Process-based modelling of NH_3 exchange over a grazed field

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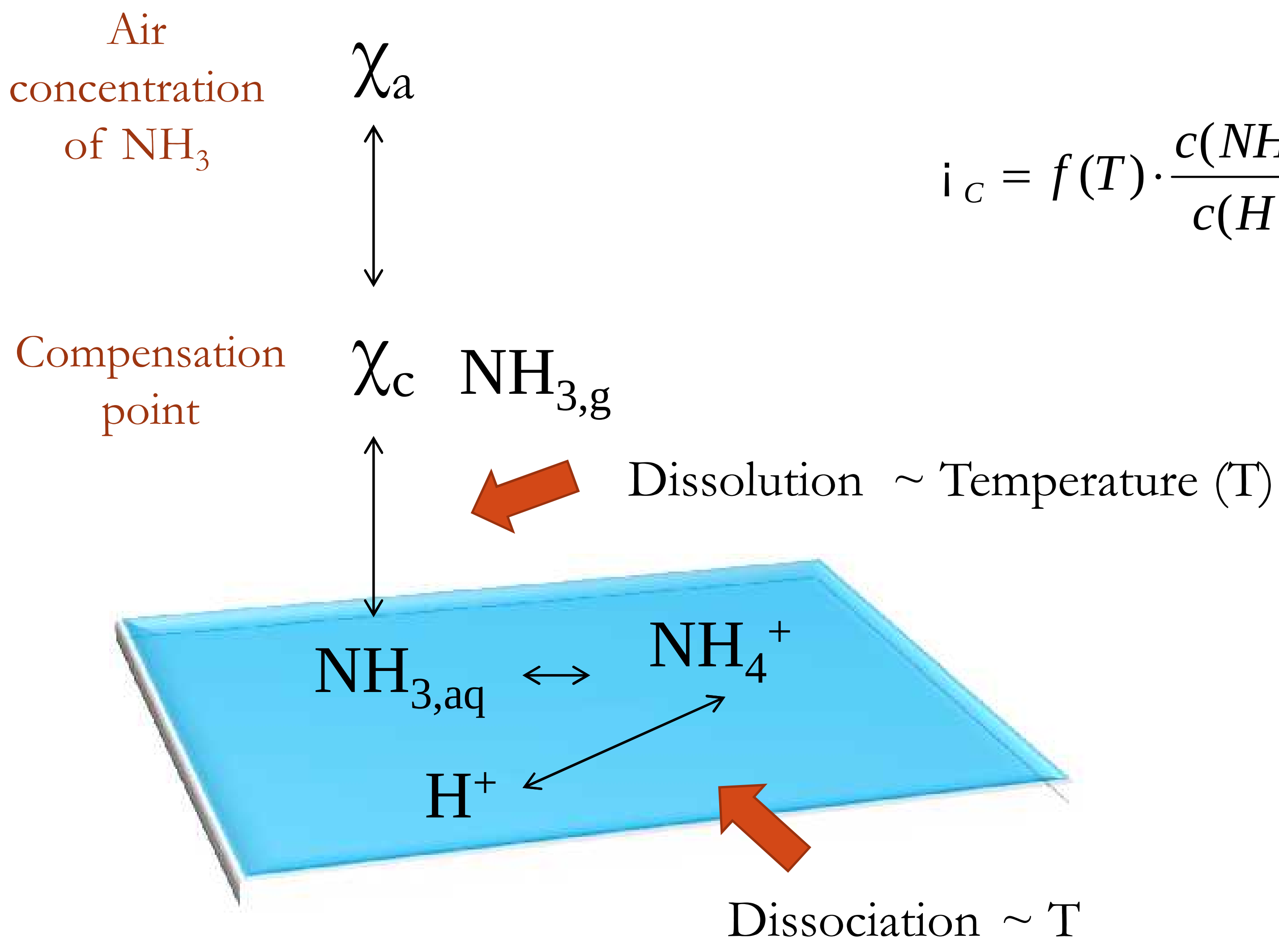
Exchange of ammonia



$$\chi_C = f(T) \cdot \frac{c(NH_4^+)}{c(H^+)}$$

Problems

1

Effect of climate change – HOW?

