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DYNAMIC (AUTOMATED) CHAMBERS

JAIME RECIO HUETOS
ALBERTO SANZ-COBEÑA

Automatic chambers design

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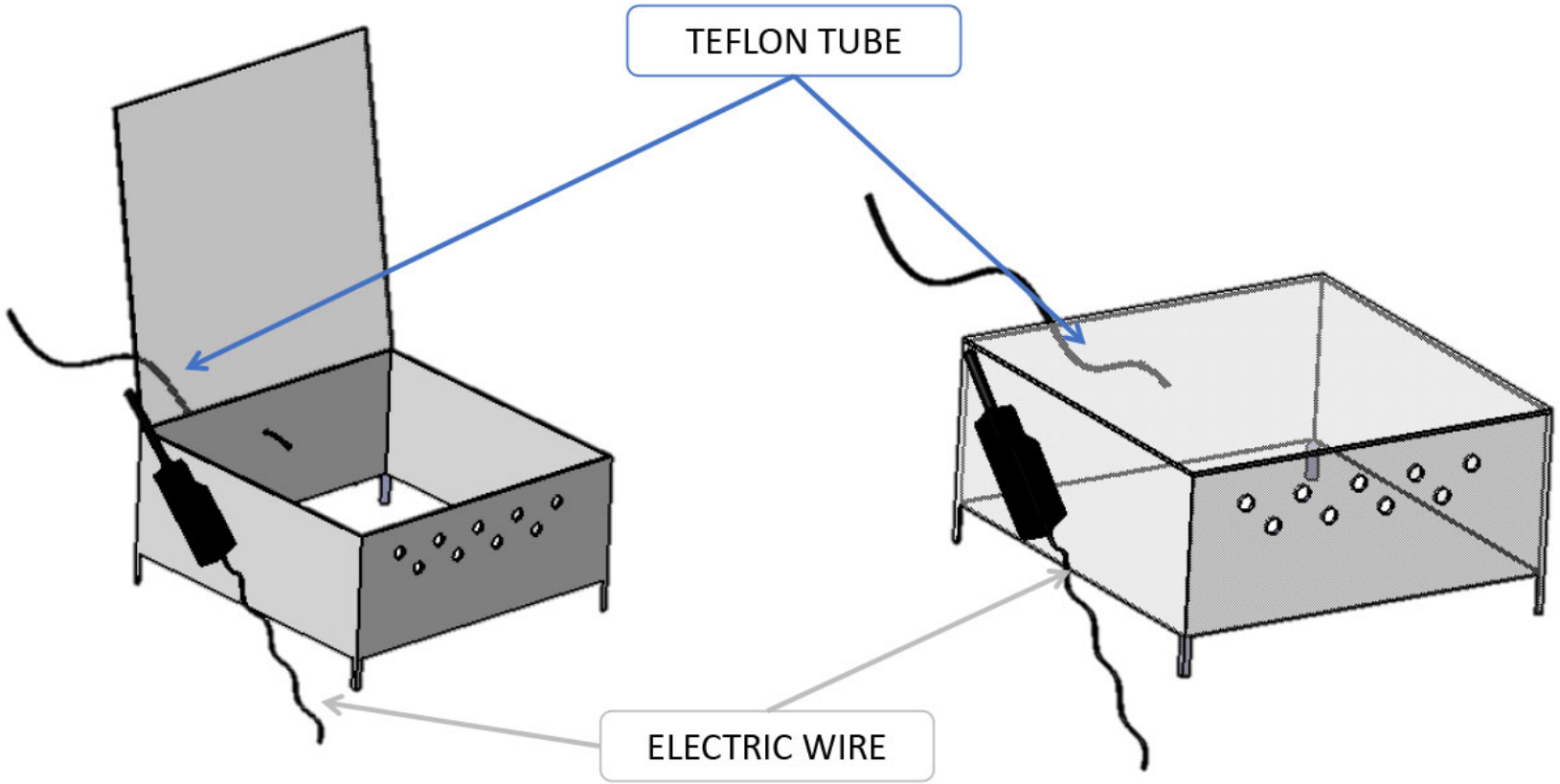

