

National Environmental Research Institute University of Aarhus, Denmark

Department of Atmospheric Environment

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COST 729

Lisboa 22-25 April 2008



- **Habitat Directive**
Danish report

- **Ammonia and N in lichen**
 - close to source ($< 600\text{m}$)
 - few km scale

Ammonia measured/modelled

Local scale model

N in lichen - concentration/deposition

- **Habitat directive:**

Rasmus Ejrnæs, Bettina Nygaard, Poul Nygaard Andersen, Christian Damgaard, Torben Bramming Jørgensen, Knud Erik Nielsen, Ditte Louise Jansen Petersen, Jens Skriver, Bjarne Søgaard, Jonas Teilmann og Peter Wind.

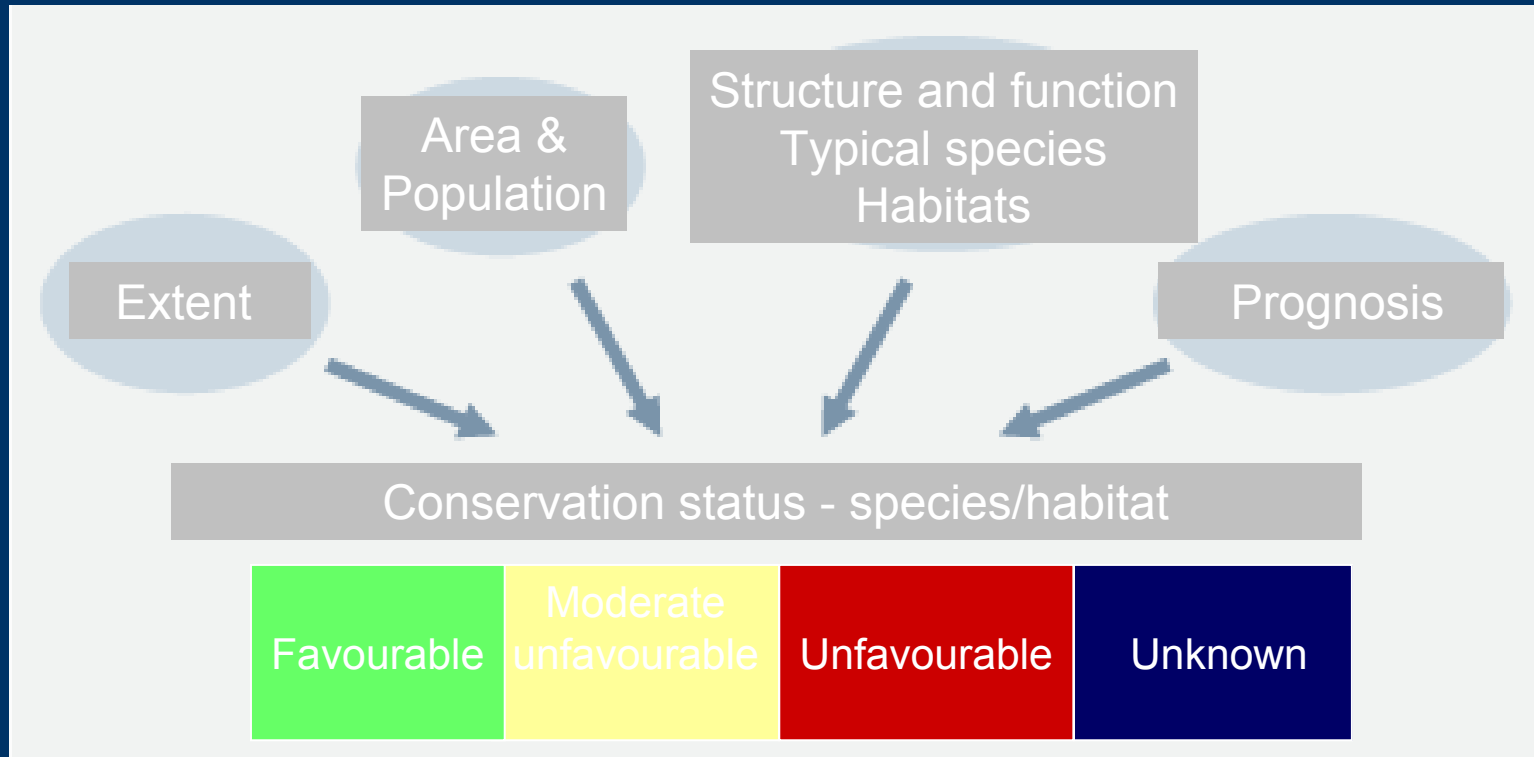
- **Co-workers on ammonia and lichens :**

Knud Erik Nielsen, Hans Jørgen Degn, Camilla Geels, Per Løfstrøm, Christian Damgård, Thomas Ellermann og Jesper Christensen.

The EC-Habitats Directive

Concept of favourable conservation status

Conservation status



Conservation status

The “natural **extent**” is stable or progressing and large enough to cover the whole variation, i.e. geographical

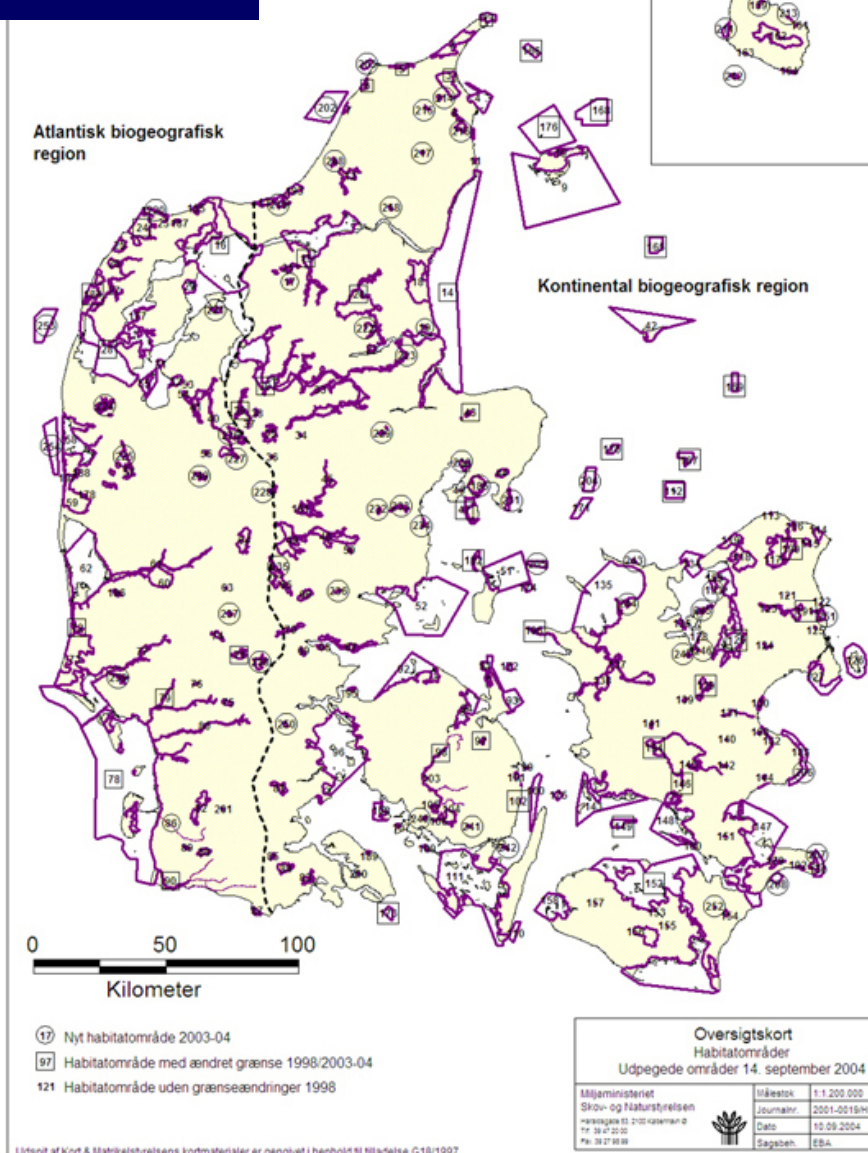
The **area** the habitat covers is stable or progressing and large enough to ensure future conservation

The **structures and functions** necessary for the habitat “long term” conservation are present

Favourable conservation status for **typical species** for particular habitats. “Typical” is good indicators for the quality of the habitat and sensitive to less favourable conditions