2

Atmospheric chemistry transport models don't handle temperature dependency

The approach

1

Construction of an NH_3 exchange model for a urine patch.

Model evaluation: Móring et. al, 2016, Biogeosciences

2

Extension and application of this model for the scale of a grazed grassland.

The GAG model - schematic

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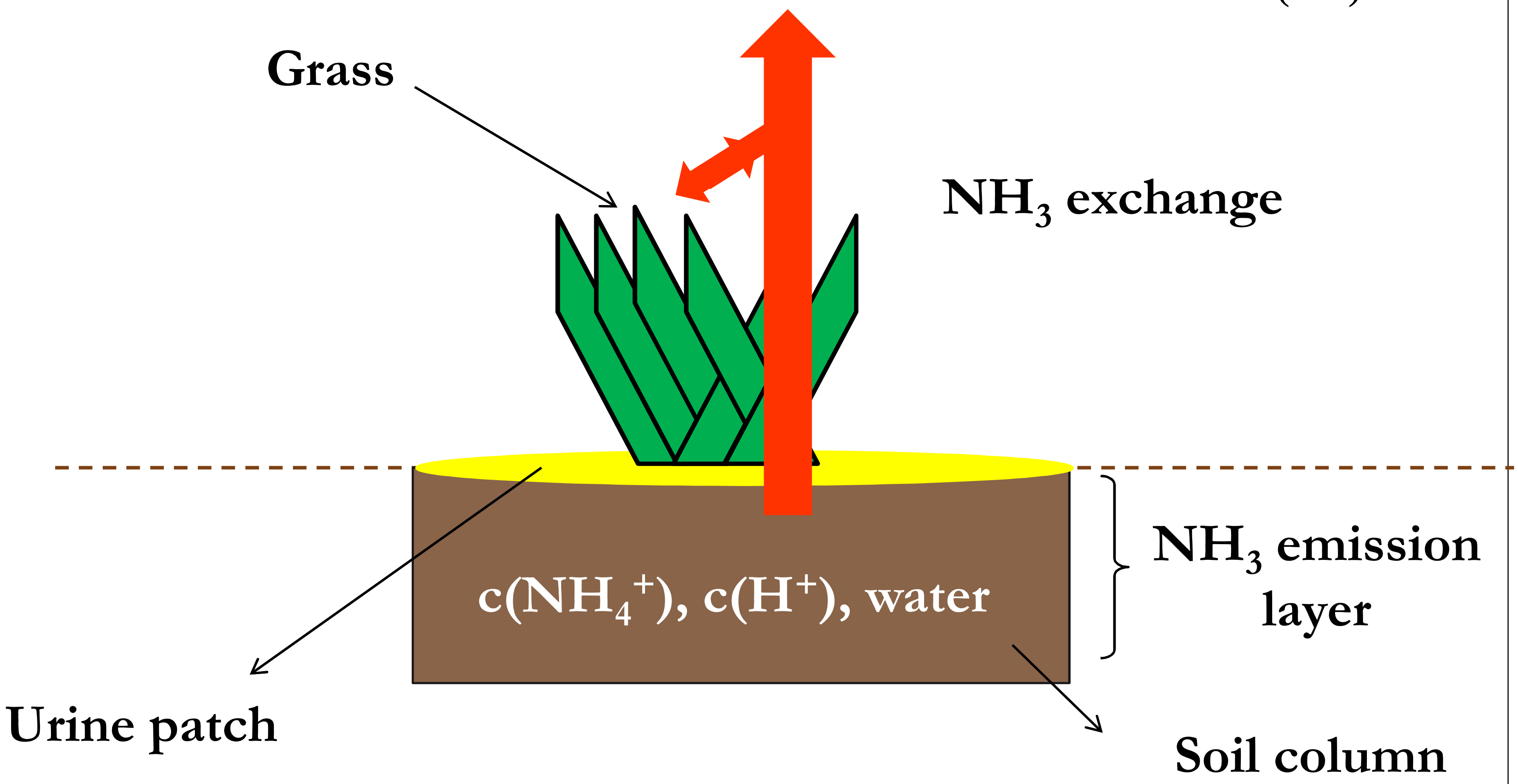
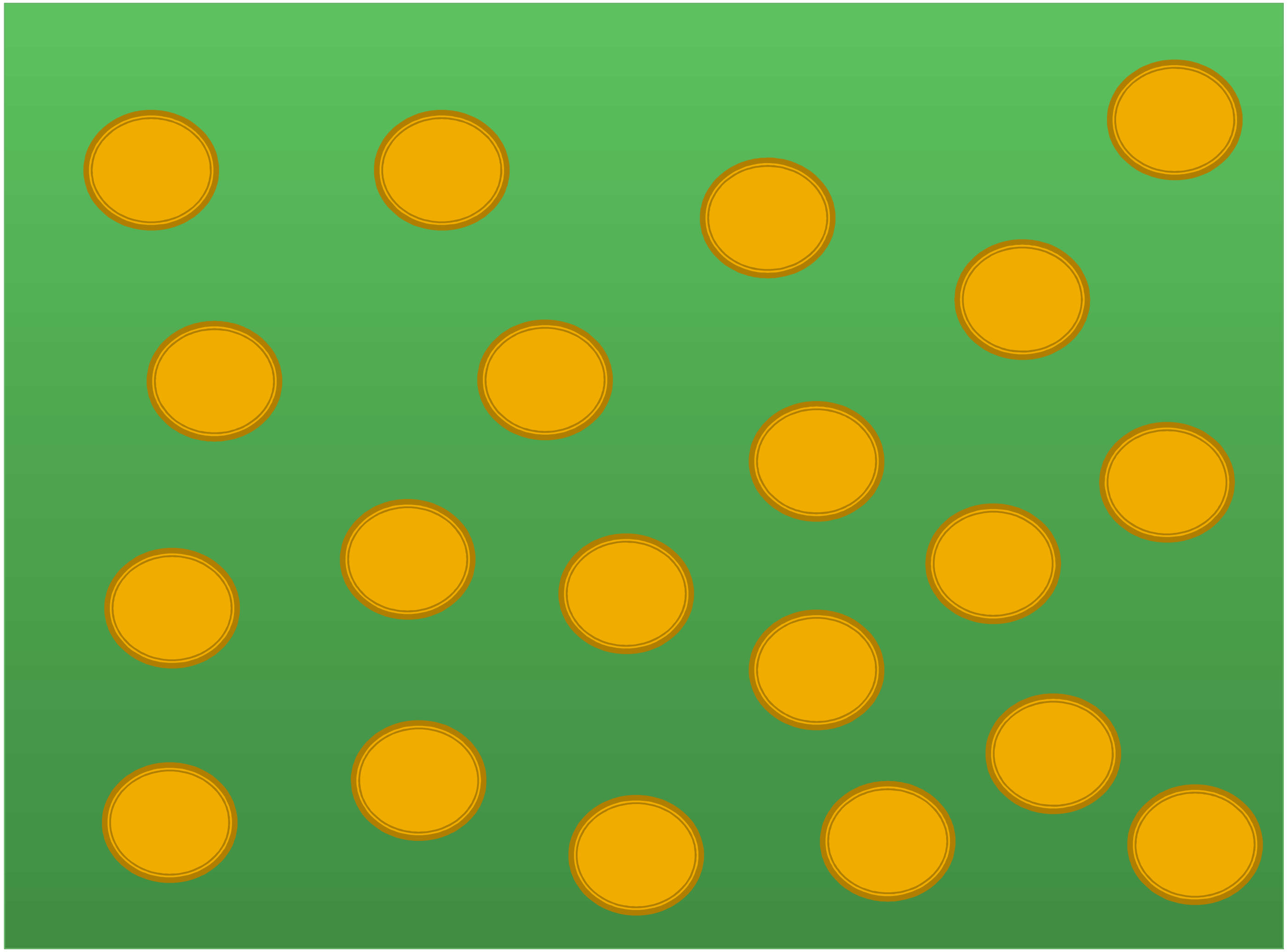
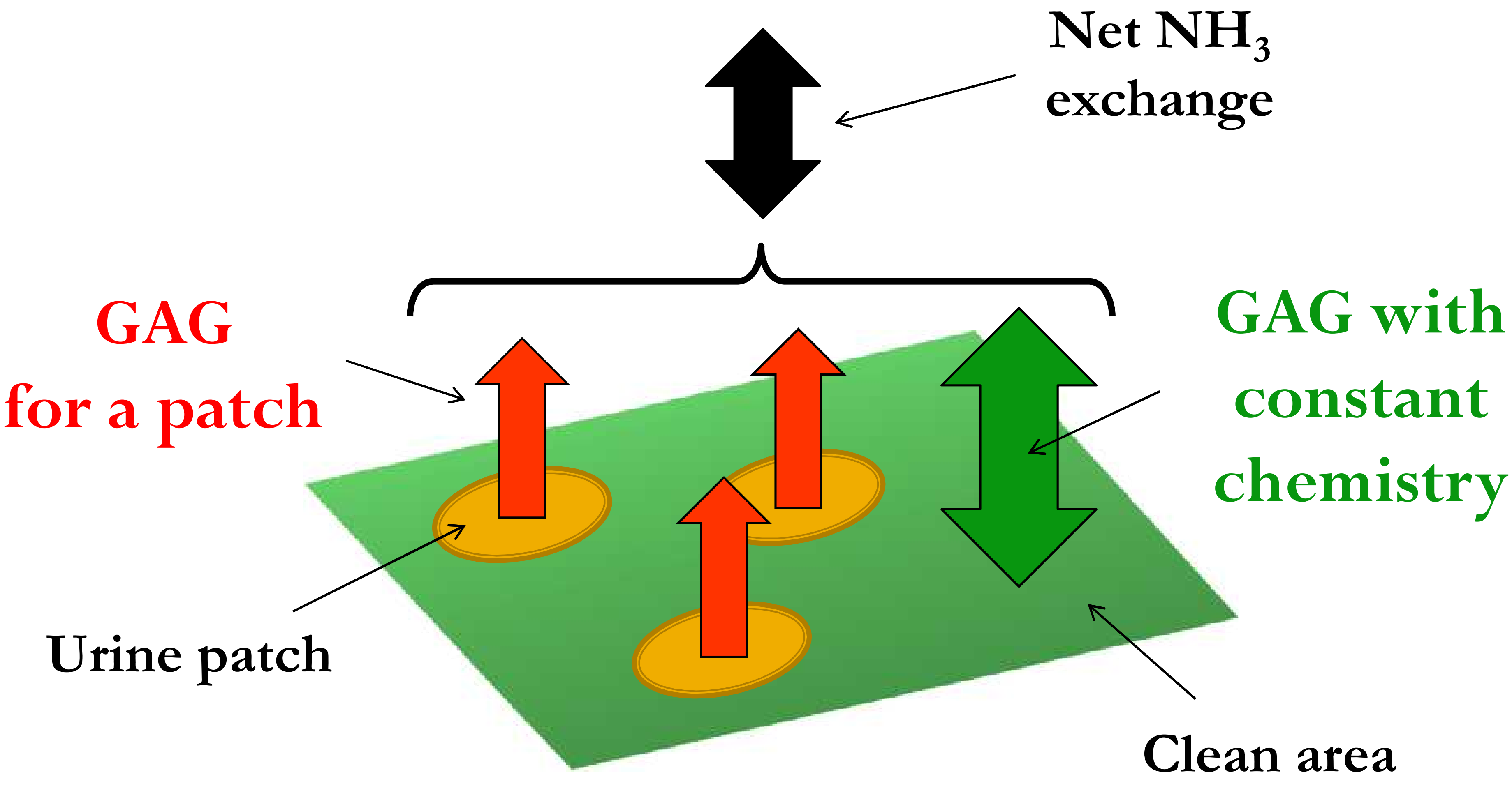
$$i_C = f(T) \cdot \frac{c(NH_4^+)}{c(H^+)}$$