OPEN → **Chamber is not measuring**

CLOSED → **Chamber is measuring**

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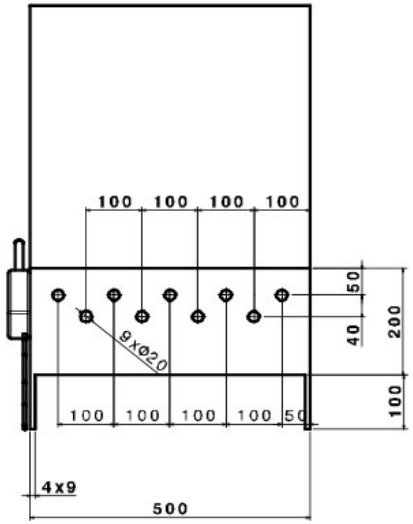
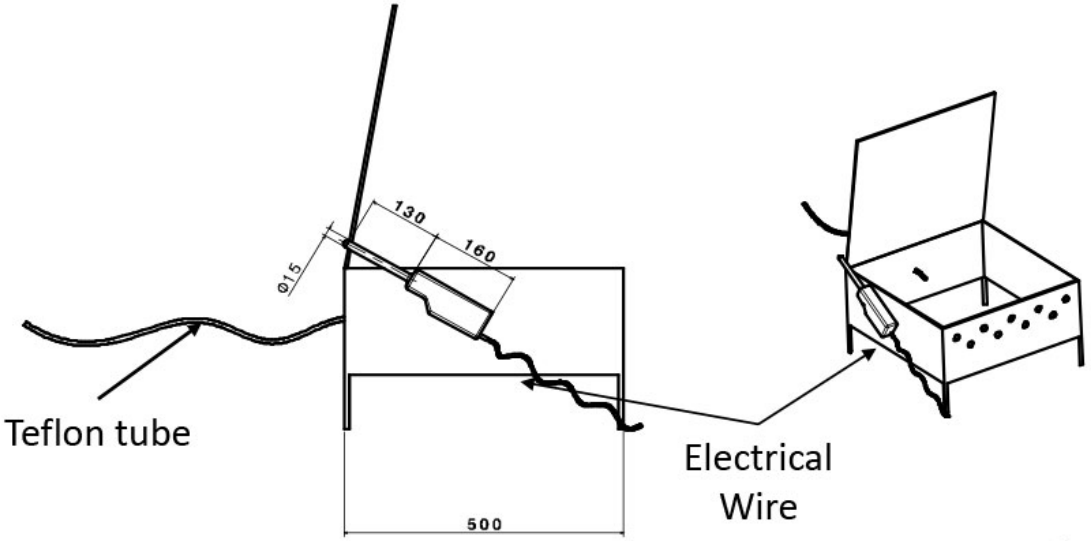
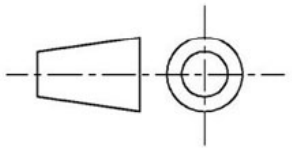
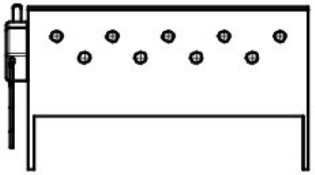
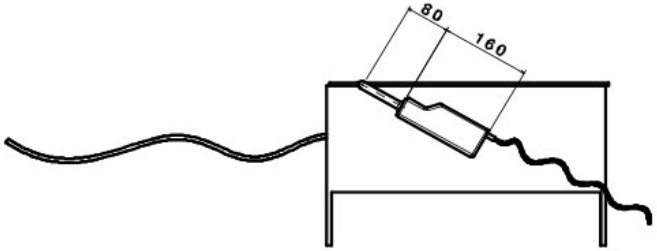
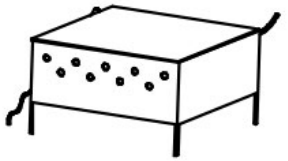

