Nitrogen uptake in temperate heath vegetation and soil microbes is influenced by elevated temperature, CO2 and drought

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Nitrogen uptake in temperate heath vegetation and soil microbes is influenced by elevated temperature, CO_2 and drought

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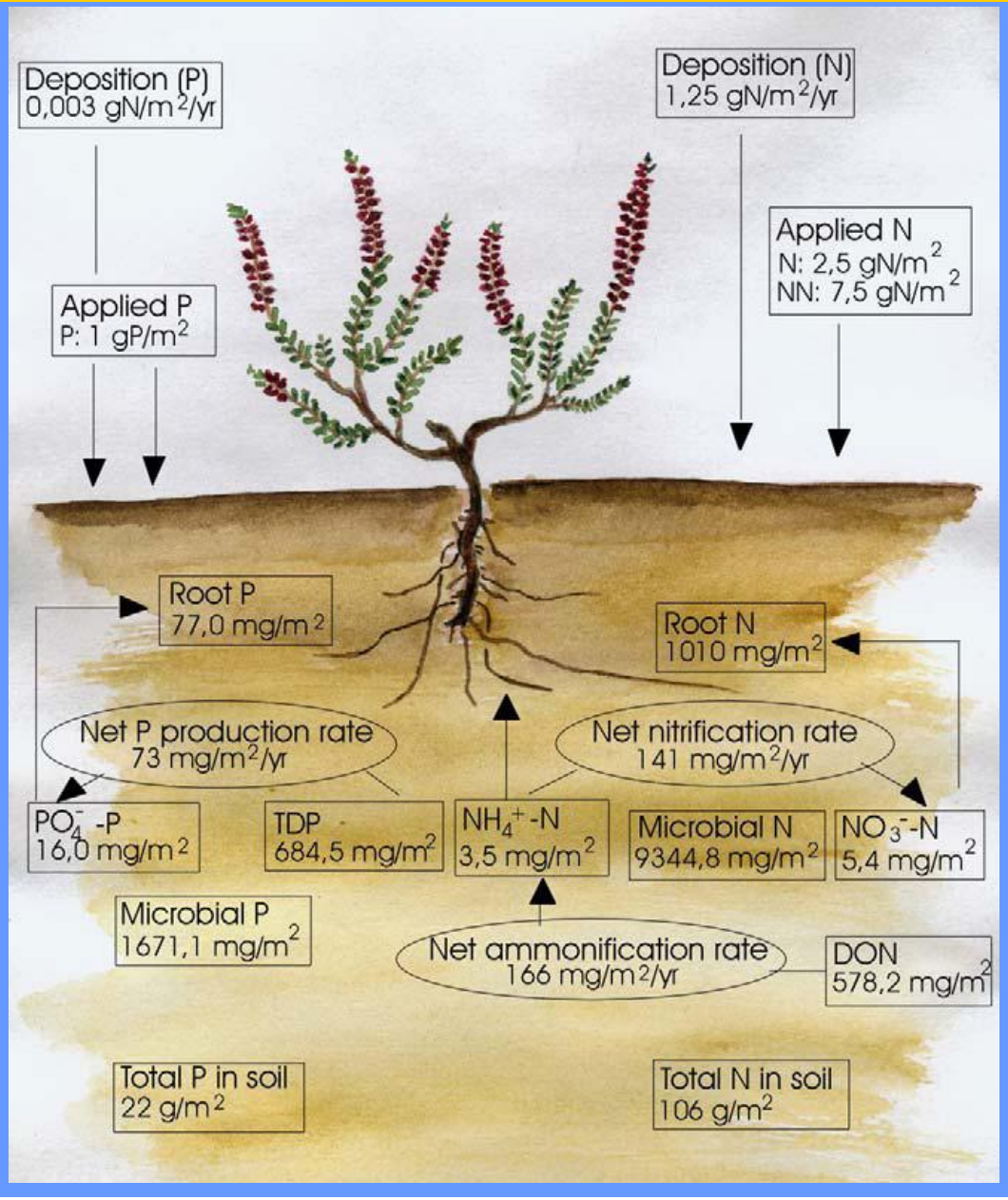
Climate

Micobes: no effect from fertilization

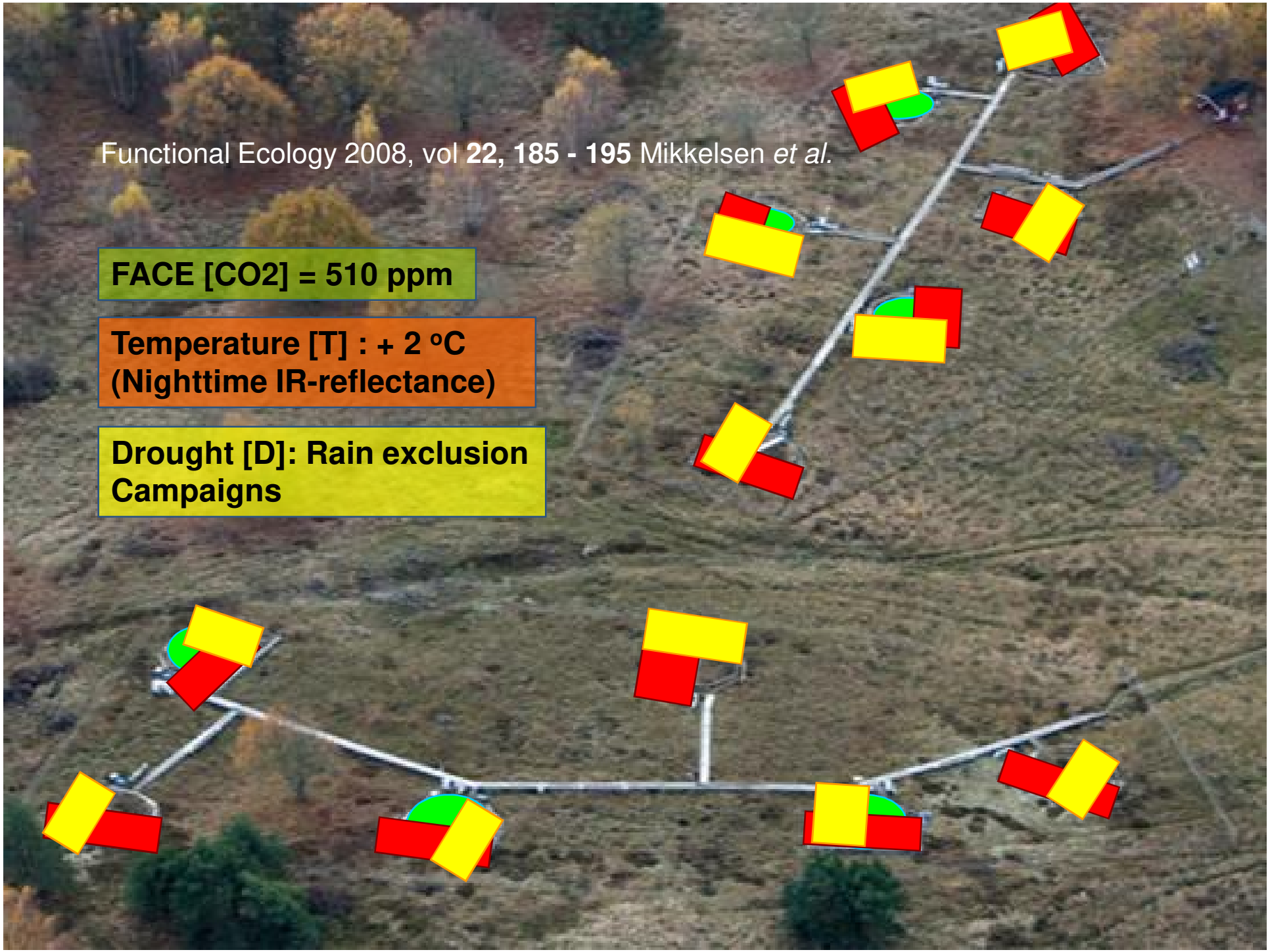
Roots increase in biomass with N and NNP