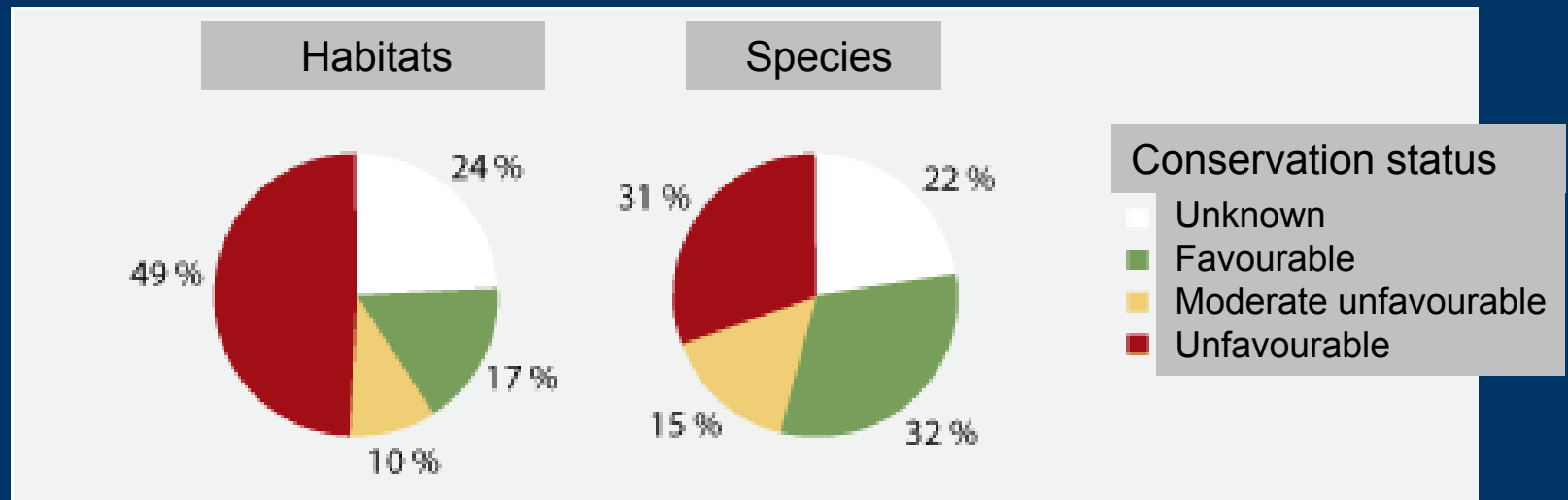


Habitats in Denmark



Conservation status

58 habitat types
70 species



Ejrnæs et al., 2008

Unfavorable conservation status

Load of nutrients

- ground water and run-off (aquatic environments)
- deposition (nutrient-poor terrestrial ecosystems)

Draining

- Drainage, drinking water abstraction

Overgrowth

- Lack of management (grazing, harvest), faster growth due to nutrient enrichment

Isolation and fragmentation of the areas

- Species only moving short distances
- Lack of nutrient poor ecosystems, clean water, old trees and dead cortex

- **Ammonia and N in lichen**

- close to source

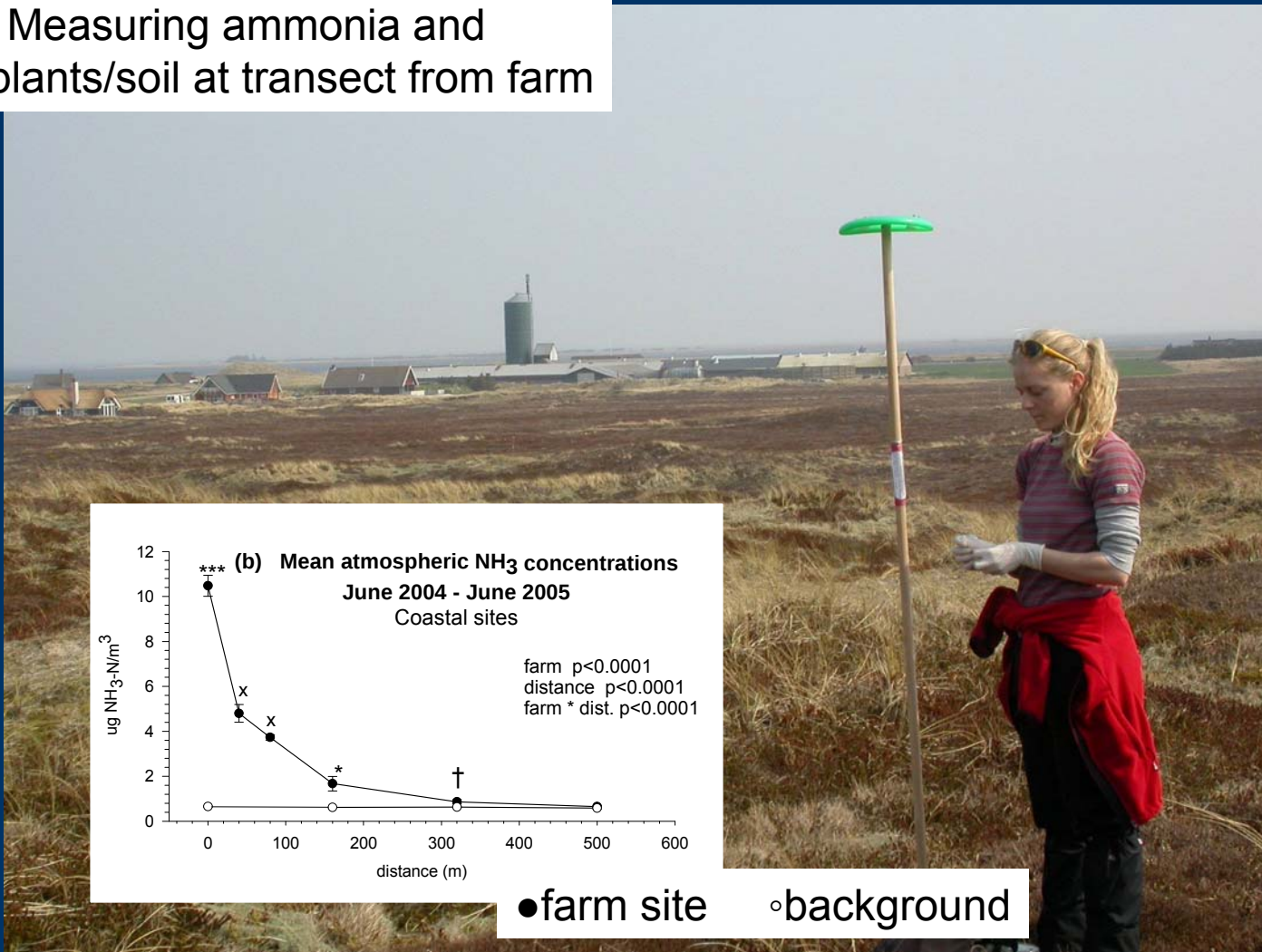
- few km scale / community level

Ammonia measured/modelled

Local scale model

N in lichen - concentration/deposition

Anja Vilsholm - Master thesis Measuring ammonia and N in plants/soil at transect from farm

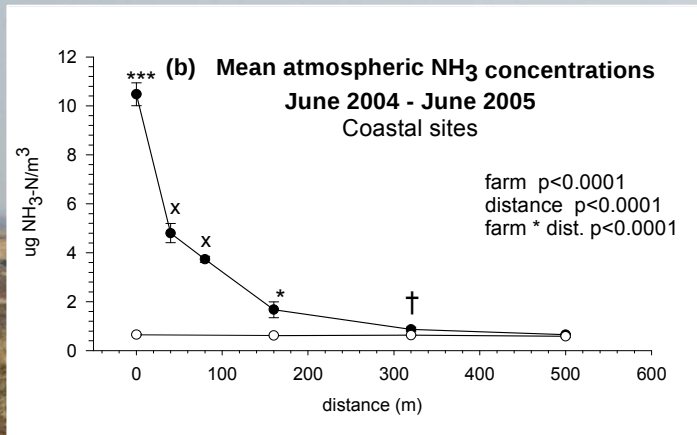


† p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.0001

x ANOVA not possible due to few observations

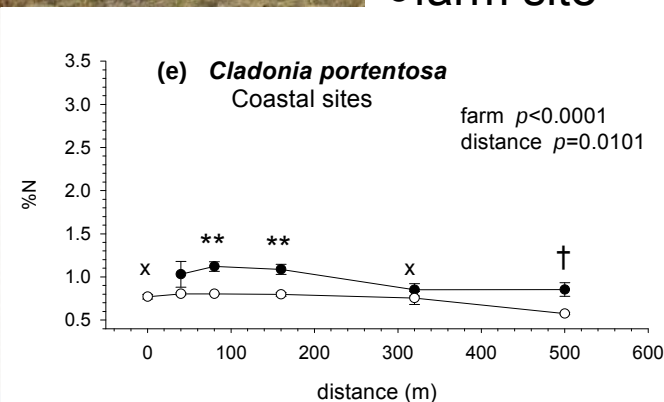
Anja Vilsholm - Master thesis

Measuring ammonia and N in plants/soil at transect from farm



● farm site

○ background



† p<0.1, * p<0.05, ** p<0.01, *** p<0.0001

^x ANOVA not possible due to few observations



Can N in lichen be an indicator for N load?