100 100 100 100
50
40
200
9xØ20
100 100 100 100 50
100
4x9
500


Ø15
130
160
Teflon tube
500
Electrical
Wire

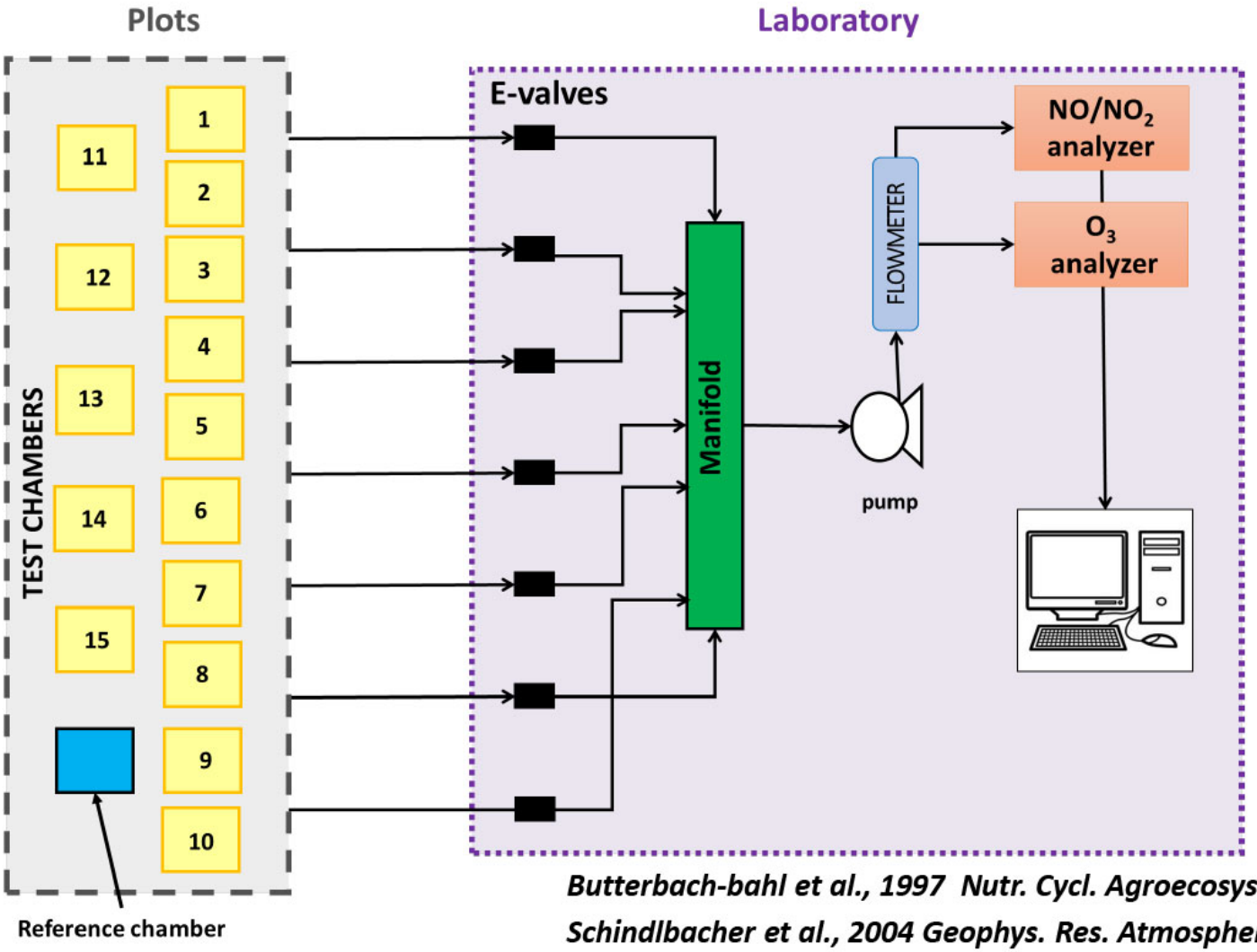





80
160



Automated measuring system design



Butterbach-bahl et al., 1997 Nutr. Cycl. Agroecosystems

Schindlbacher et al., 2004 Geophys. Res. Atmospheres

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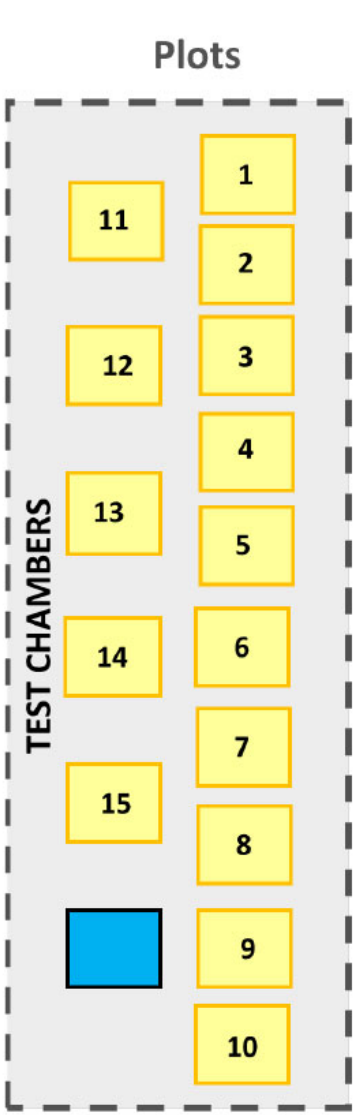
Plots
TEST CHAMBERS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

