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

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

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Nitrogen uptake in temperate heath vegetation and soil microbes is influenced by elevated temperature, \( \text{CO}_2 \) and drought

1Louise C. Andresen, 1Anders Michelsen, 1Sven Jonasson, 2Claus Beier, 2Per Ambus

1 University of Copenhagen, Denmark; louisea@bio.ku.dk and loand@life.ku.dk
2 Risø National Laboratory for Sustainable Energy, Technical University of Denmark, Denmark
Micobes: no effect from fertilization

Roots increase in biomass with N and NNP

Nielsen, Andresen, Michelsen, Schmidt and Kongstad

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FACE [CO2] = 510 ppm

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

Drought [D]: Rain exclusion Campaigns
Glycine $^{15}$N $^{13}$C$_2$ addition
Immediate root $^{15}$N uptake:

- $T \uparrow$
- $CO_2 \uparrow$

Grass fine root enrichment ($\mu$mol $^{15}$N·g$^{-1}$N)

Submitted to Acta Oecologica (2009)
Andresen, Michelsen, Jonasson, Ambus, Beier
Ammonium concentration: TCO2 ↑

Ammonium $\text{NH}_4^+$-N (µgN·g$^{-1}$SOM)

DTCO2
T*CO2 *
T*D *
D*T*CO2 *

To be submitted, Andresen et al.
DON:
TCO2 ↓

To be submitted, Andresen et al.
Microbial carbon:

\[ T \uparrow \]

\[ \text{CO}_2 \uparrow \]

\[ \text{TCO}_2 \rightarrow \]

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:

$D \uparrow$

To be submitted, Andresen et al.
Nitrification rate:

D ↓

ALSO litter decomposition:

D ↓

0.6
0.4
0.2

D:**

Δ µgN·g⁻¹SOM·day⁻¹

A D T TD CO2 DCO2 TCO2 DTCO2

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:

- $T \uparrow$
- $CO_2 \uparrow$
- $TCO_2 \rightarrow$

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:


Louise C. Andresen:

louisea@bio.ku.dk and loand@life.ku.dk
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Air Liquide

DONG

Jægersprislejren