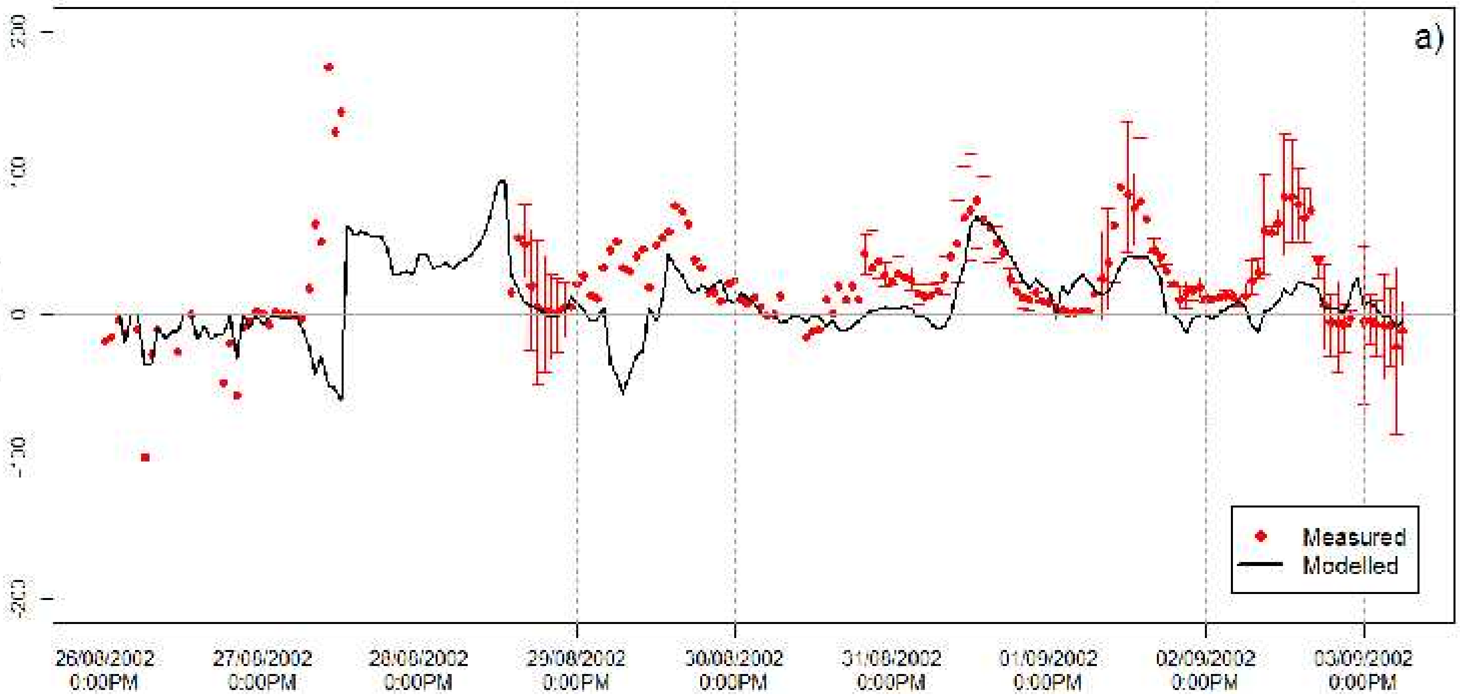
What's happening on the field?