Plots



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Laboratory

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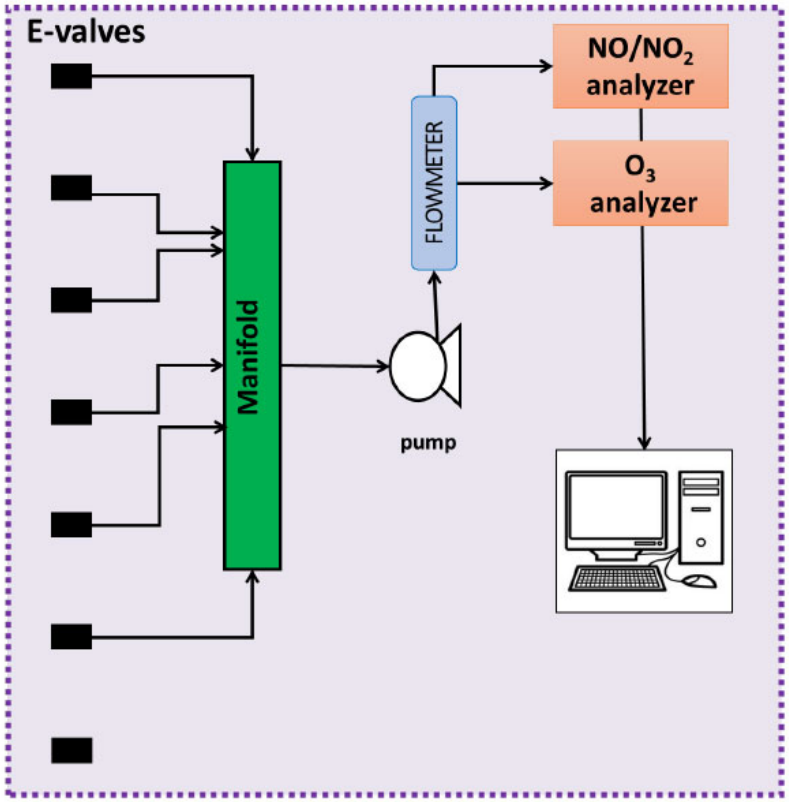
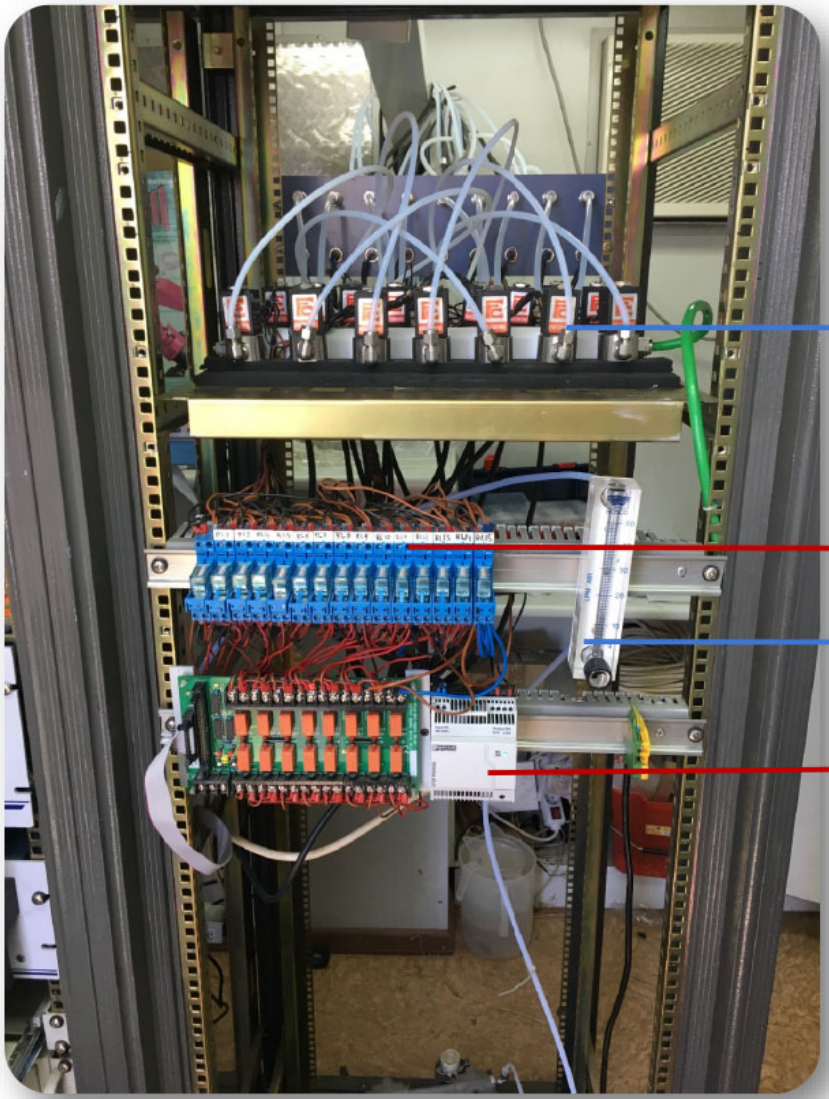

