



Centre for
Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL



éclair

Process-based modelling of NH_3 exchange over a grazed field

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Melbourne, Australia

Exchange of ammonia

Air
concentration
of NH_3

χ_a



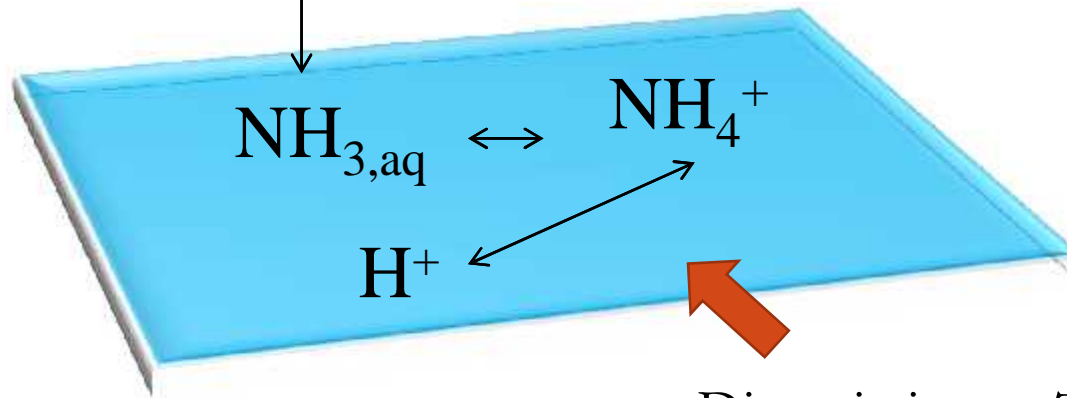
Compensation
point

χ_c

$\text{NH}_{3,g}$



Dissolution \sim Temperature (T)



$\text{NH}_{3,\text{aq}}$

\leftrightarrow

NH_4^+

H^+

\leftarrow



Dissociation \sim T

$$t_c = f(T) \cdot \frac{c(\text{NH}_4^+)}{c(\text{H}^+)}$$

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

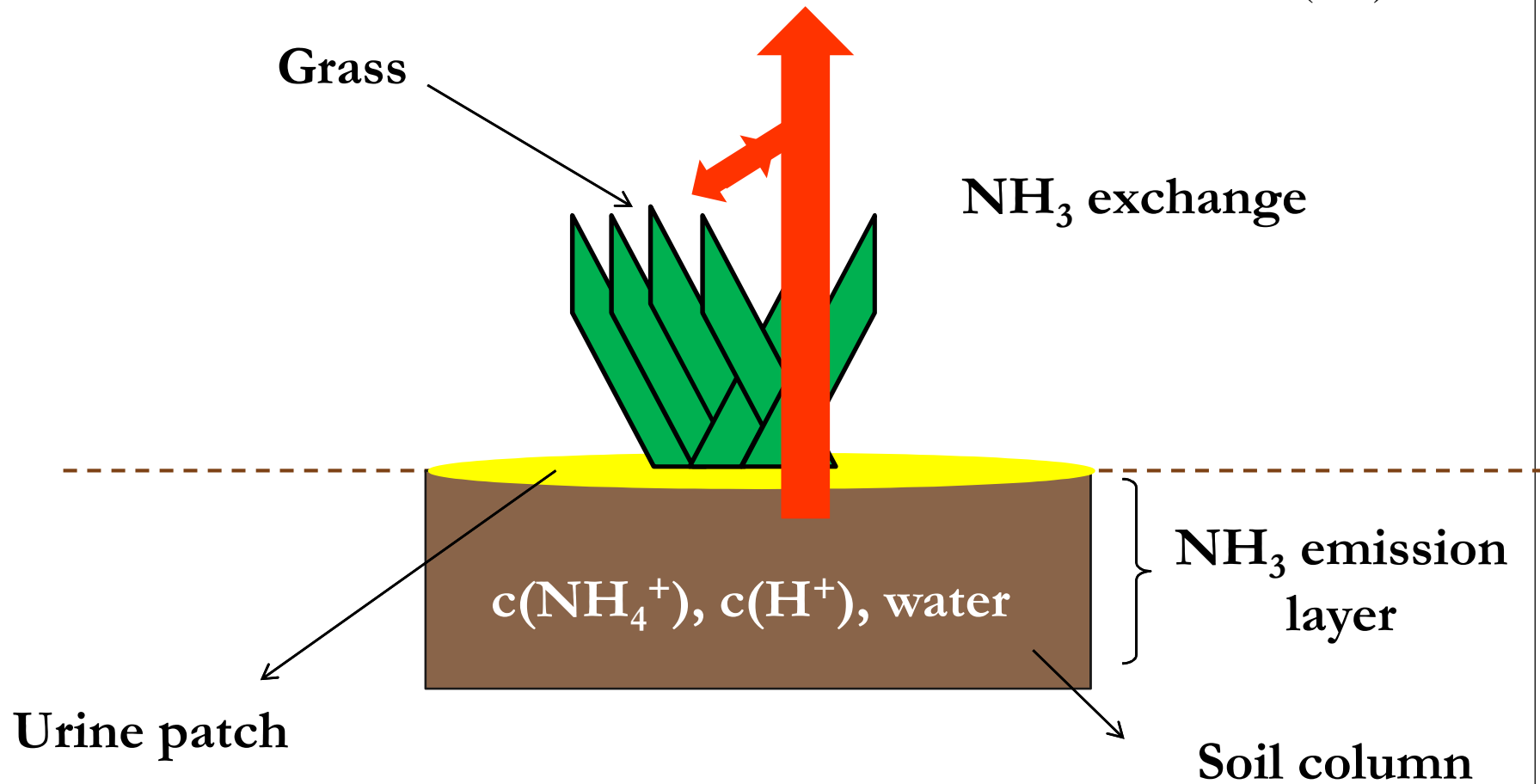
Extension and application of this model for the scale of a grazed grassland.

