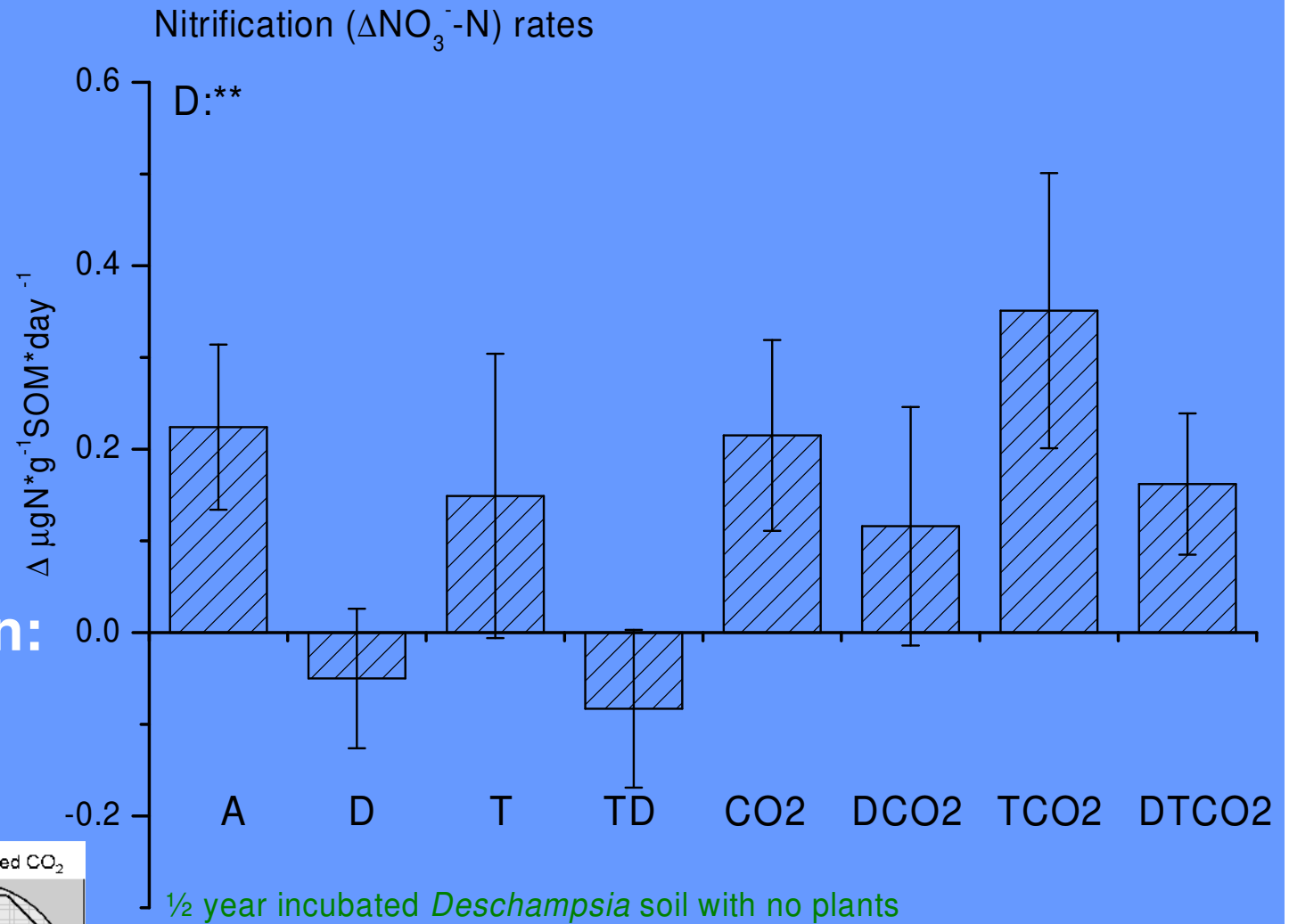
rate:

D ↓

ALSO litter

decomposition:

D ↓



Submitted to Plant and Soil (2009)  
Andresen, Michelsen, Jonasson,  
Mikkelsen, Schmidt, Ambus, Beier