E-valves
Manifold
FLOWMETER
pump
NO/NO2 analyzer
O3 analyzer


Environnement S.A
AC 31M



ELECTRO VALVES

MAGNETIC RELAYS

FLOW METER

MOTHERBOARD

PUMP

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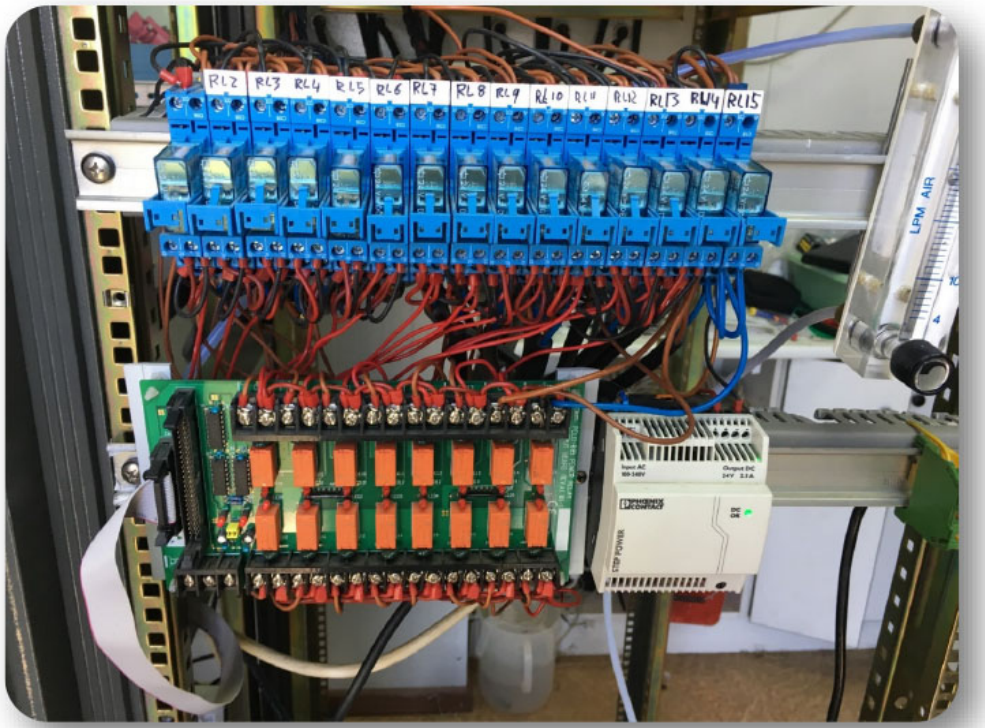