The GAG model - schematic

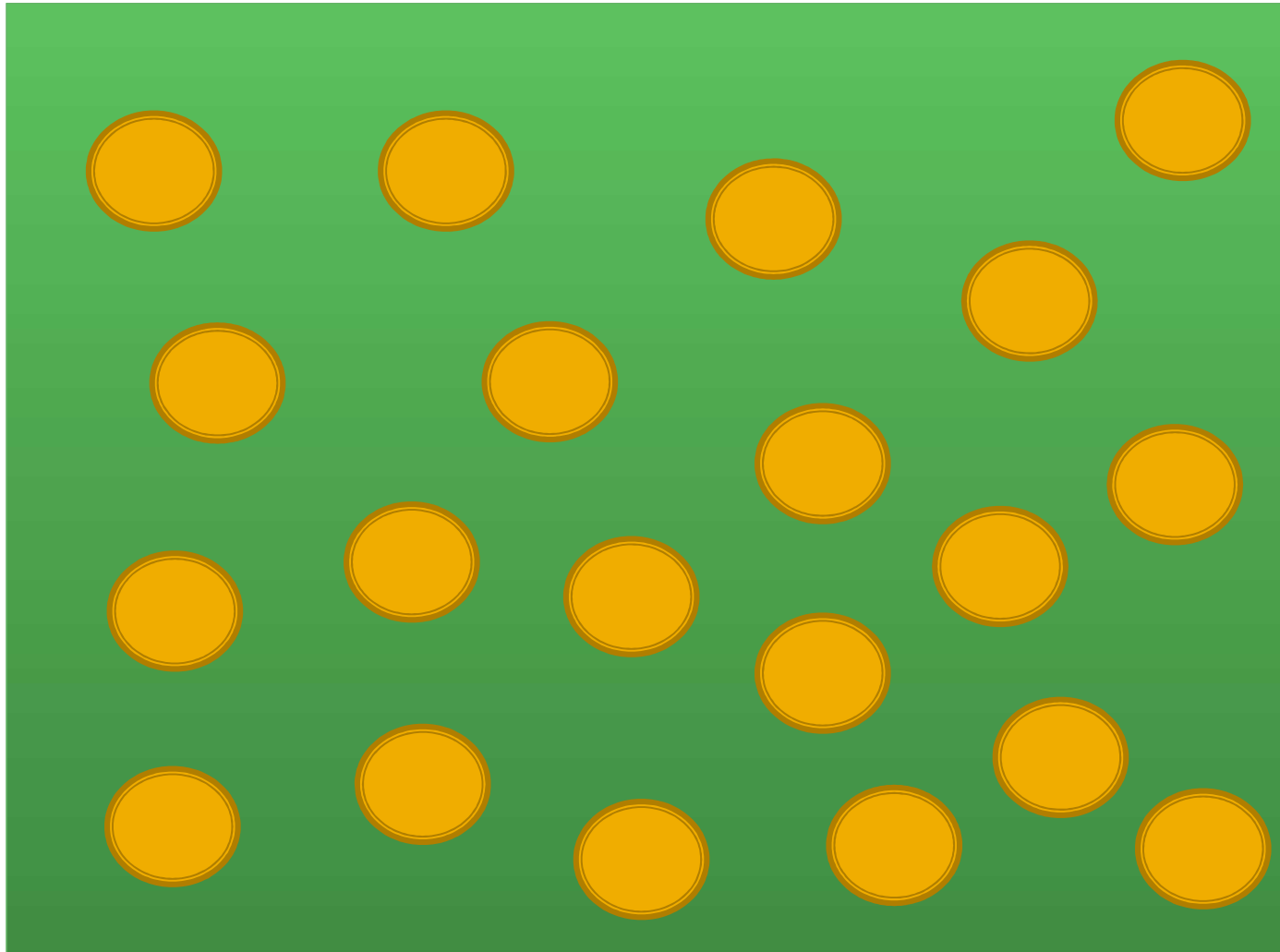


The GAG model - schematic

