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

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BIOGEOMON 2009

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

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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 [CO₂] = 510 ppm

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

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

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

Immediate root ^{15}N uptake:

$\text{T} \uparrow$

$\text{CO}_2 \uparrow$

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

Ammonium
concentration:
 $\text{TCO}_2 \uparrow$

DON:
TCO₂ ↓

Microbial carbon:

T ↑

CO₂ ↑

TCO₂ --

Heather
flower N %:
CO₂ ↓

Heather

N pool:

D ↑

Heather

^{15}N recovery:

D ↑

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 --

TWO years of climate change treatments:

- Combined warming and elevated CO₂ kicks up mineralization of DON into ammonium
- Microbial biomass C and ¹⁵N tracer recovery higher in warmed and elevated CO₂ plots (not in TCO₂)
- CO₂ 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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