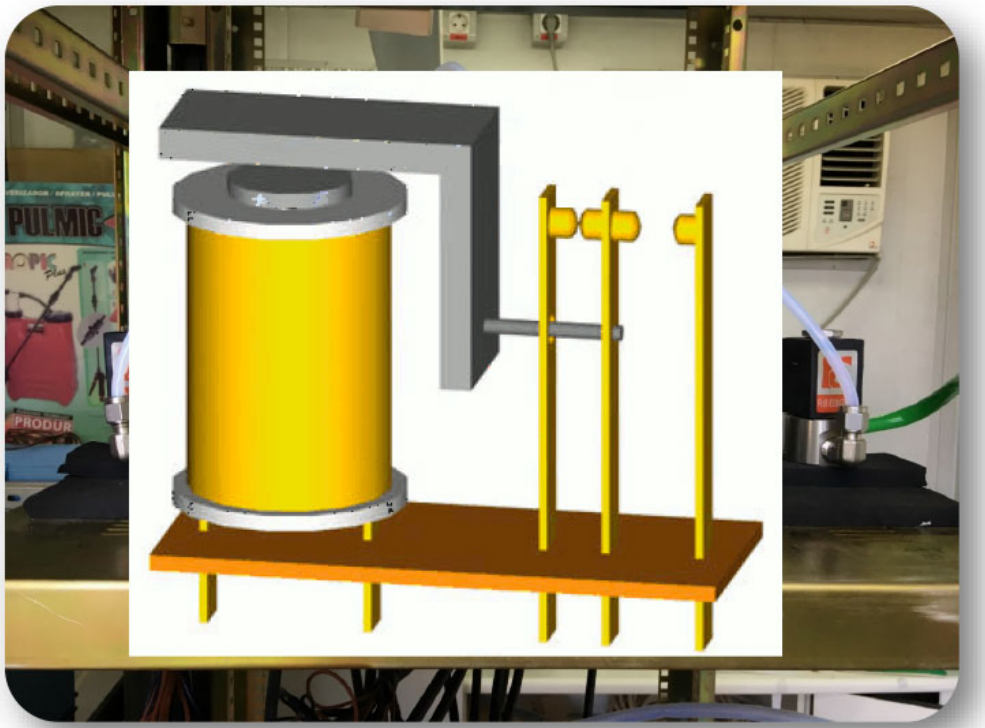

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What do we want to measure?

NO+ NO_2 emissions

↓

NOx Analyzer

↓

Chemiluminiscence detector

$$NO + O_3 \rightarrow NO_2 + O_2 + h_v$$

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How can we calculate NOx fluxes?

Steady-state

Dynamic equilibrium between the concentration of the air entering and leaving the headspace of the chamber

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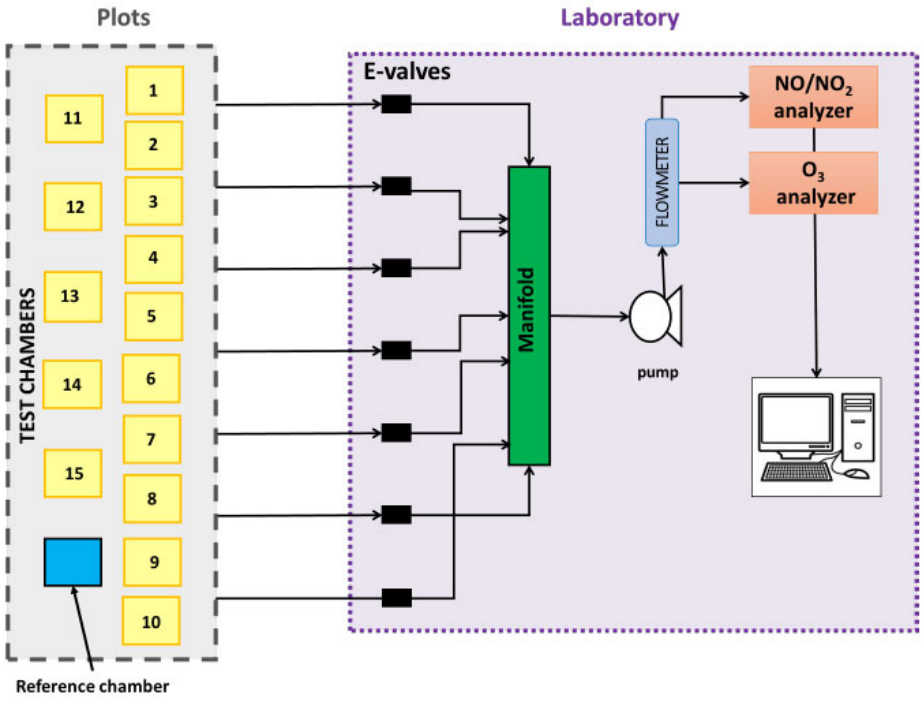
How can we calculate NOx fluxes?