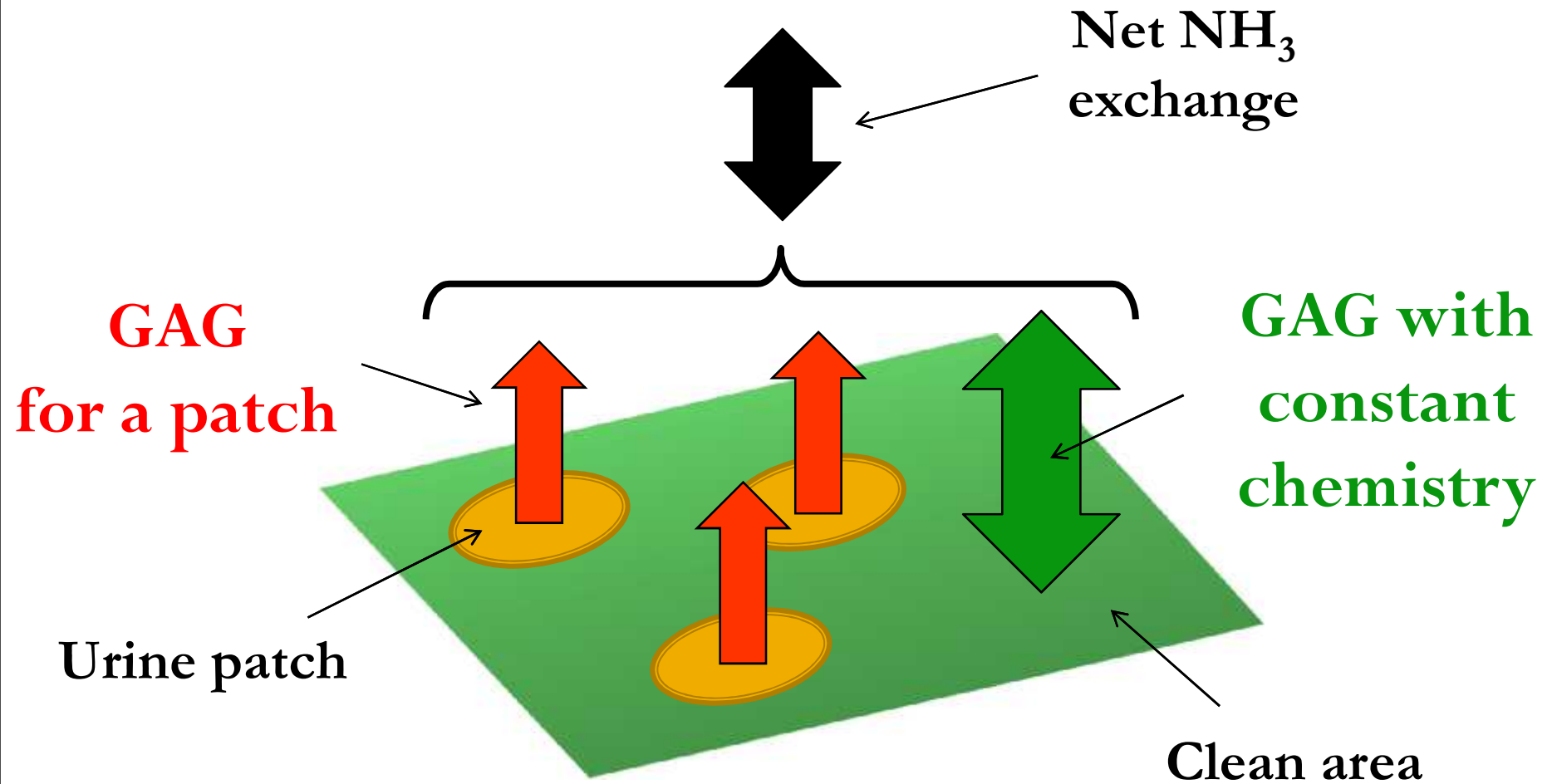
$$t_c = f(T) \cdot \frac{c(NH_4^+)}{c(H^+)}$$