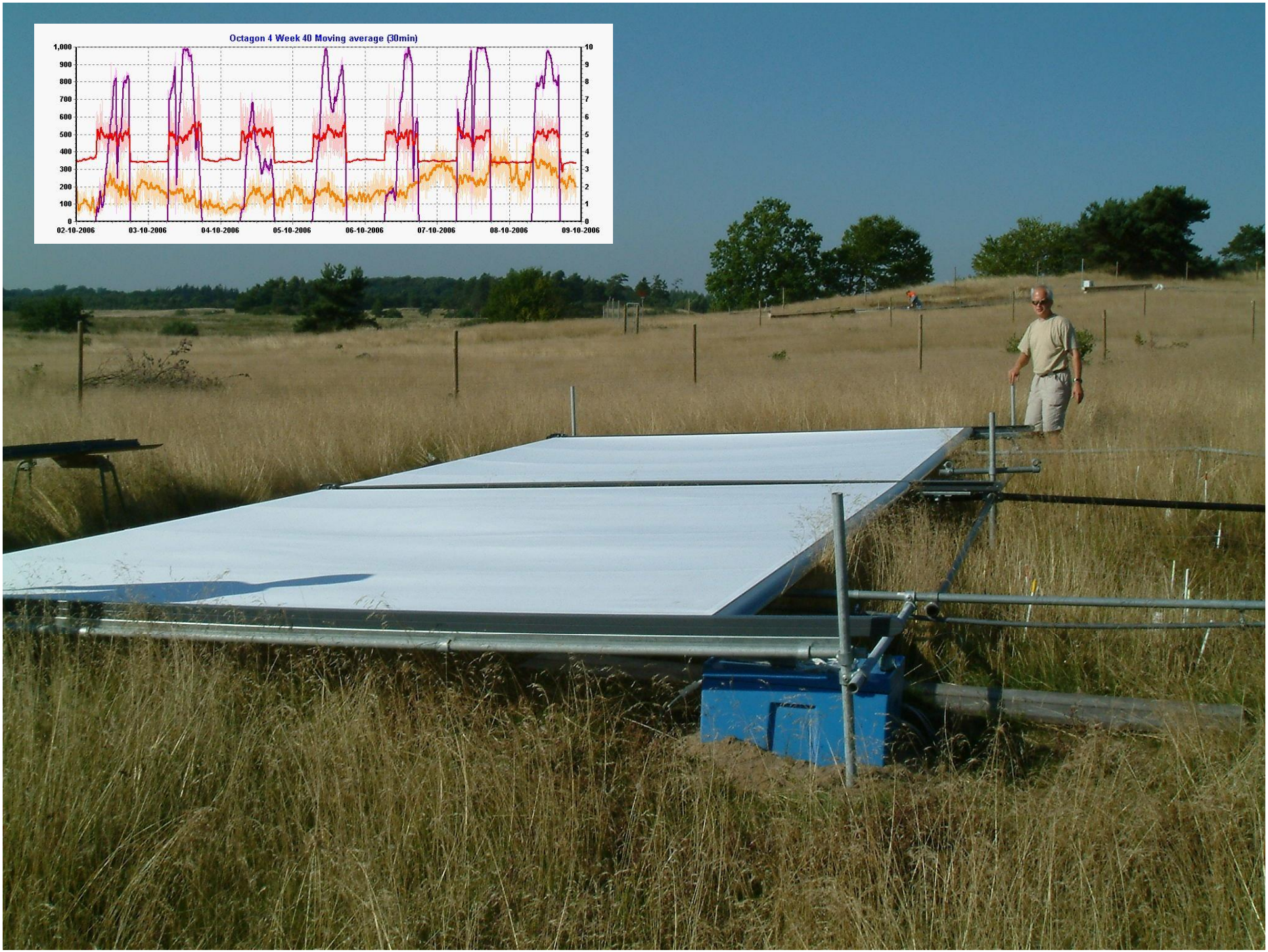


Applied Soil Ecology

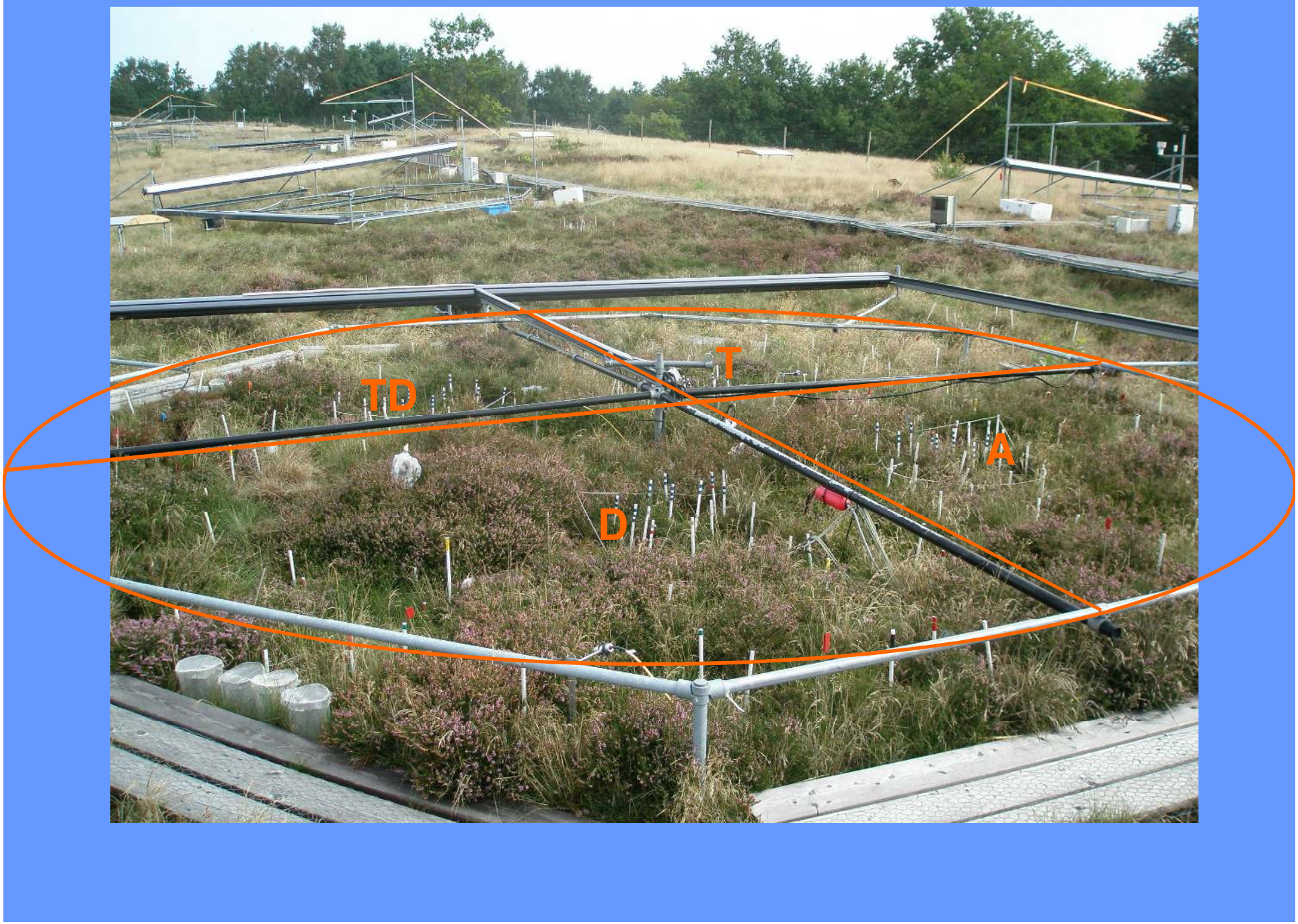
(2009); vol 42 279 – 287

Nielsen, Andresen, Michelsen, Schmidt and Kongstad


Functional Ecology 2008, vol **22, 185 - 195** Mikkelsen *et al.*
FACE [CO2] = 510 ppm
Temperature [T] : + 2 °C (Nighttime IR-reflectance)
Drought [D]: Rain exclusion Campaigns