$$F = \left(C_{ch} - C_o\right) \cdot \frac{M \cdot Q \cdot 10^6}{V_m \cdot A \cdot 10^9} \cdot 60$$

Schindlbacher et al., 2004. Geophys. Res. Atmospheres



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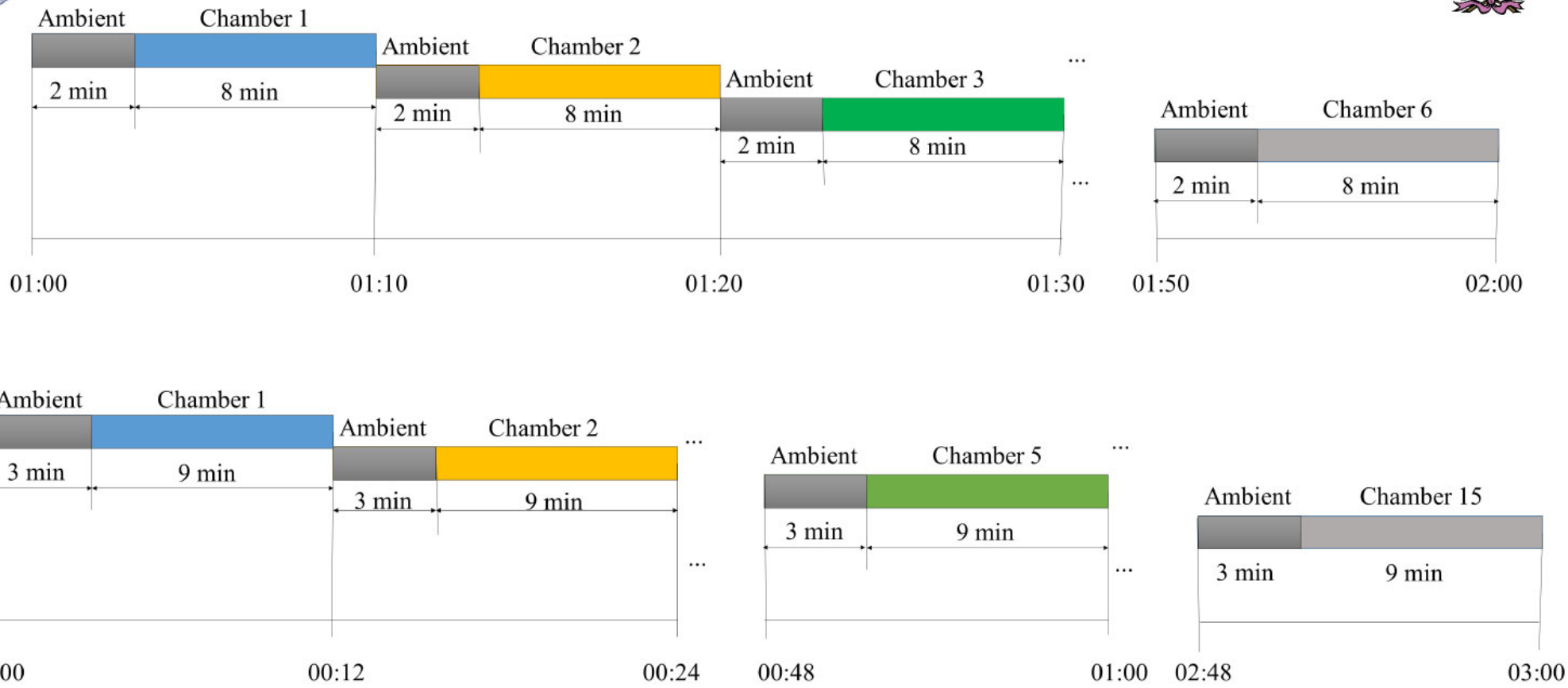
When the steady-state is reached?



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Once everything is ready….what do we do?