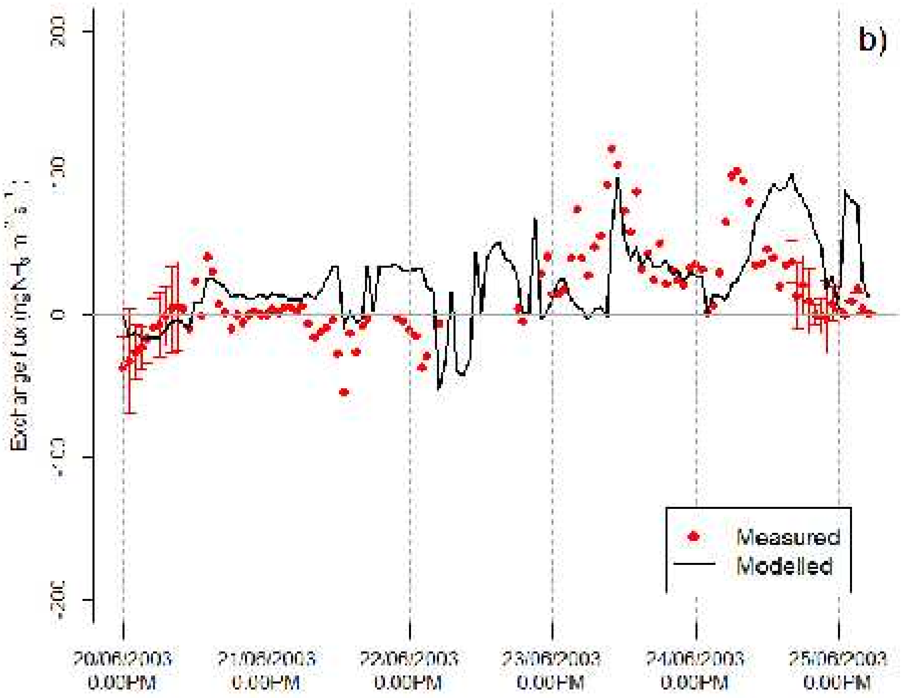
Model schematic for a grazed field



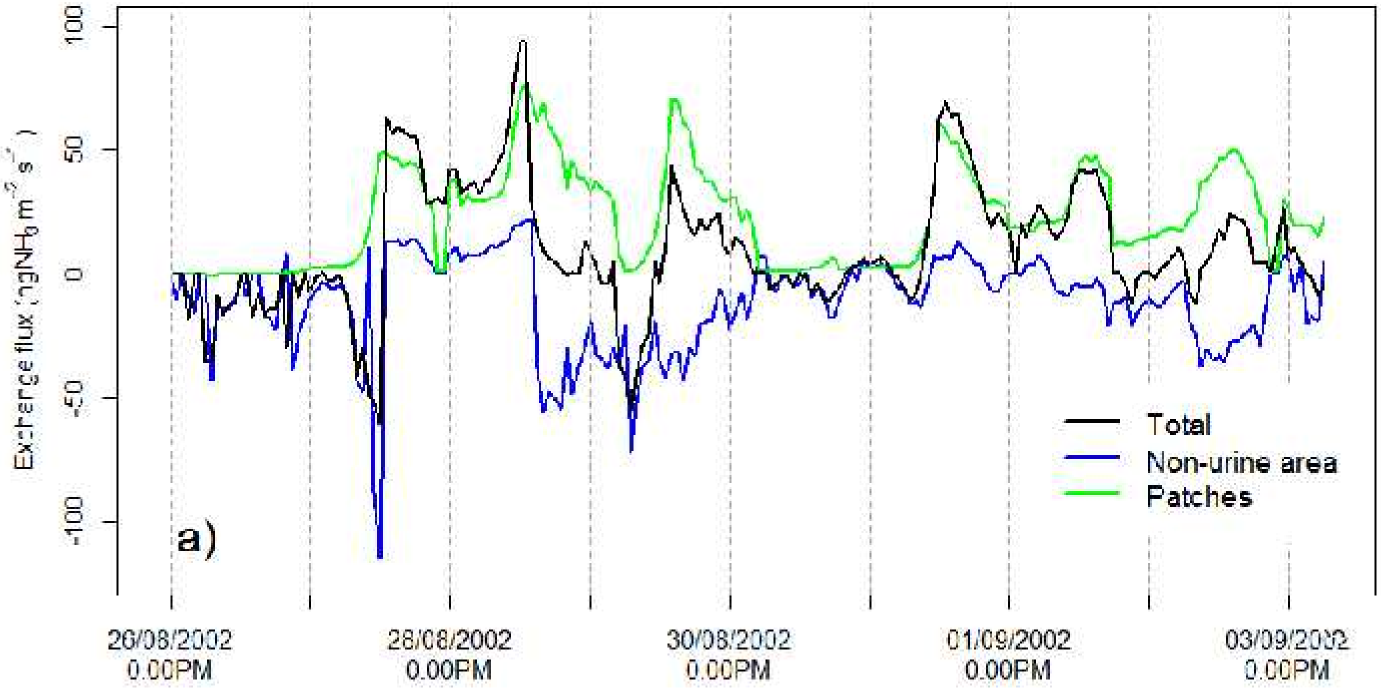
P2002


a)
Measured
Modelled
26/08/2002 0:00PM
27/08/2002 0:00PM
28/08/2002 0:00PM
29/08/2002 0:00PM
30/08/2002 0:00PM