Differences on small scale – few kilometers community level

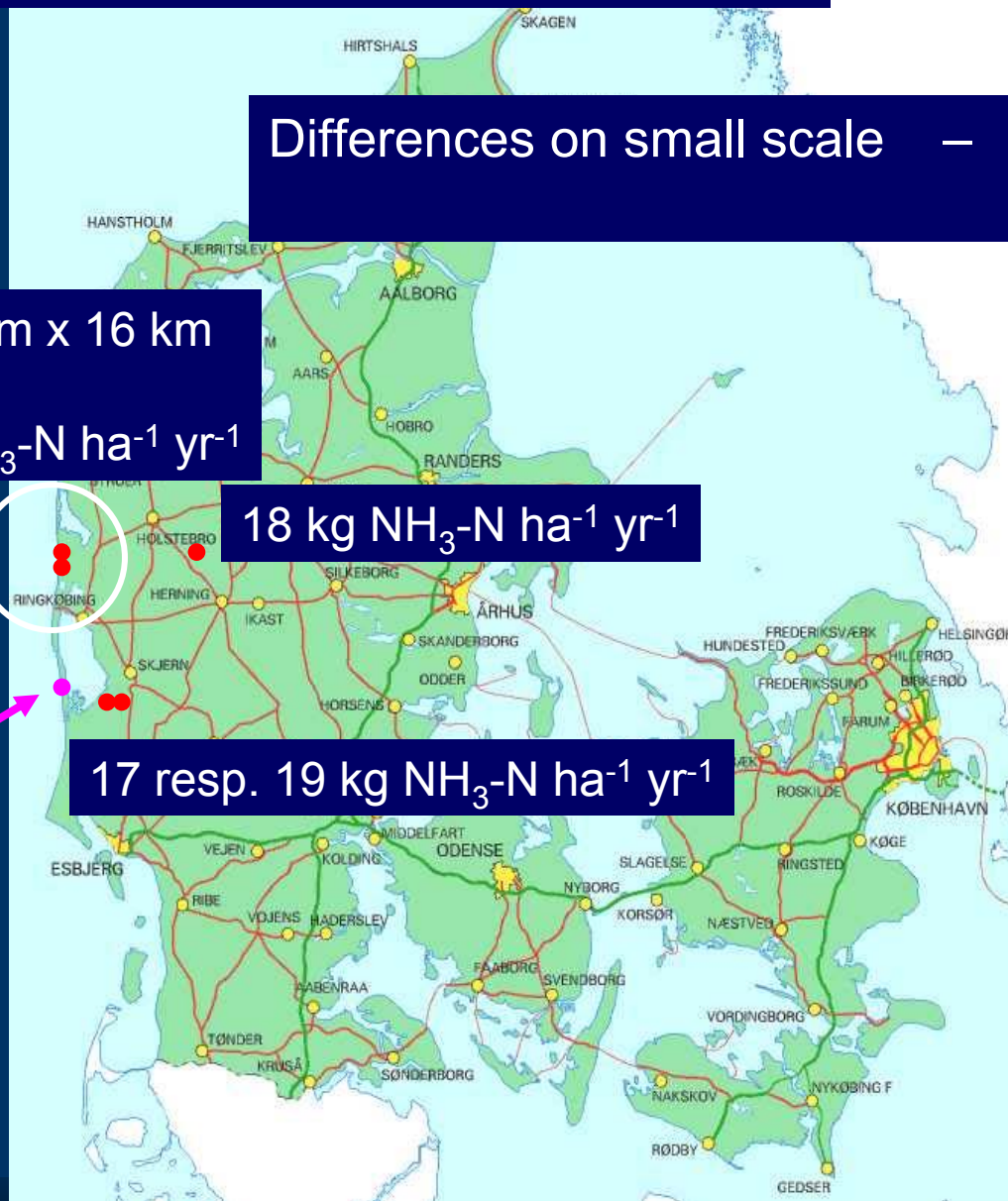
Emission 16 km x 16 km

5 resp. 7 kg $\text{NH}_3\text{-N ha}^{-1} \text{ yr}^{-1}$

18 kg $\text{NH}_3\text{-N ha}^{-1} \text{ yr}^{-1}$

17 resp. 19 kg $\text{NH}_3\text{-N ha}^{-1} \text{ yr}^{-1}$

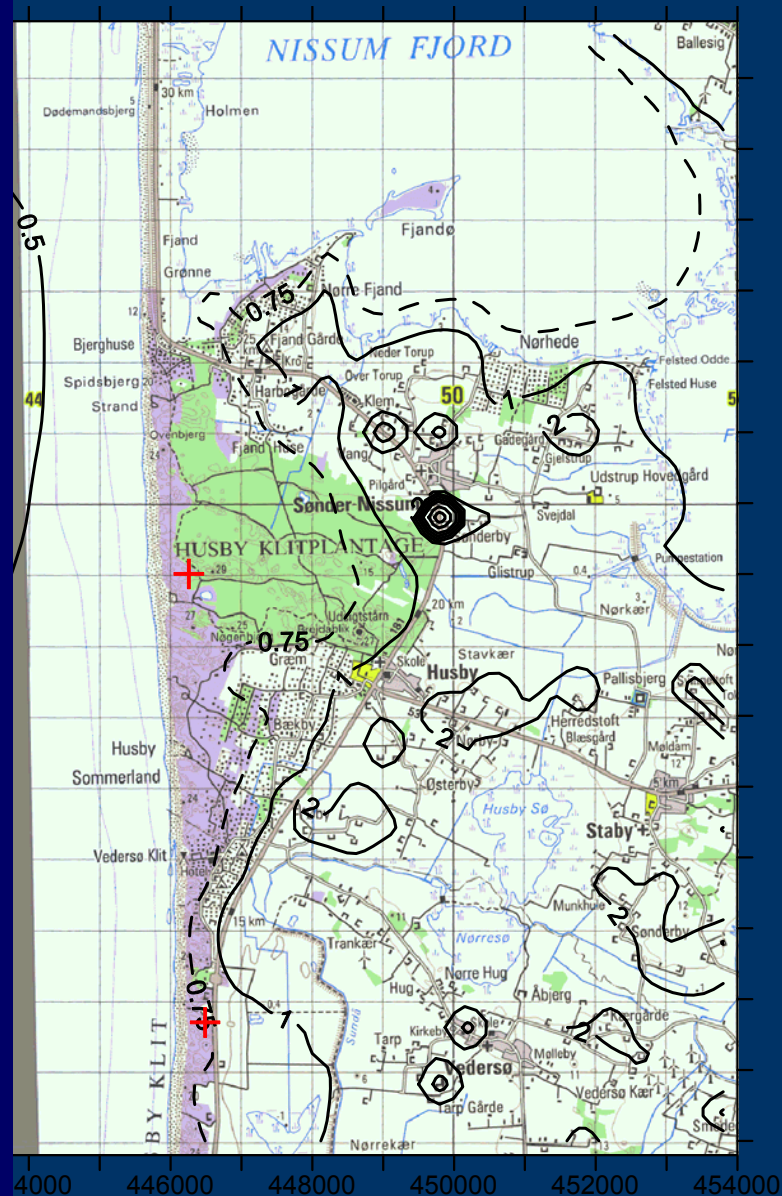
Anjas site



Dominating wind direction
west southwest