Octagon 4 Week 40 Moving average (30min)
1,000
900
800
700
600
500
400
300
200
100
0
10
9
8
7
6
5
4
3
2
1
0
02-10-2006
03-10-2006
04-10-2006
05-10-2006
06-10-2006
07-10-2006
08-10-2006
09-10-2006

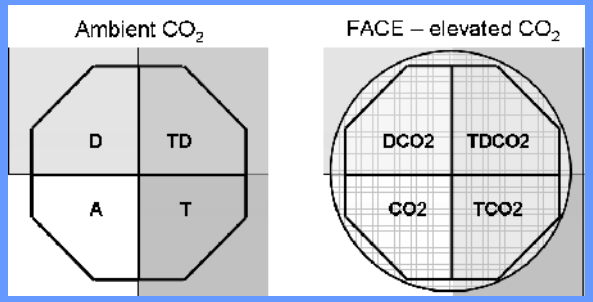

Glycine ^{15}N $^{13}C_2$
addition


TD
T
A
D

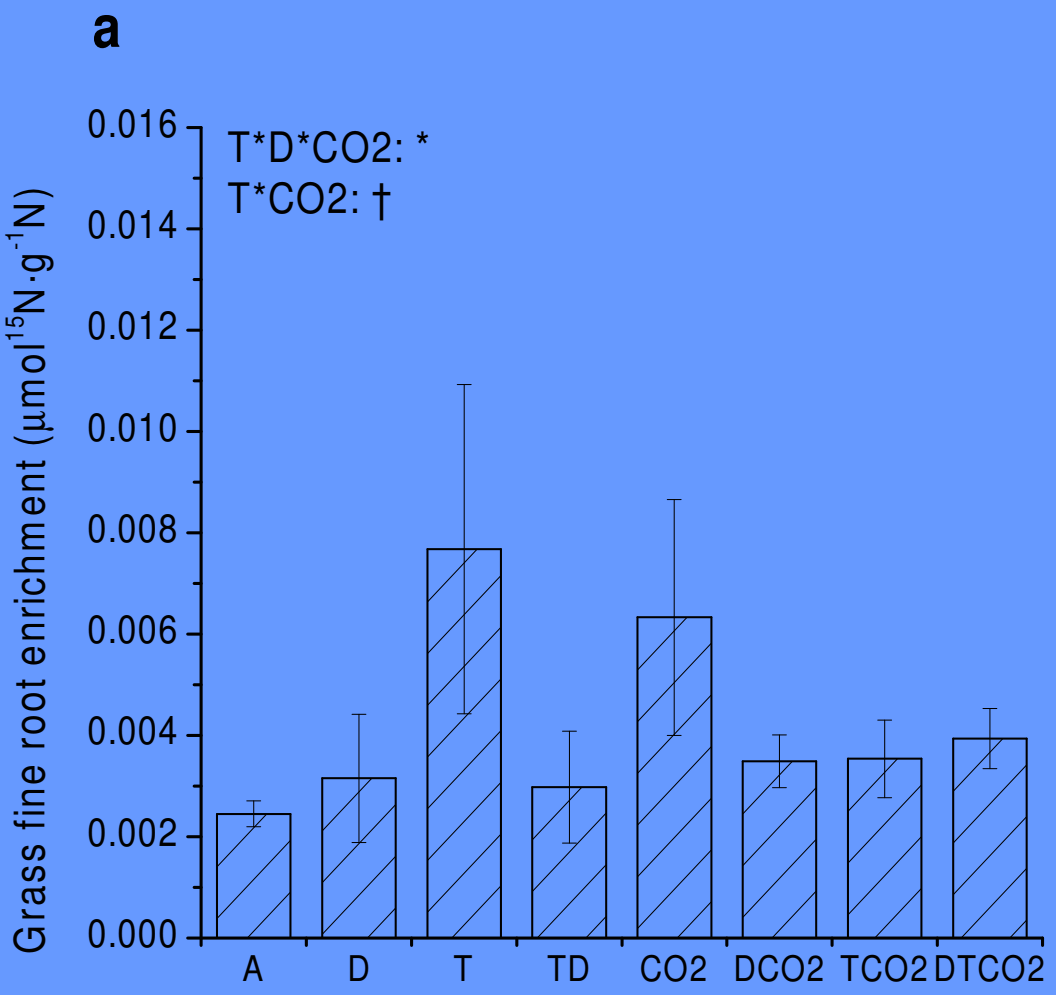
Immediate root ^{15}N uptake:

T ↑

CO2 ↑

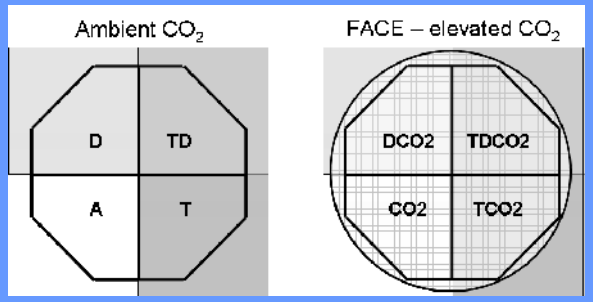


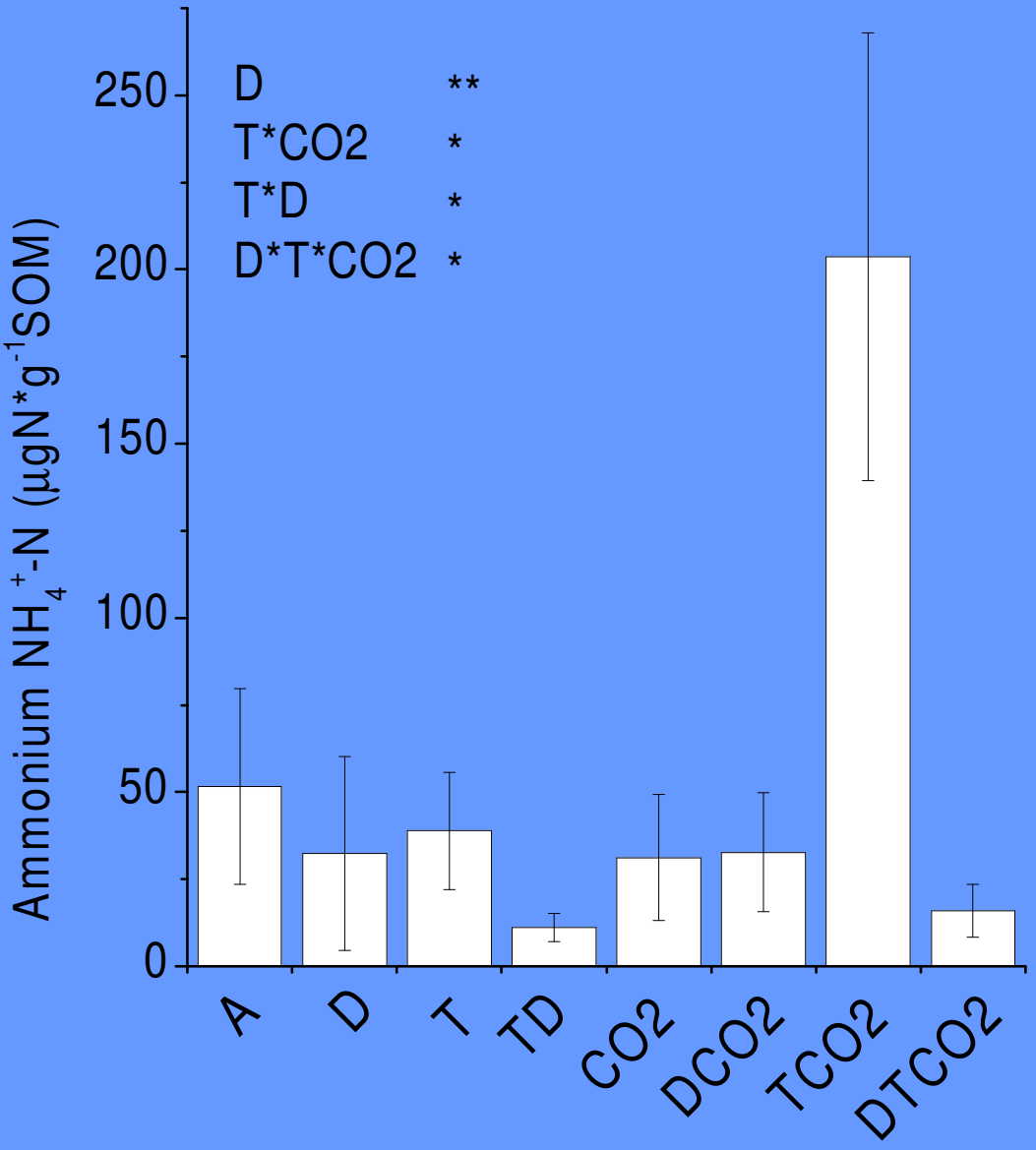
Submitted to Acta Oecologica (2009)
Andresen, Michelsen, Jonasson, Ambus, Beier



Ammonium concentration:

TCO2 ↑

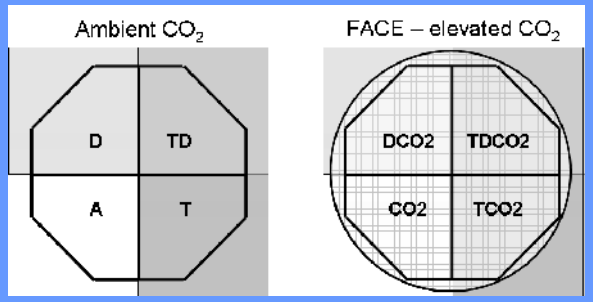


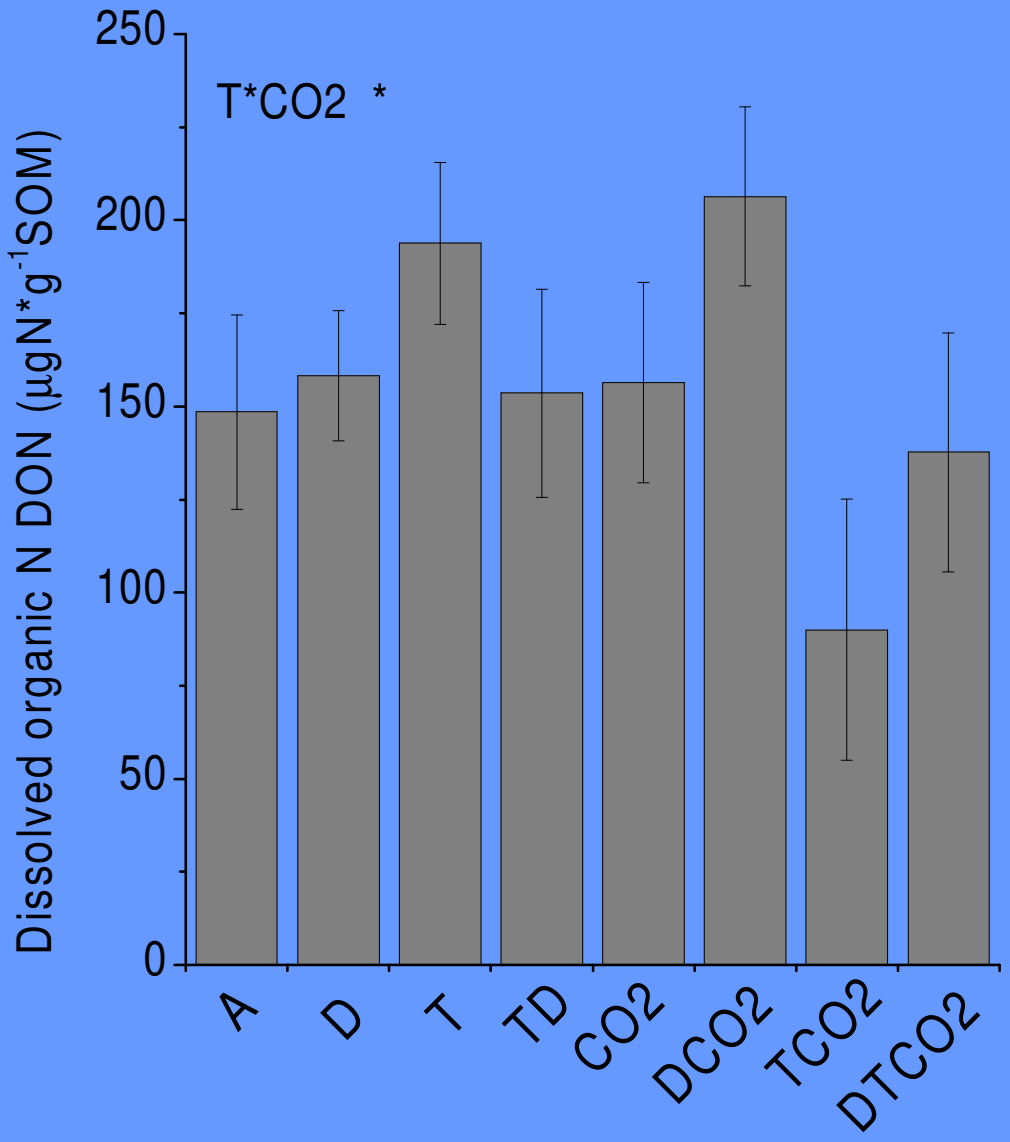


To be submitted, Andresen *et al.*

DON:

TCO2 ↓





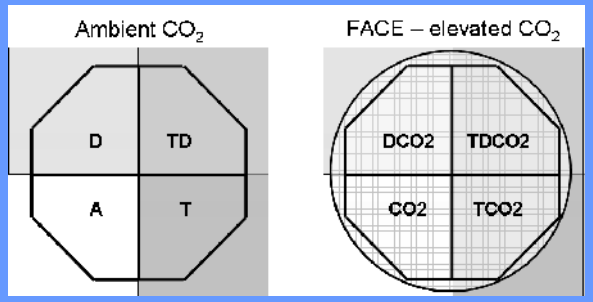
To be submitted, Andresen *et al.*

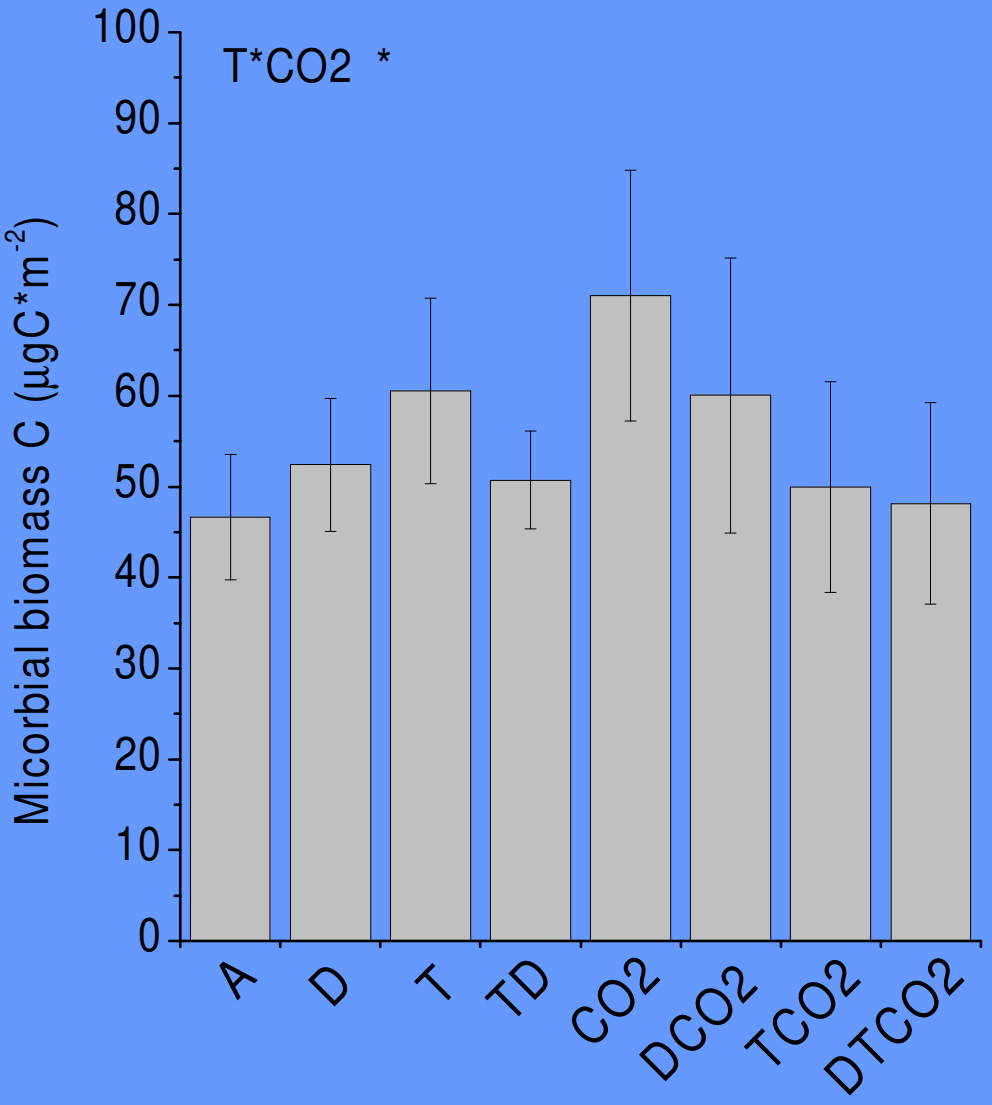
Microbial carbon:

T ↑

CO2 ↑

TCO2 --

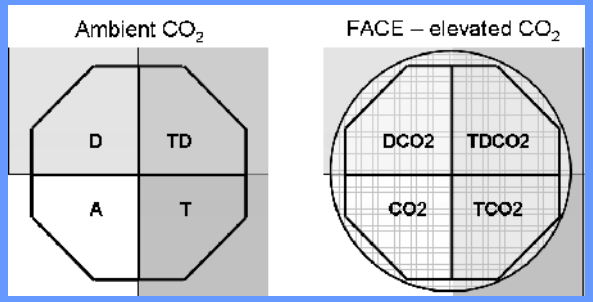


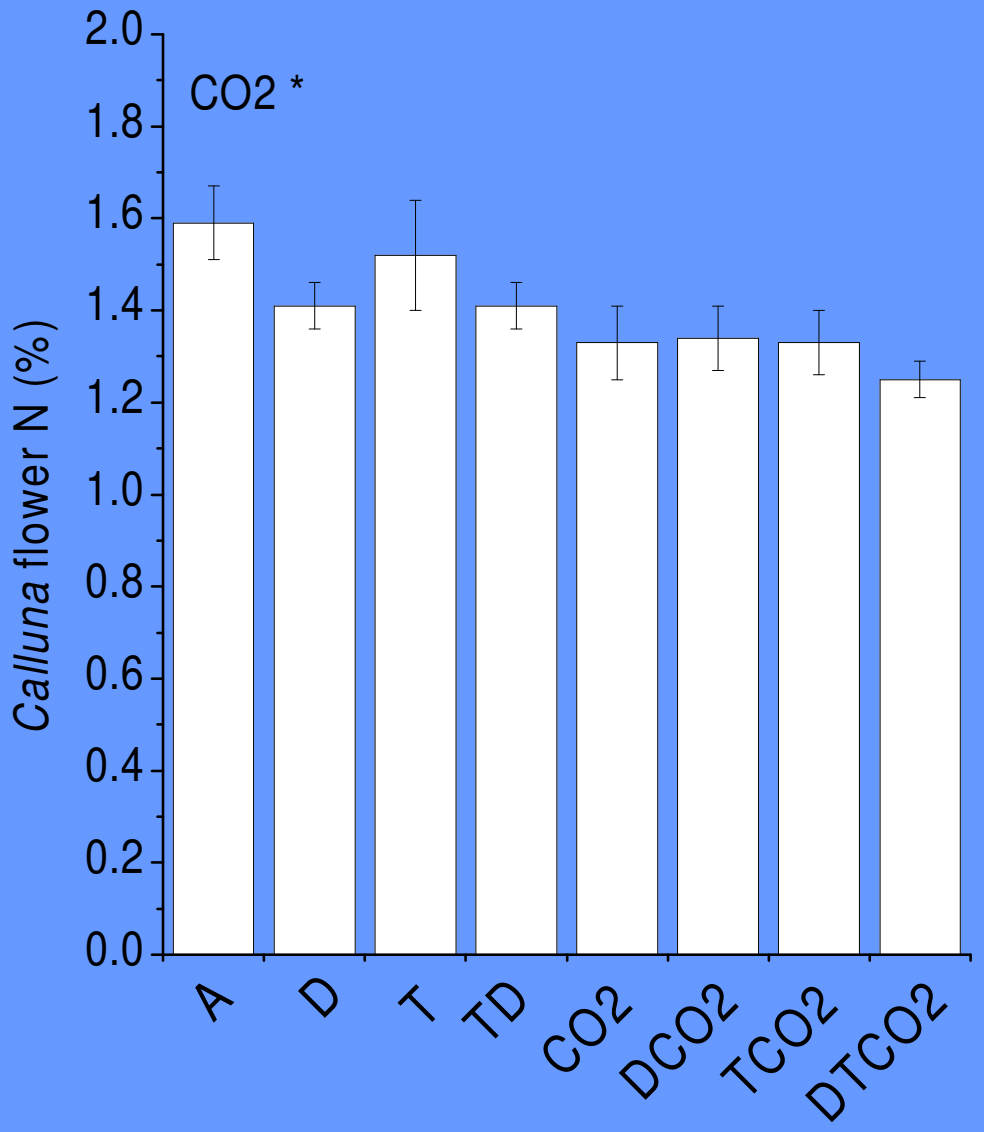


To be submitted, Andresen *et al.*

Heather flower N %:

CO2 ↓



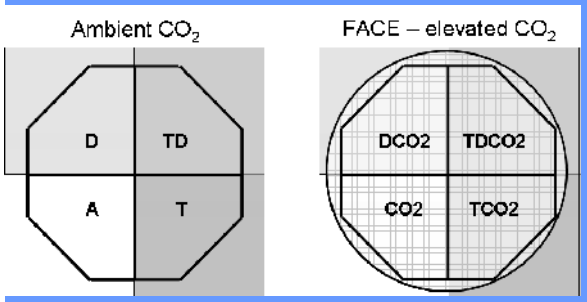


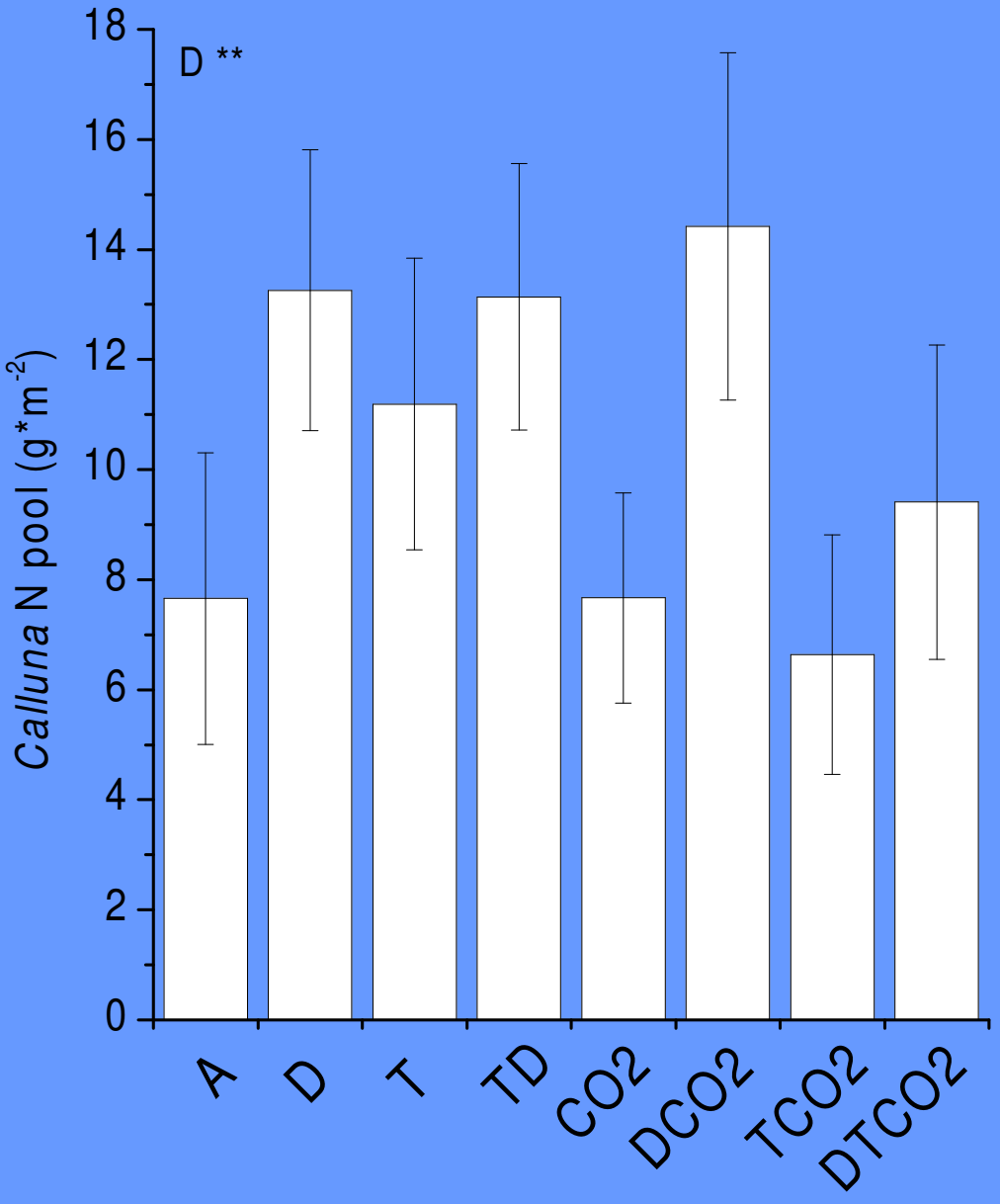
To be submitted, Andresen *et al.*

Heather

N pool:

D ↑



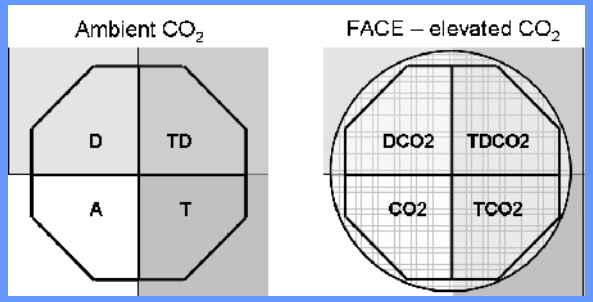


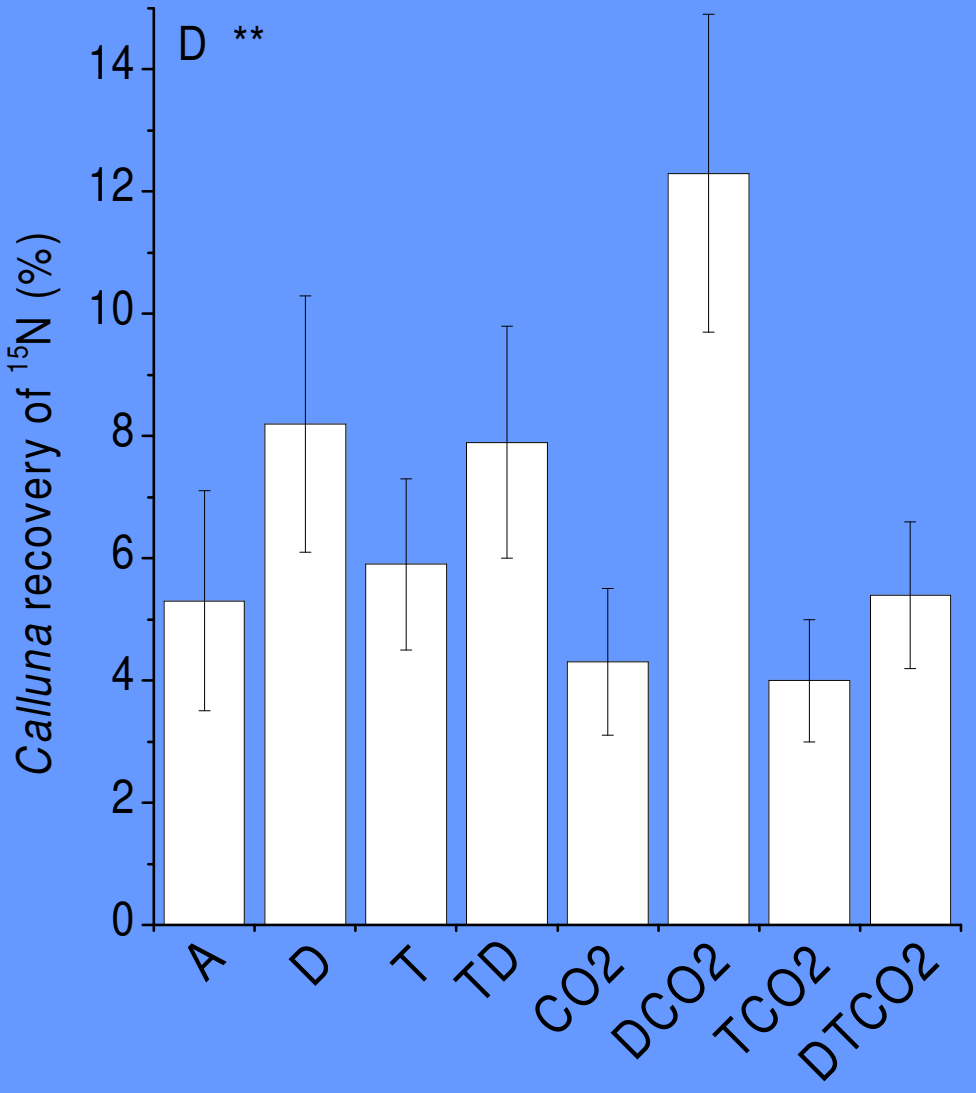
To be submitted , Andresen *et al.*

Heather

^{15}N recovery:

D ↑





To be submitted, Andresen *et al.*

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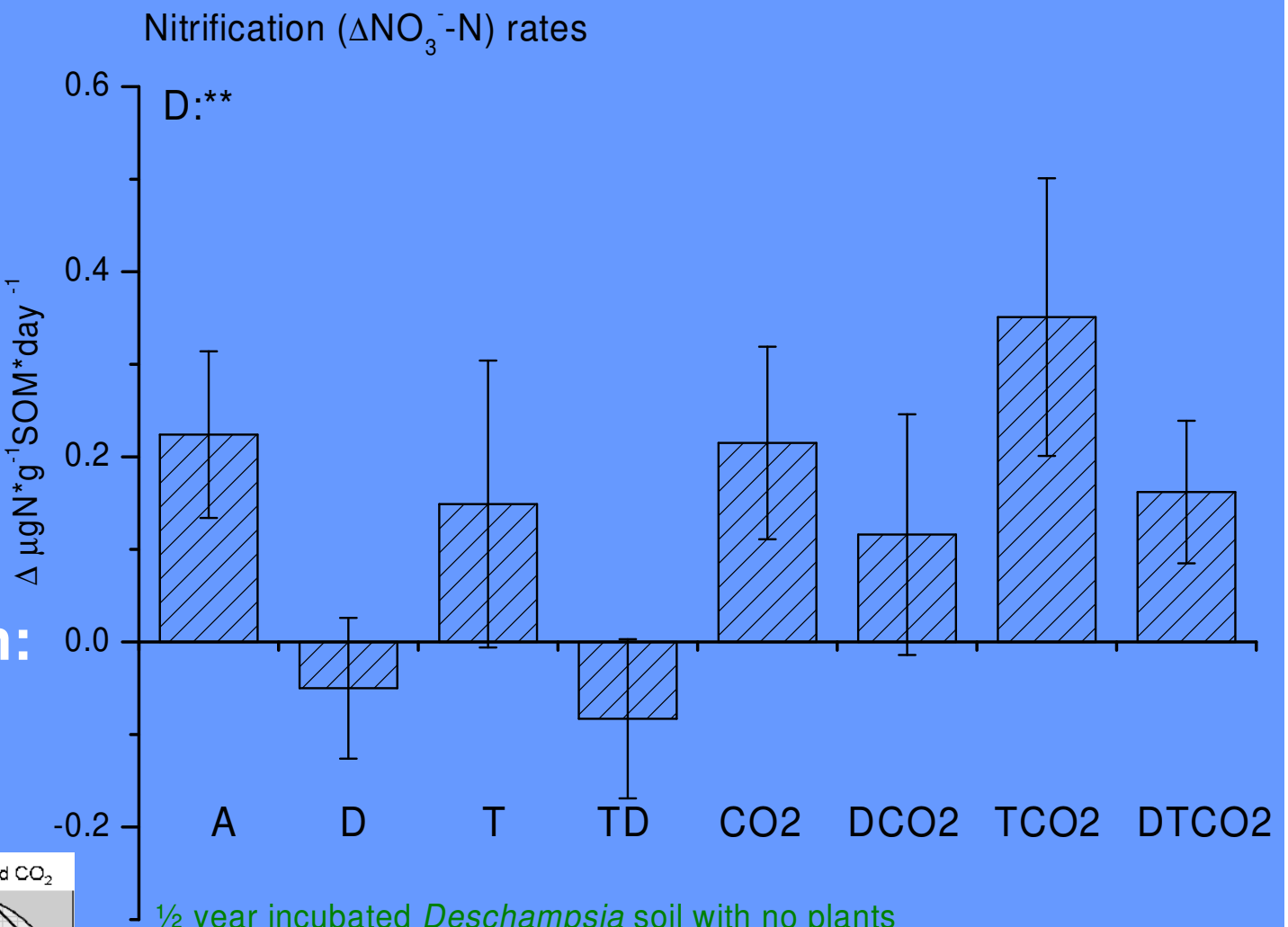
Nitrification rate:

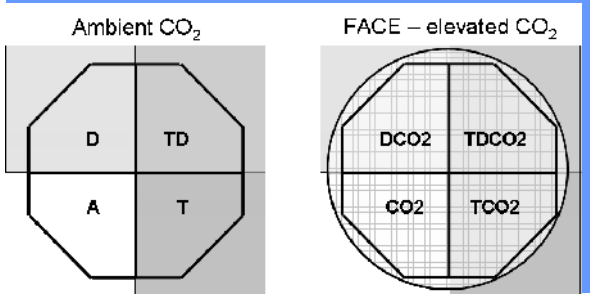
D ↓

ALSO litter decomposition:

D ↓



½ year incubated *Deschampsia* soil with no plants



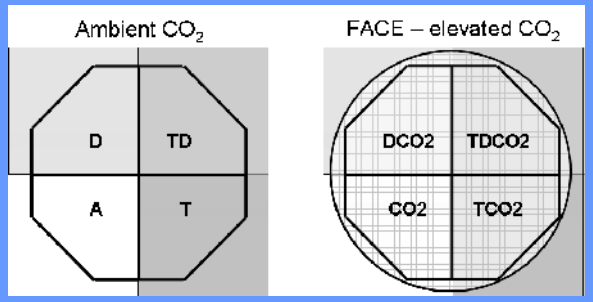
Submitted to Plant and Soil (2009)
Andresen, Michelsen, Jonasson,
Mikkelsen, Schmidt, Ambus, Beier

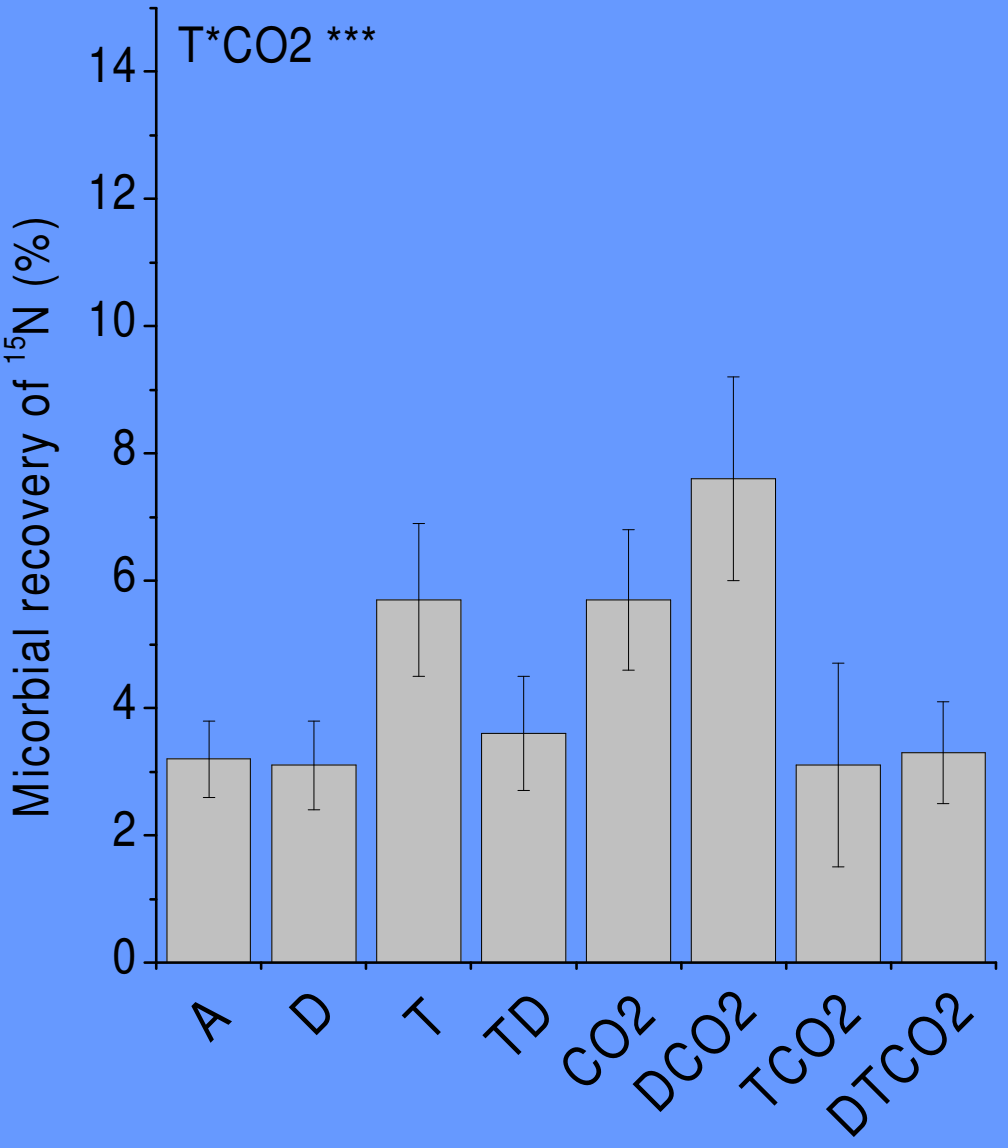
Microbial ^{15}N recovery:

T ↑

CO2 ↑

TCO2 --





To be submitted, Andresen *et al.*

TWO years of climate change treatments:

- Combined warming and elevated CO_2 kicks up mineralization of DON into ammonium
- Microbial biomass C and ^{15}N tracer recovery higher in warmed and elevated CO_2 plots (not in TCO_2)
- CO_2 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.

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Air Liquide

DONG

Jægersprislejren