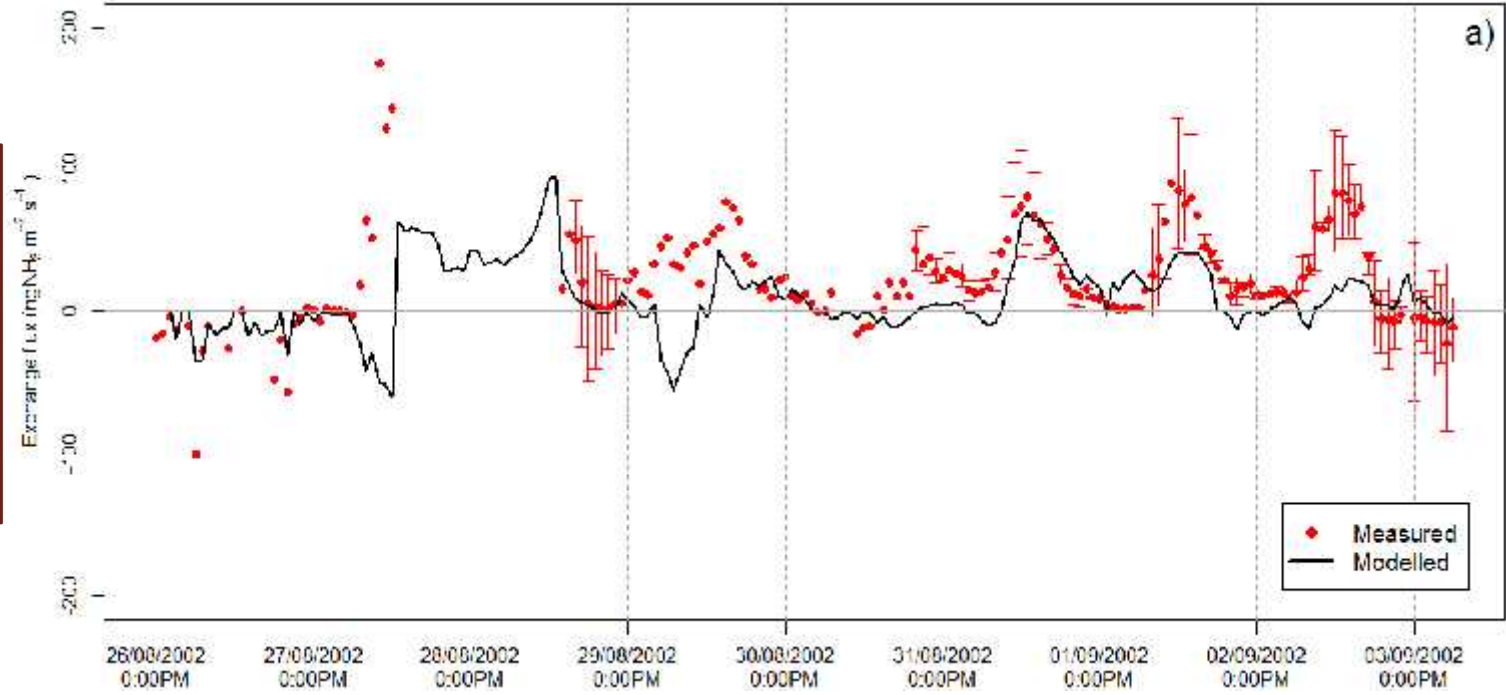
What's happening on the field?