Northern location:
forest east

Southern location:
meadow/agricultural land east



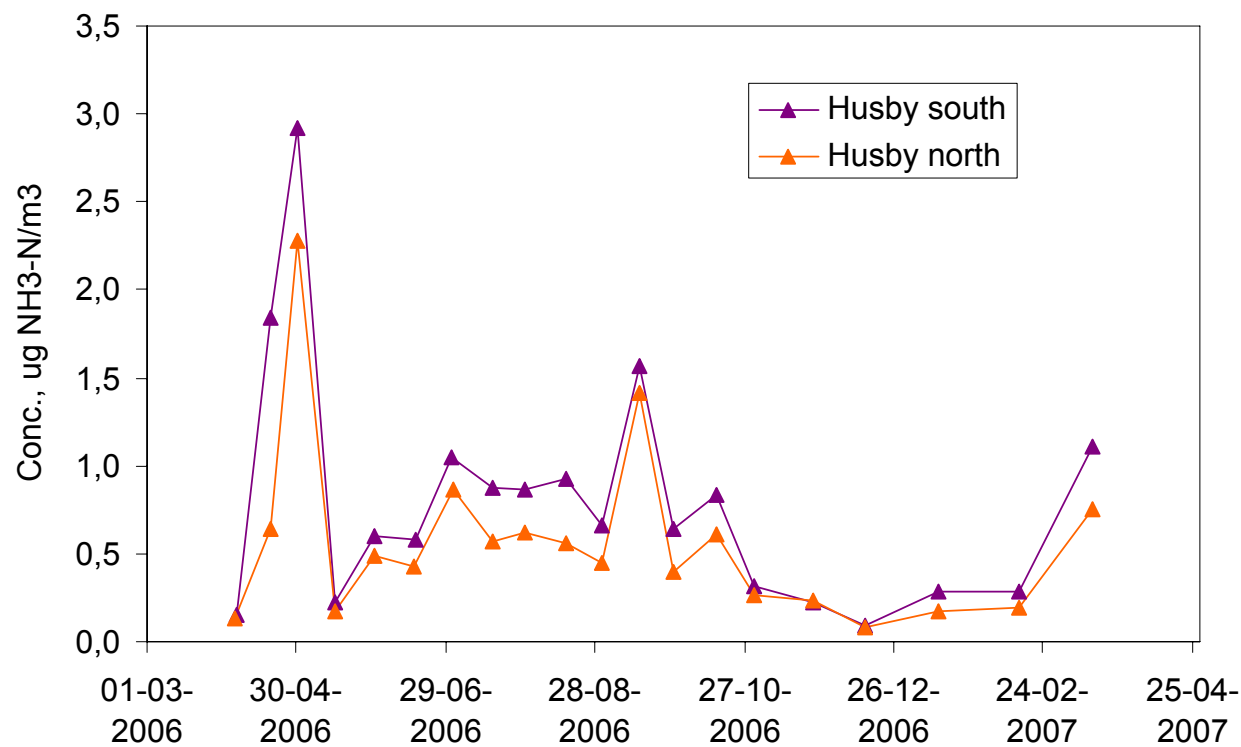


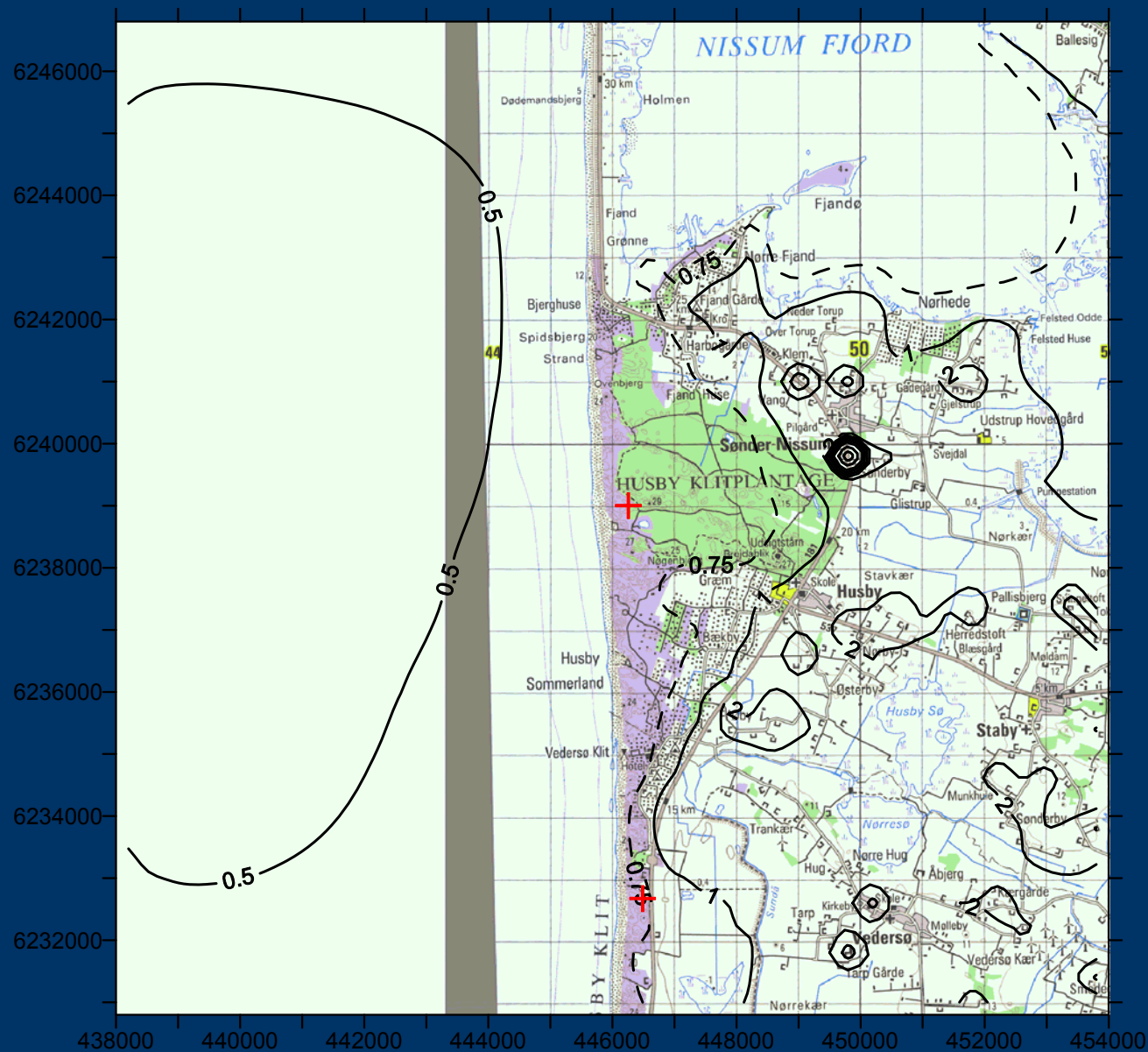
Husby (North)



Husby (South)

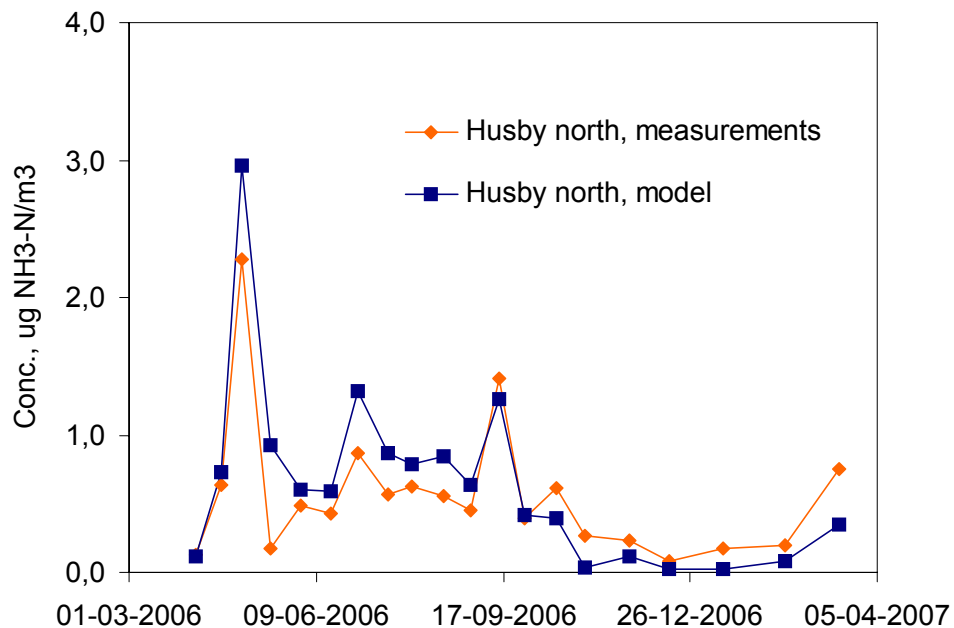
½-1 monthly mean concentrations of ammonia



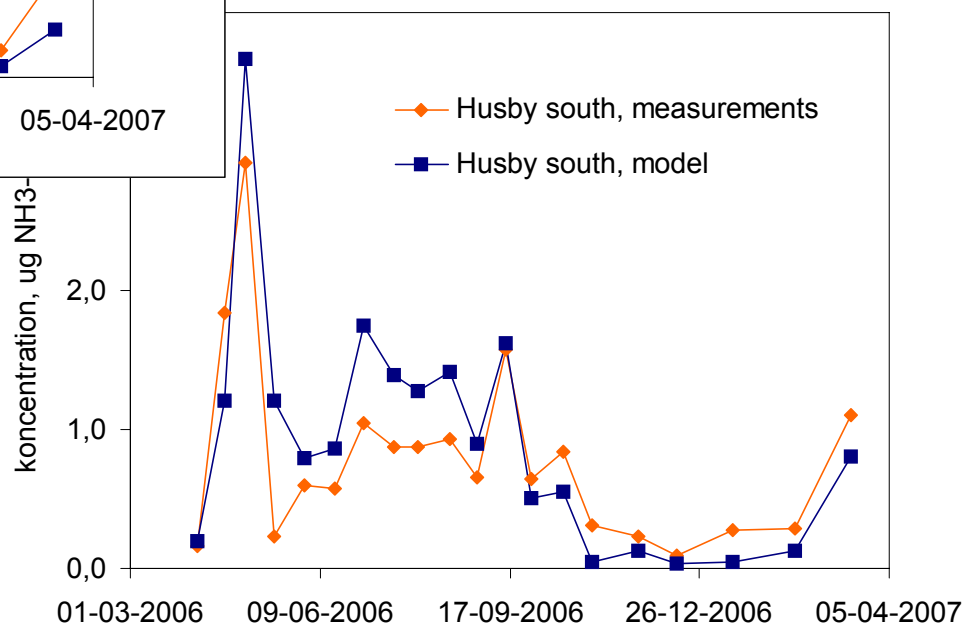


Modelled ammonia concentrations, yearly mean (2006) , $\mu\text{g NH}_3\text{-N m}^{-3}$