31/08/2002 0:00PM
01/09/2002 0:00PM
02/09/2002 0:00PM
03/09/2002 0:00PM

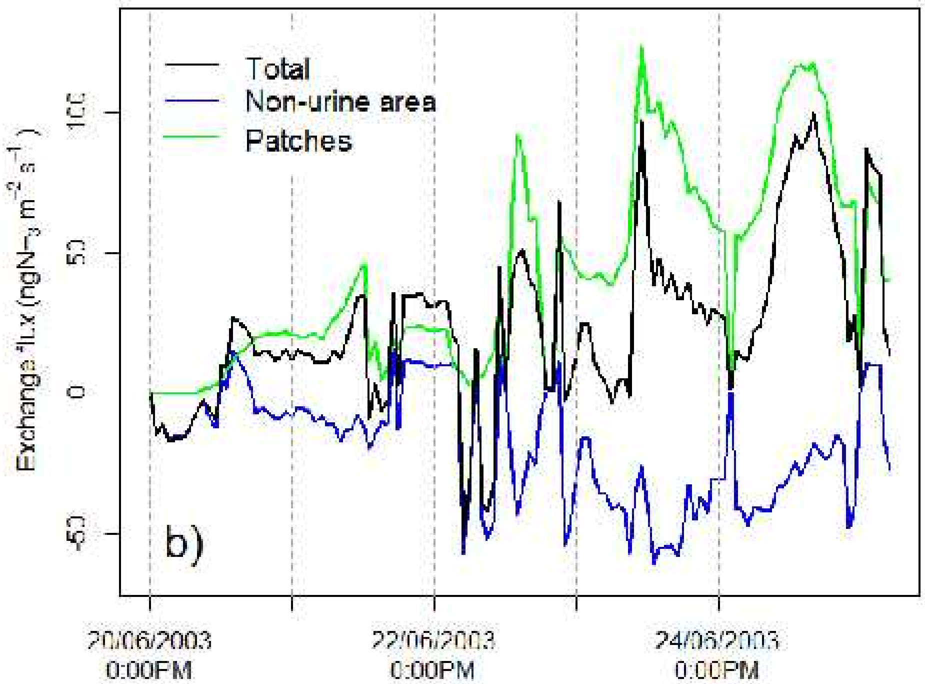
P2003


b)
Measured
Modelled
20/06/2003 0:00PM
21/06/2003 0:00PM
22/06/2003 0:00PM
23/06/2003 0:00PM
24/06/2003 0:00PM
25/06/2003 0:00PM