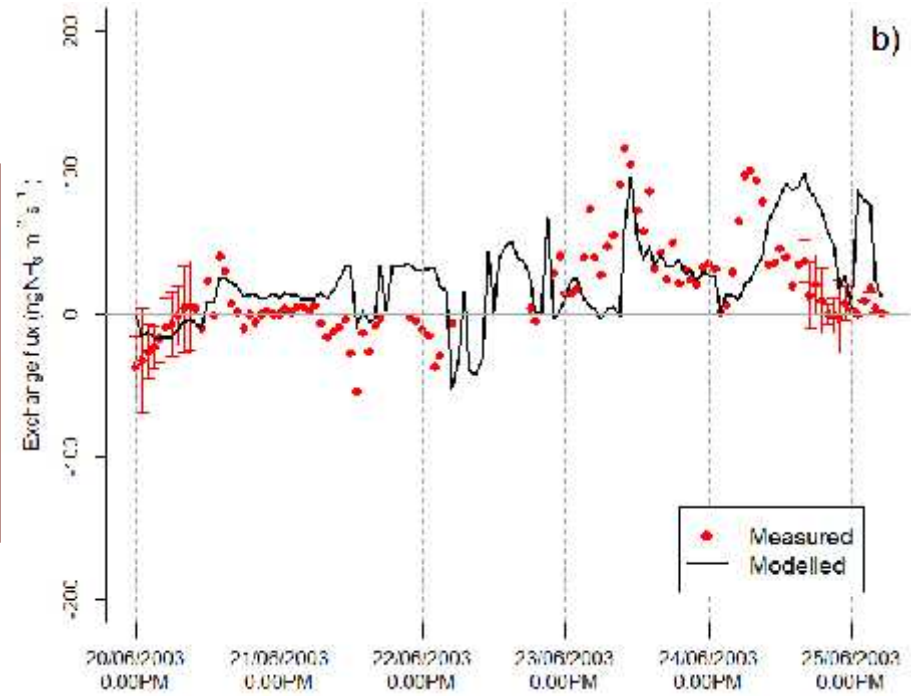
Model schematic for a grazed field



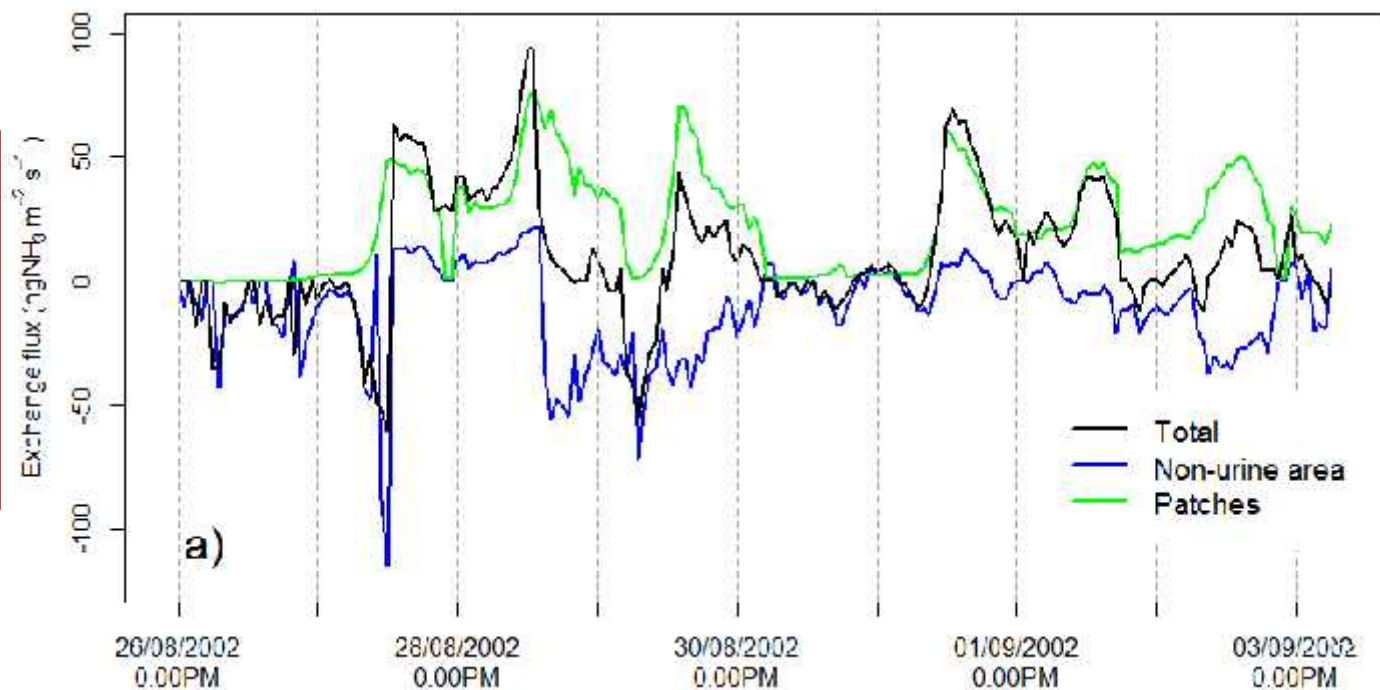
P2002



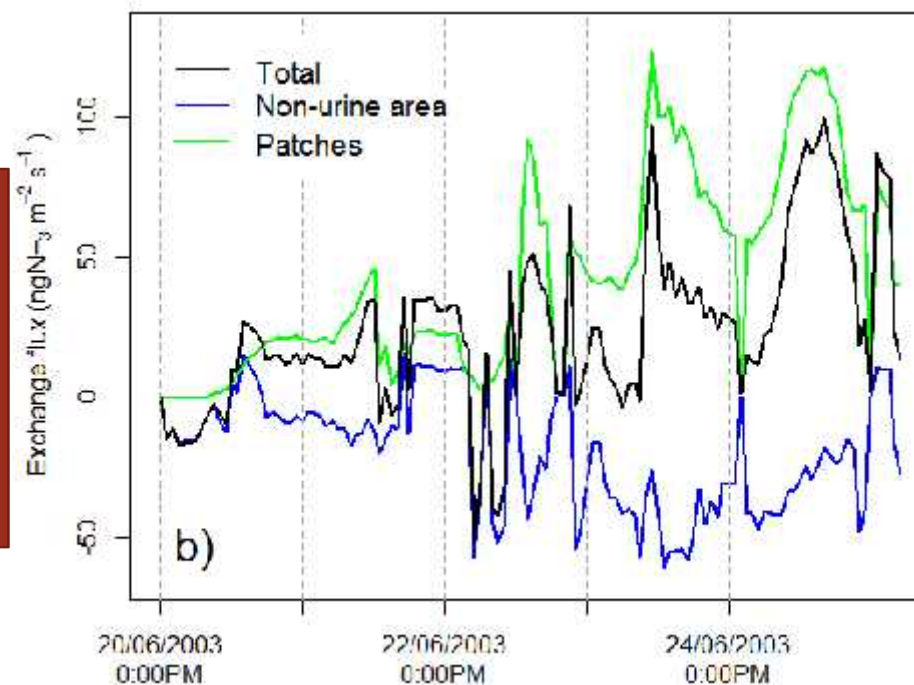