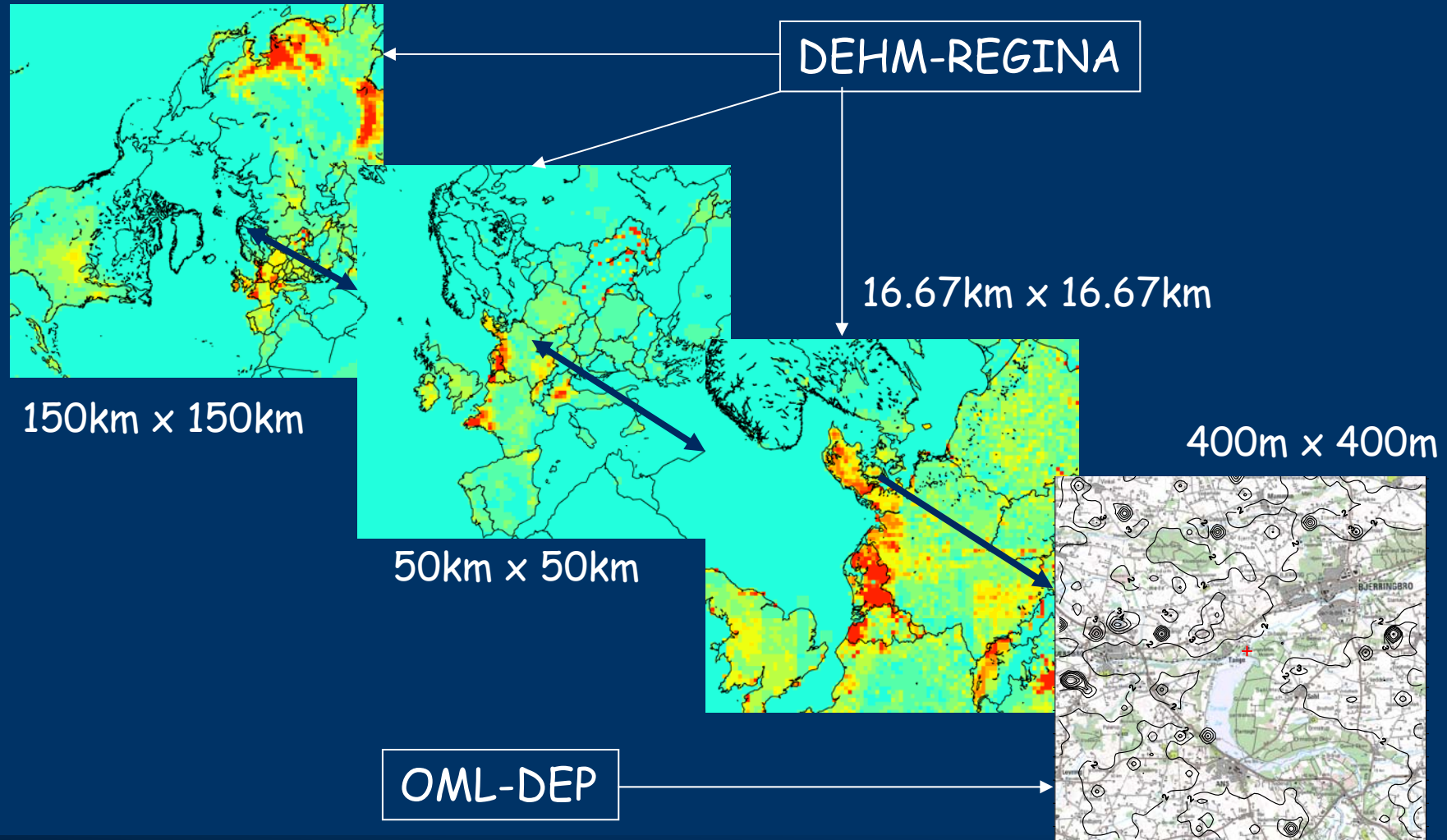
Measured and modelled ½-1 monthly mean concentrations of ammonia



Measured and modelled ½-1 monthly concentrations of ammonia

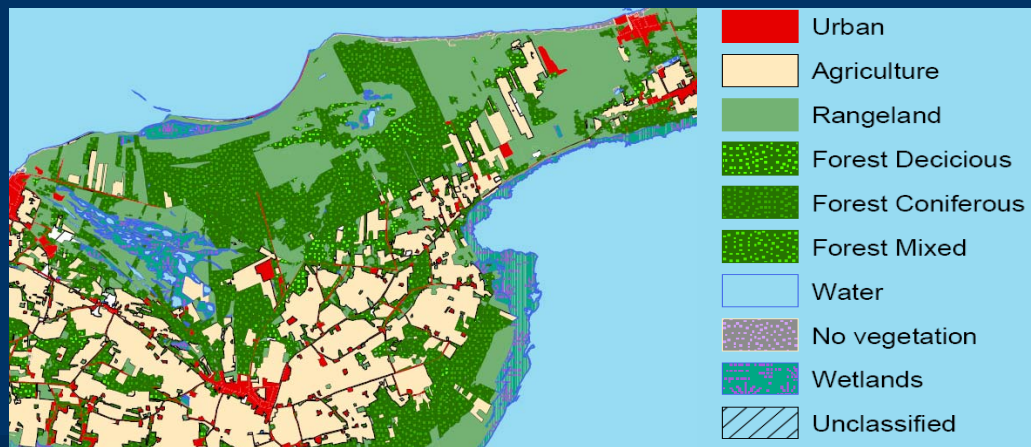
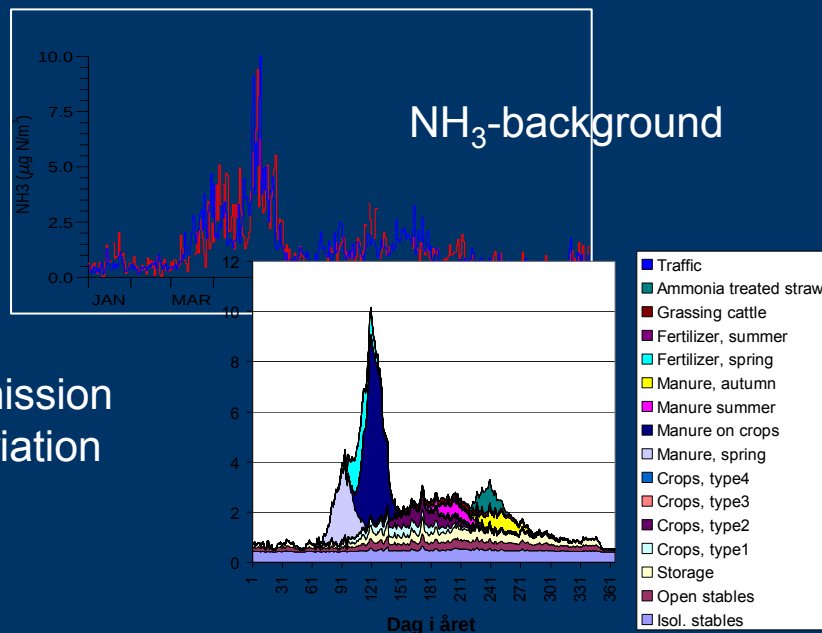


NH₃ modelling on different scales - coupling regional and local scale



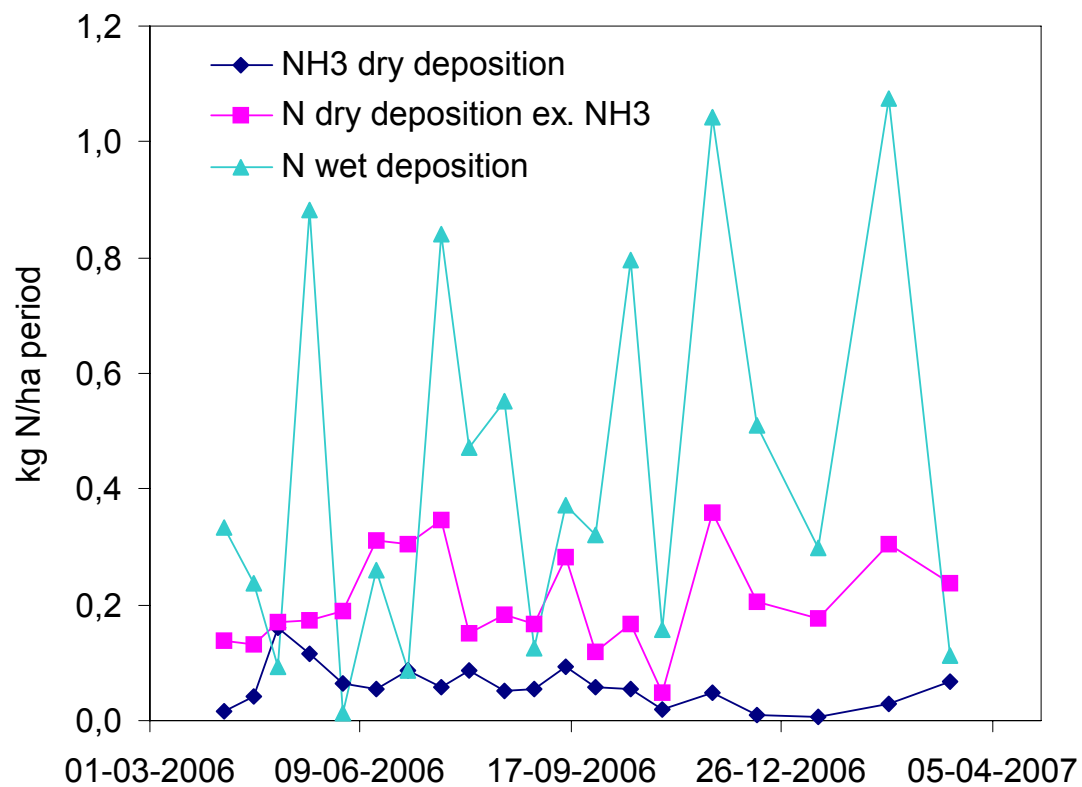
OML-DEP input data

- NH_3 and SO_2 -background concentration from DEHM
- Local emission for point and area sources, based on CHR og GLR (100 m)
- 'Land use' from "Area Information System" giving surface roughness (100mx100m)
- Meteorology from model (Eta/MM5) or measurements