P2002



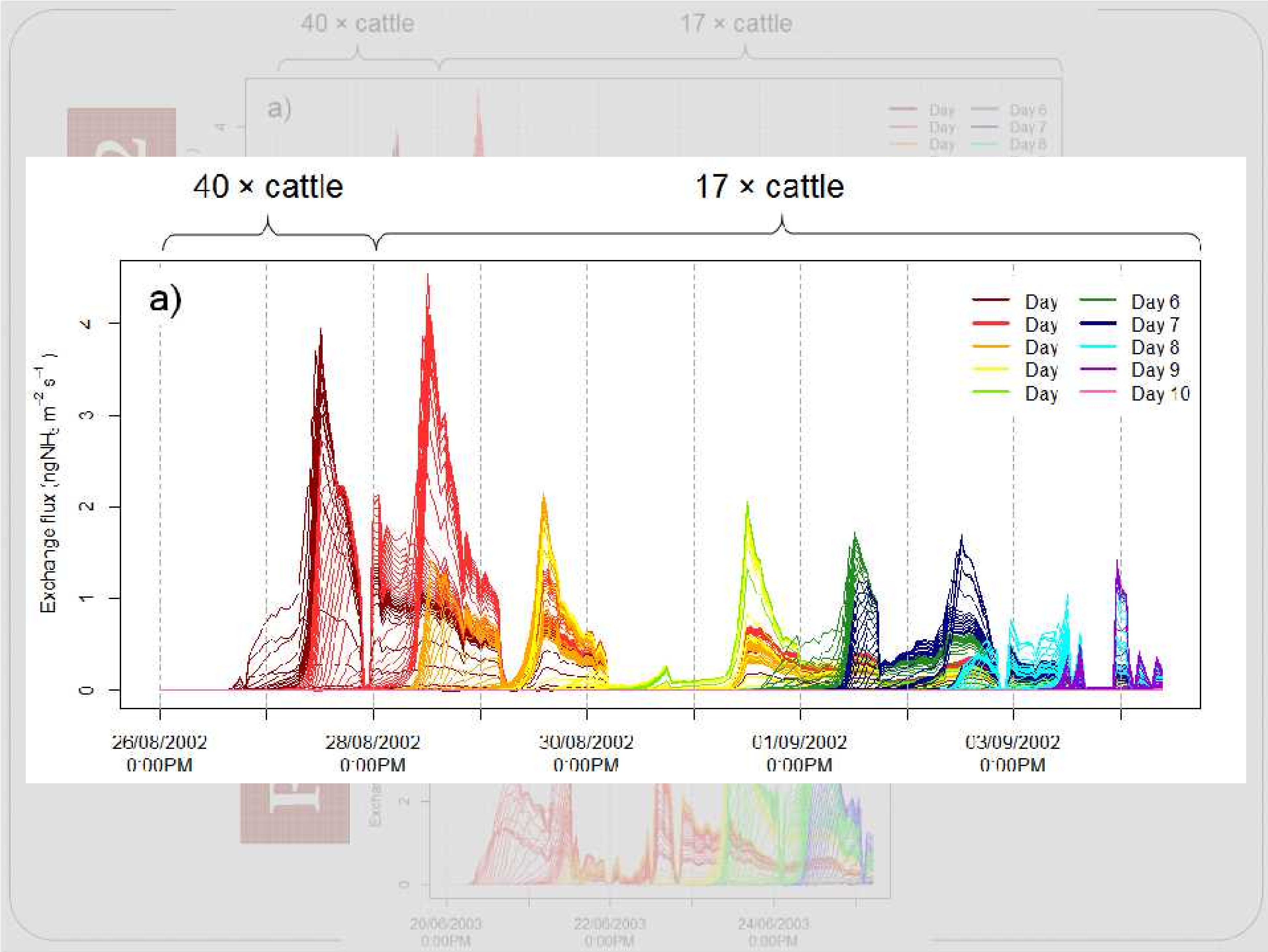
P2003



Patches

Clean area

Total



40 × cattle
17 × cattle
a)
Day
Day
Day
Day
Day
Day 6
Day 7
Day 8
Day 9
Day 10
Exchange flux (ngNH3 m-2 s-1)
0
1
2
3
4
26/08/2002 0:00PM
28/08/2002 0:00PM
30/08/2002 0:00PM
01/09/2002 0:00PM
03/09/2002 0:00PM

Summary

- The modelled fluxes are in a broad agreement with the measurements.
- The temporal evolution of NH_3 flux is dominated by the NH_3 emission from the urine patches, which is substantially reduced by simultaneous NH_3 deposition to the clean area.
- The evolution of NH_3 emission from urine patches deposited in different time steps could be substantially different.

Thank you for listening!