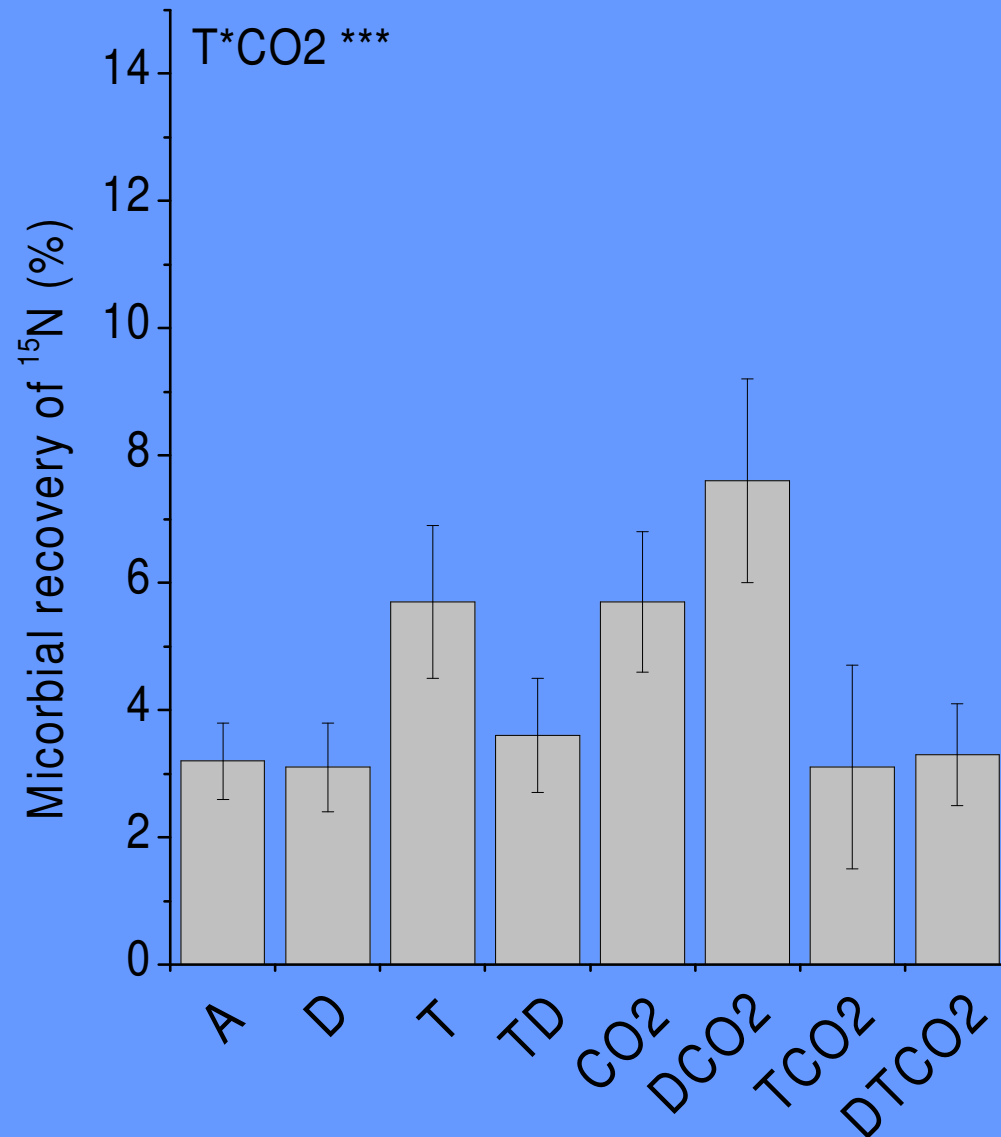
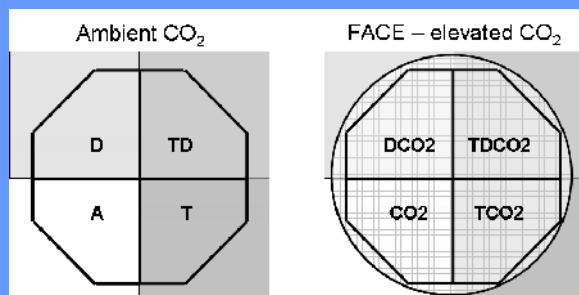


## Microbial $^{15}\text{N}$ recovery:

T ↑

CO<sub>2</sub> ↑

TCO<sub>2</sub> --





TWO years of climate change treatments:

- Combined warming and elevated CO<sub>2</sub> kicks up mineralization of DON into ammonium
- Microbial biomass C and <sup>15</sup>N tracer recovery higher in warmed and elevated CO<sub>2</sub> plots (not in TCO<sub>2</sub>)
- CO<sub>2</sub> dilutes nitrogen in Heather flowers (and fine roots)
- Drought increases Heather N pool, biomass and tracer recovery

**Papers from the field site:**

Experimental design: Mikkelsen *et al.*  
Functional Ecology 2008, vol **22**, 185 – 195.

N and P application: Nielsen *et al.* Applied  
Soil Ecology 2009, vol **42**, 279 – 287.

**Louise C. Andresen:**

[louisea@bio.ku.dk](mailto:louisea@bio.ku.dk) and [loand@life.ku.dk](mailto:loand@life.ku.dk)

## Acknowledgements:

Leader of the CLIMAITE VKR center of excellence **Claus Beier**

Teis Mikkelsen, Sven Jonasson, Martin Holmstrup, Inger K. Schmidt, Per Ambus, Kim Pilegaard, Anders Michelsen, Kristian Albert, Marie Arndal, Niels Bruun, Søren Christensen, Svend Danbæk, Per Gundersen, Preben Jørgensen, Leon Linden, Jane Kongstad, Kristine Maraldo, Anders Priemé, Torben Riis-Nielsen, Helge Ro-Poulsen, Karen Stevnbak, Merete Selsted, Poul Sørensen, Klaus S. Larsen, Mette S. Carter, Andreas Ibrom, Torben Martinussen, Franco Miglietta, Harald Sverdrup, Gosha Sylvester, Karna Heinsen, Esben Nielsen, Pia L. Nielsen

The Villum Kann Rasmussen foundation

Air Liquide

DONG

Jægersprislejen