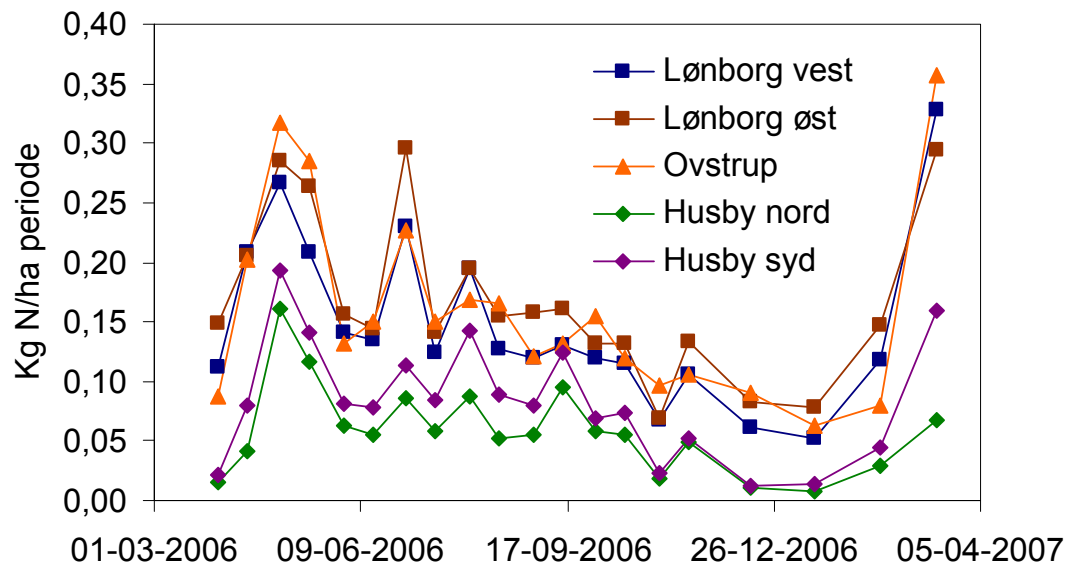




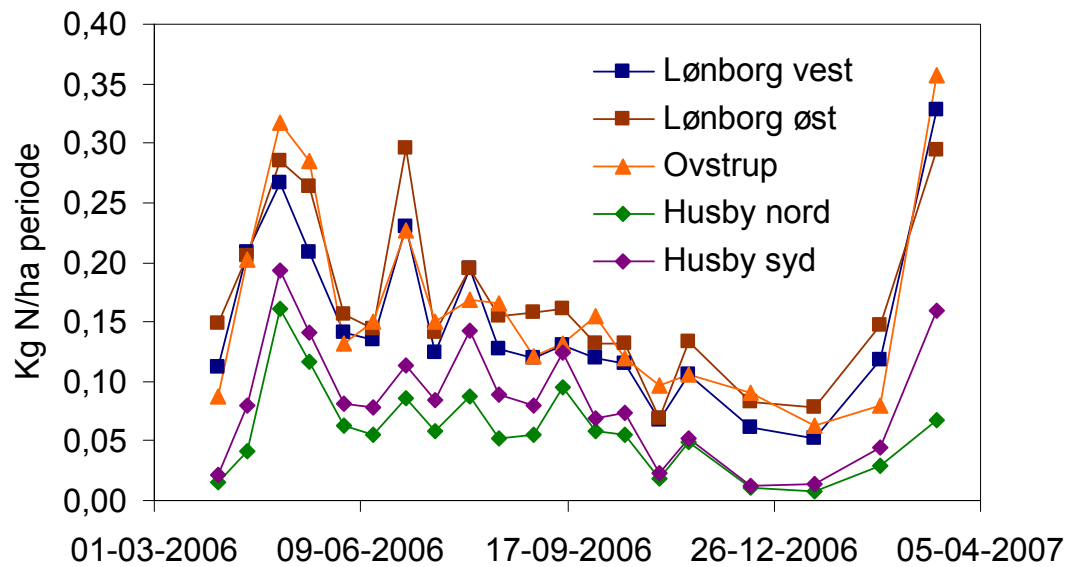
Husby north, modelled N load



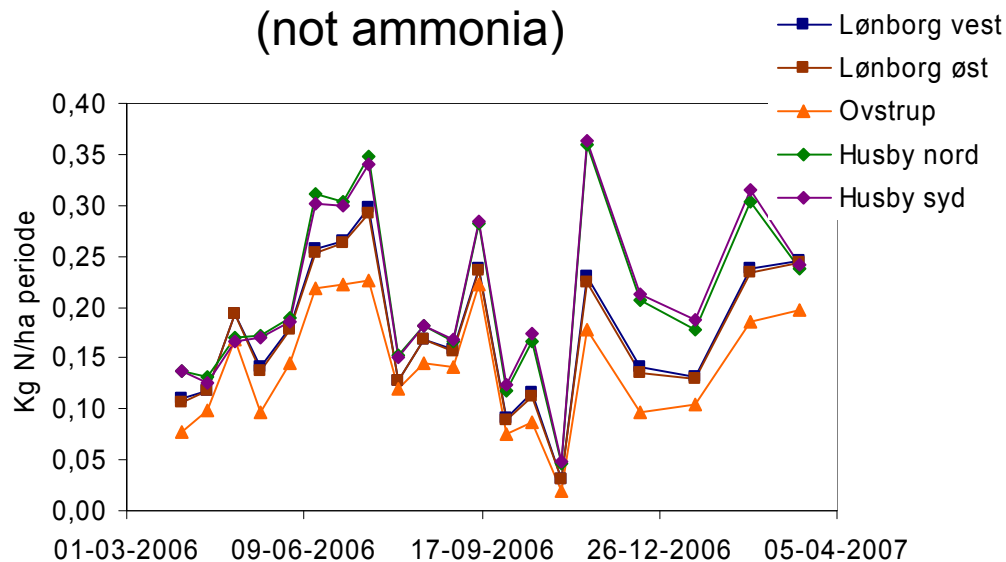
Modelled ammonia dry deposition



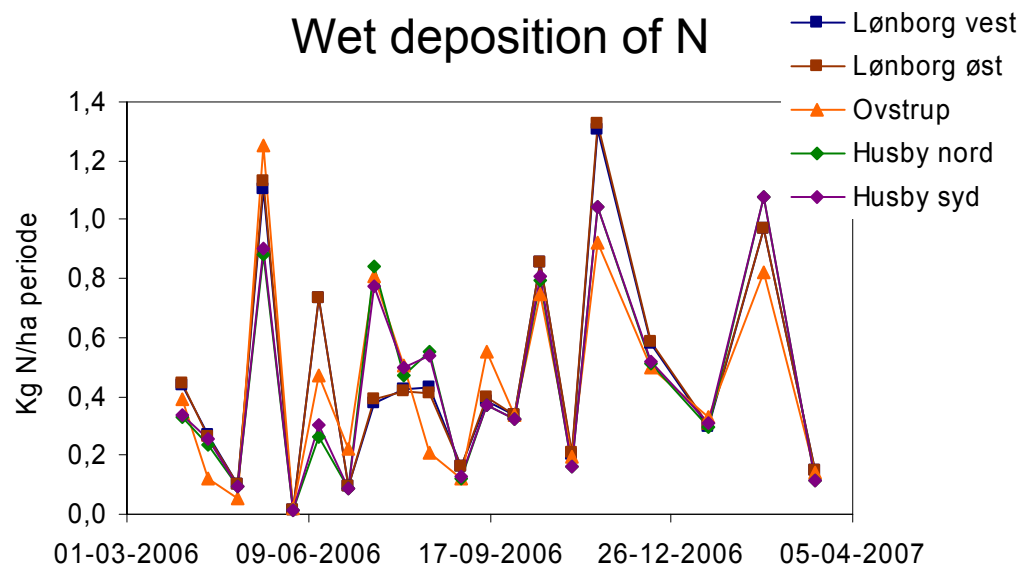
Modelled ammonia dry deposition