P2003



P2002



P2003



Patches
Clean area
Total

40 × cattle

17 × cattle

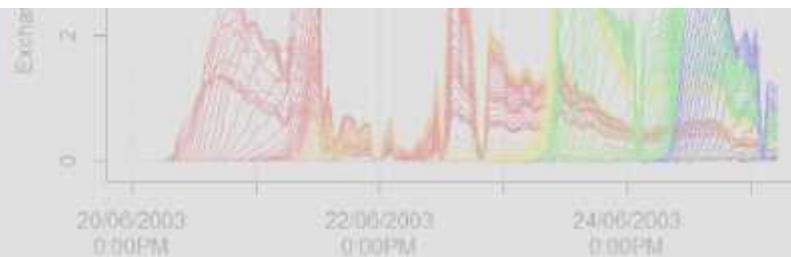
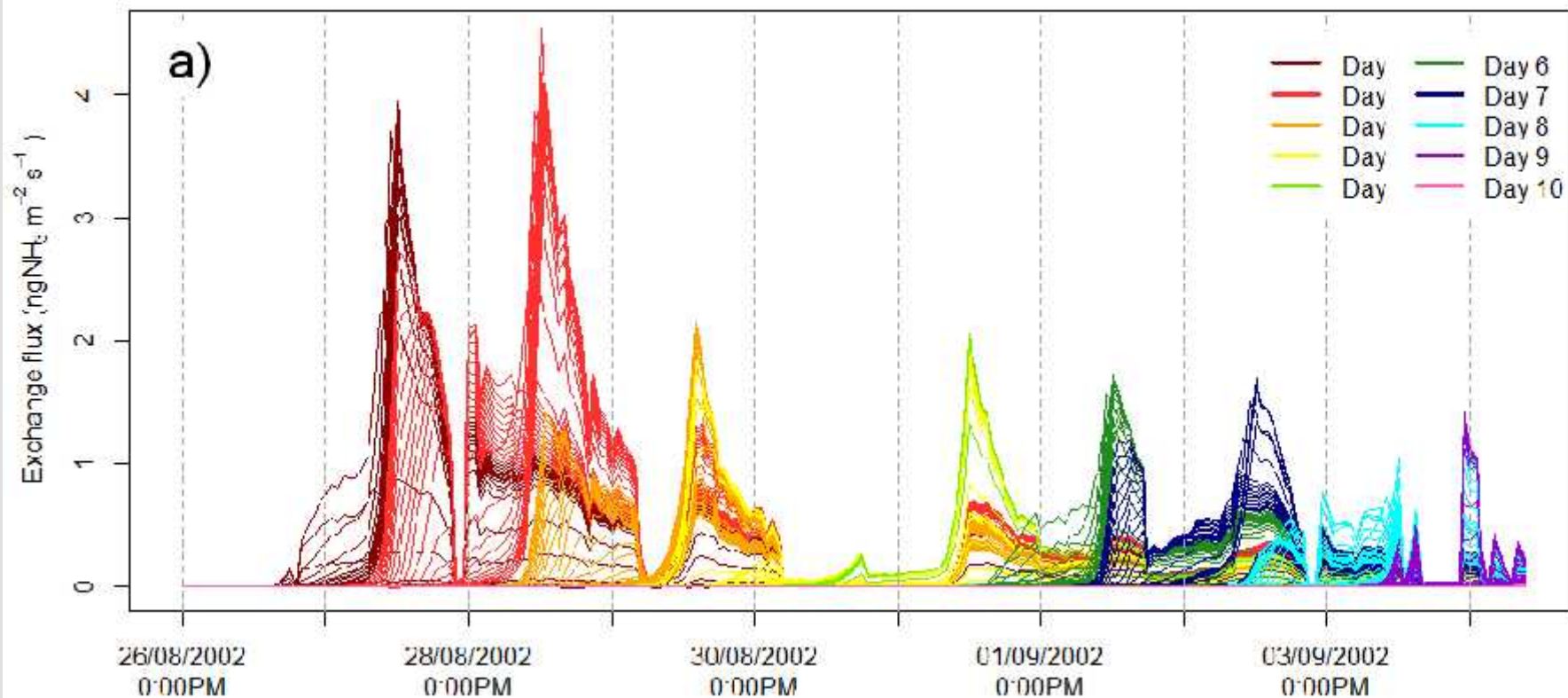
a)

Day Day 6
Day Day 7
Day Day 8

40 × cattle

17 × cattle

a)



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!