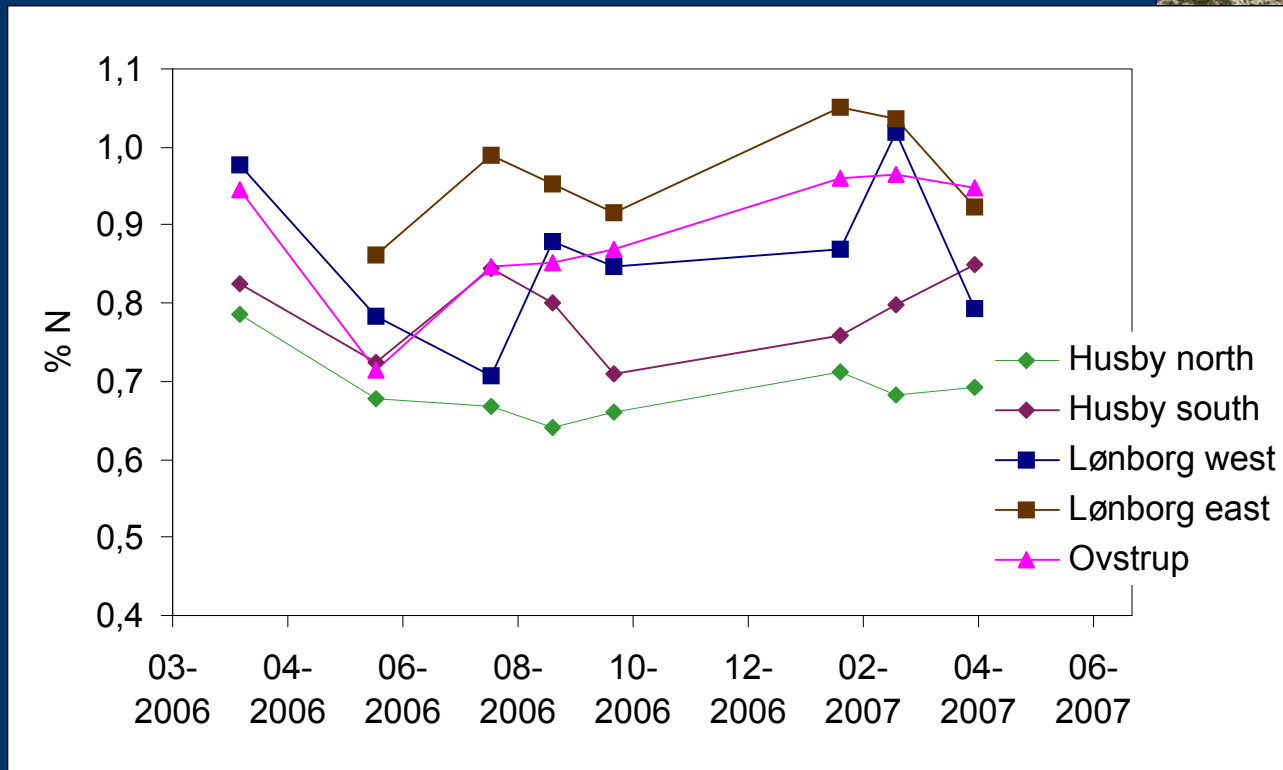
Dry deposition of "other" N (not ammonia)



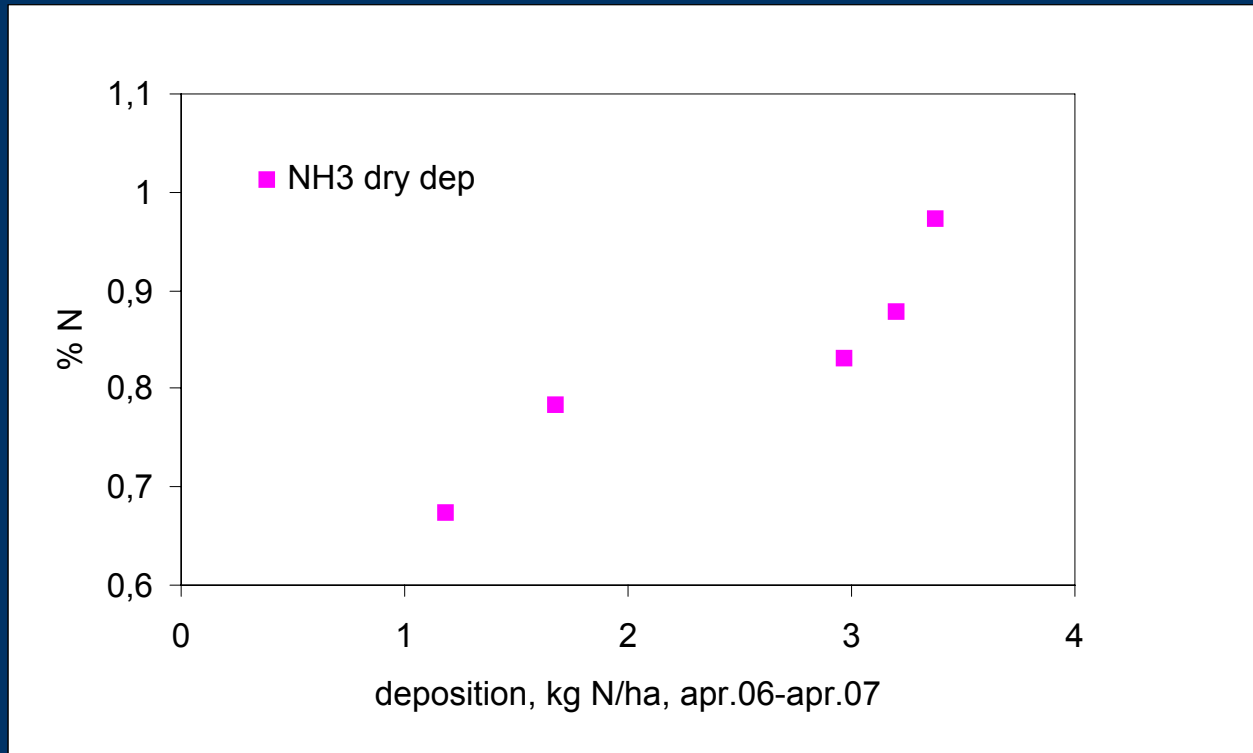
Wet deposition of N



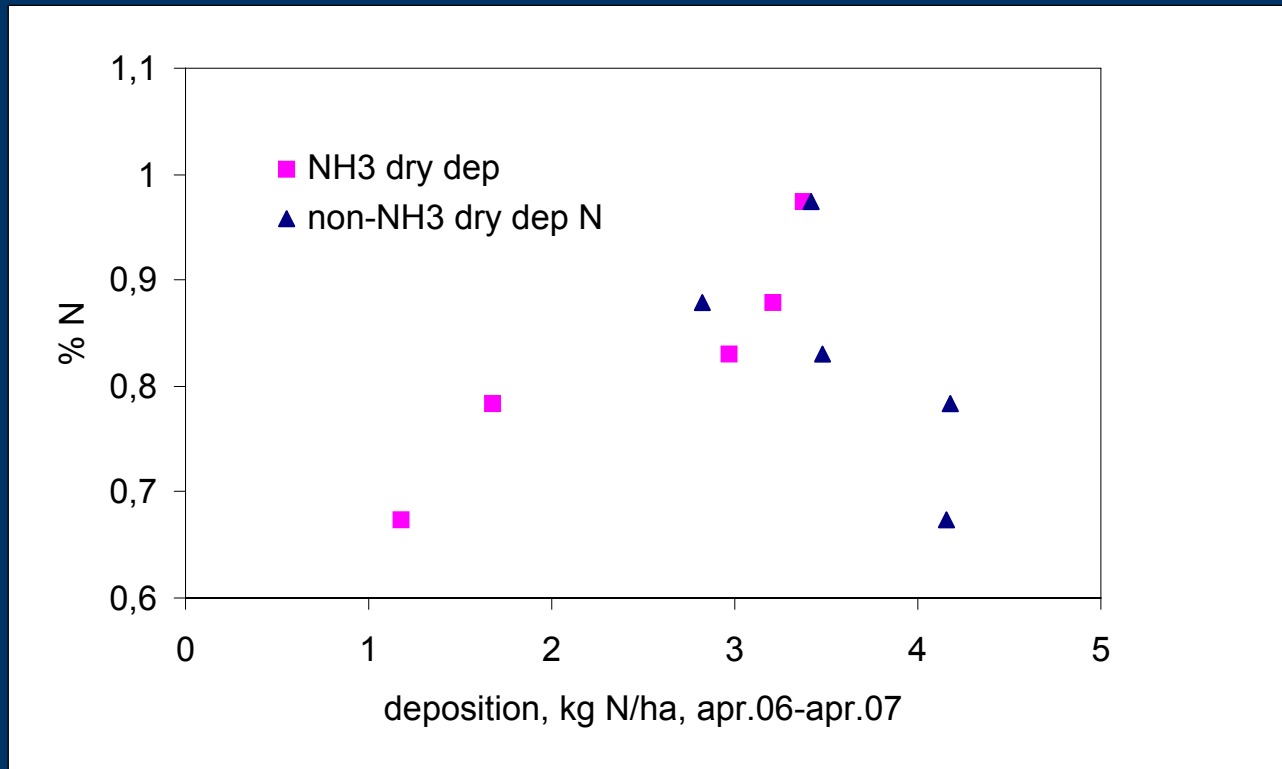
Nitrogen content (% N) in lichen *Cladonia portentosa* - sesonal variation?



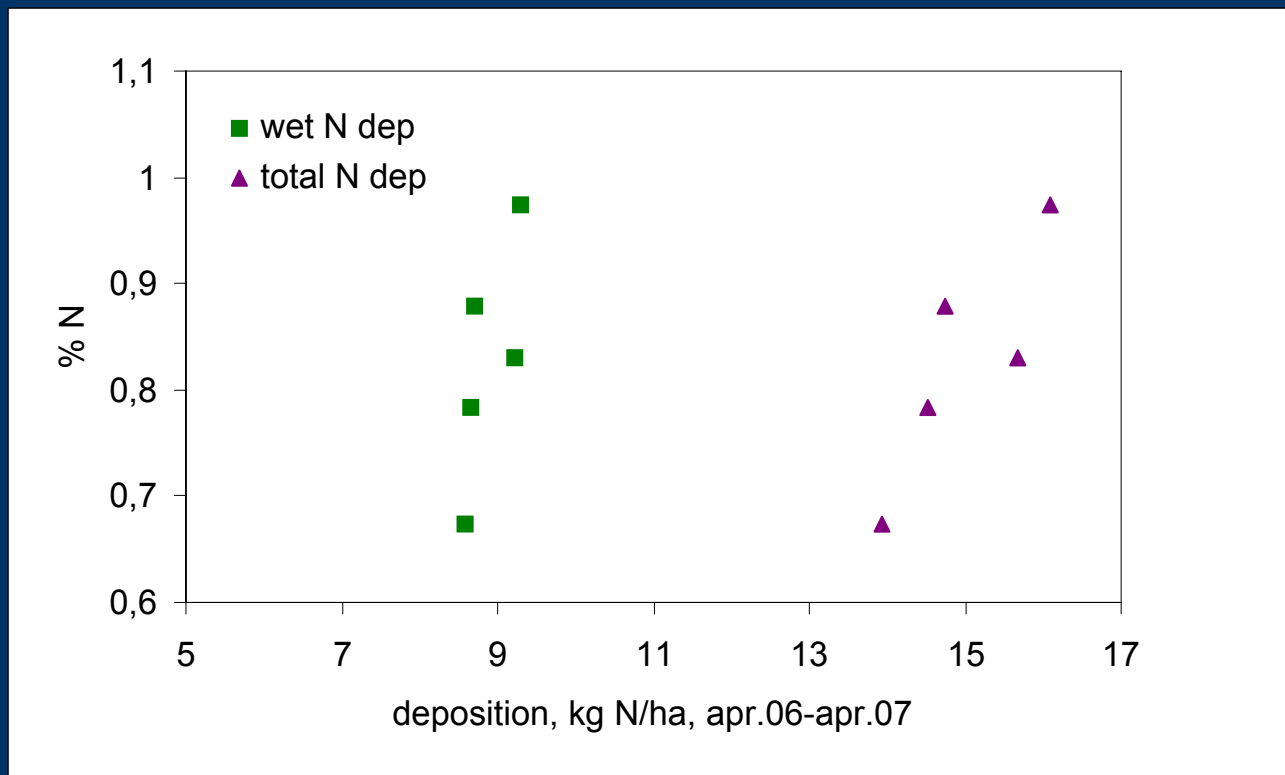
%N in lichen versus modelled dry dep ammonia at the five locations



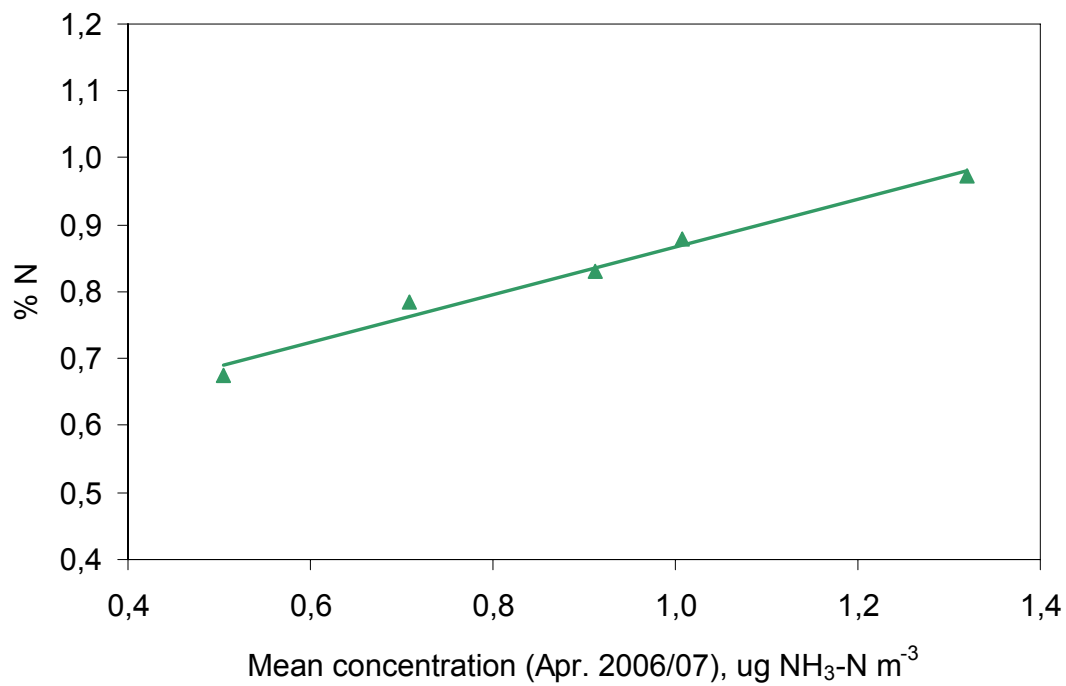
%N in lichen versus modelled dry dep ammonia and "other dry dep" at the five locations



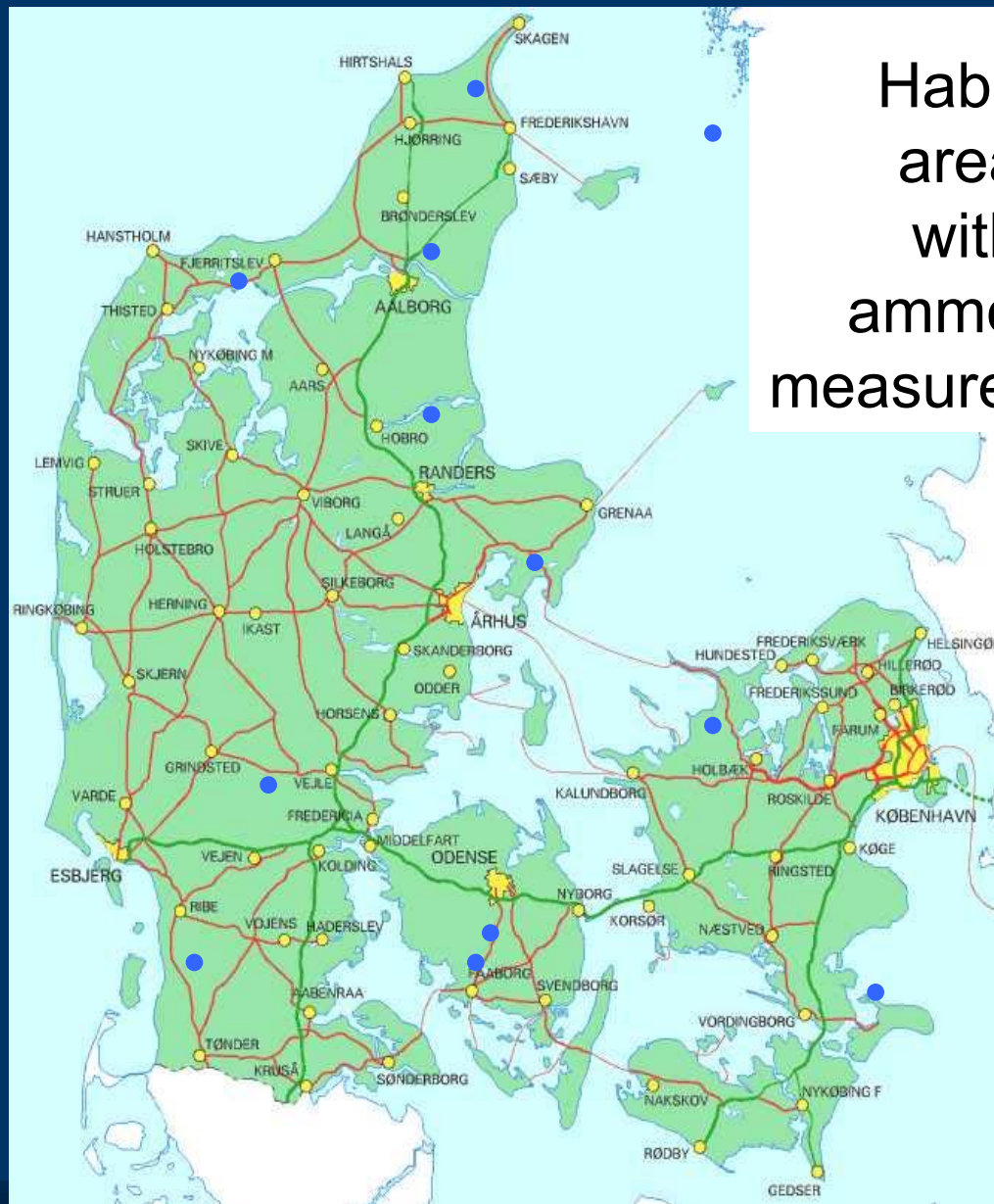
%N in lichen versus modelled wet dep N and total dep N at the five locations



Relation between ammonia concentration
and nitrogen content in lichen



Habitat areas with ammonia measurements



• Bornholm

....waiting for % N in lichen.....

Thank you for your attention