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DATA ANALYSIS

Programming code

To discard the values previous to the steady-state

To obtain the steady-state value per chamber and per cycle.

To find out missing values, both ambient and plot chambers.

To relate the mean value of the last 2 minutes of the plot chambers, with the mean value of the reference chamber measured before each chamber

To calculate the net value of concentrations, subtracting the value of the chamber to the average of the reference chamber (ambient).

To calculate the flux for each concentration ($\mu g\ m^{-2}\ h^{-1}$)

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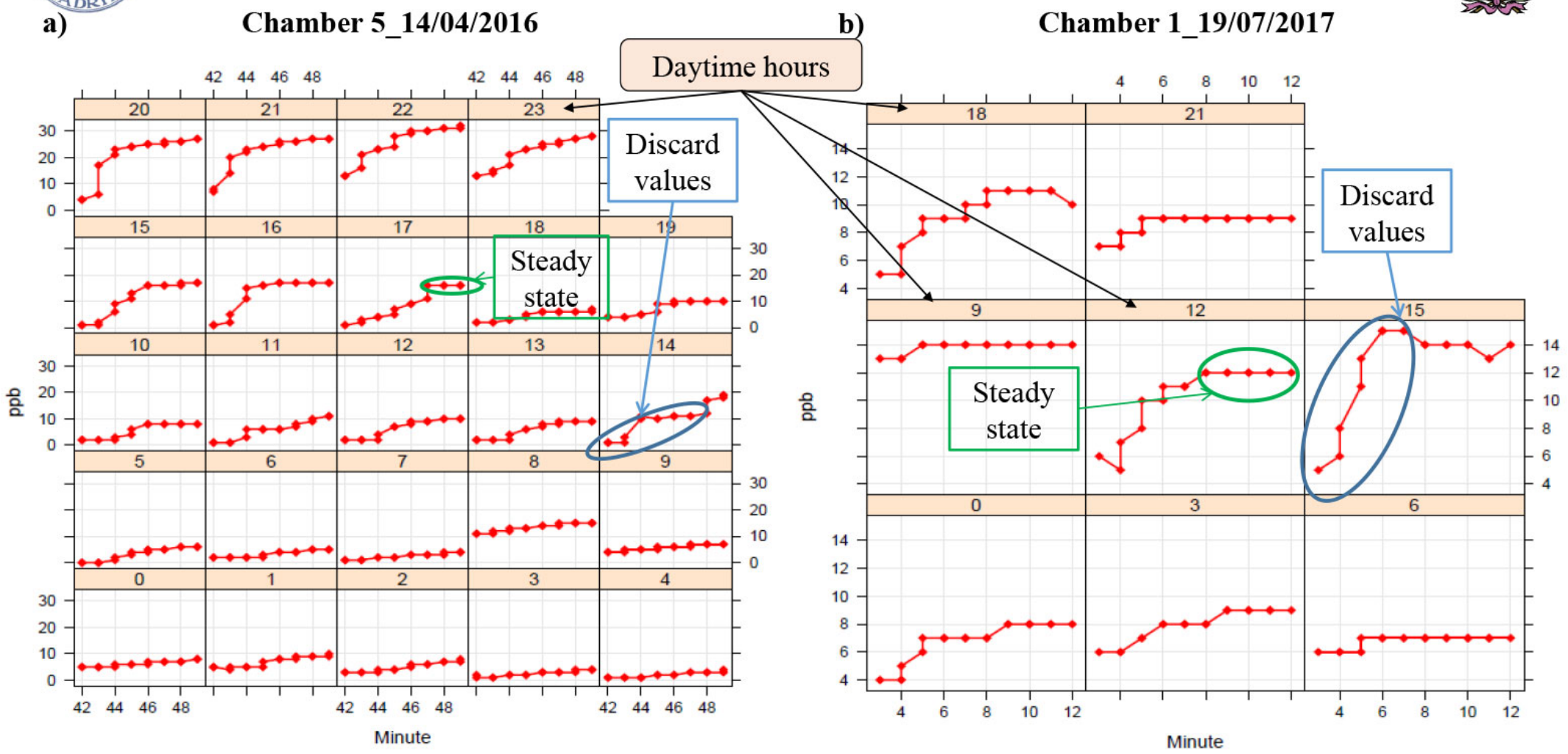
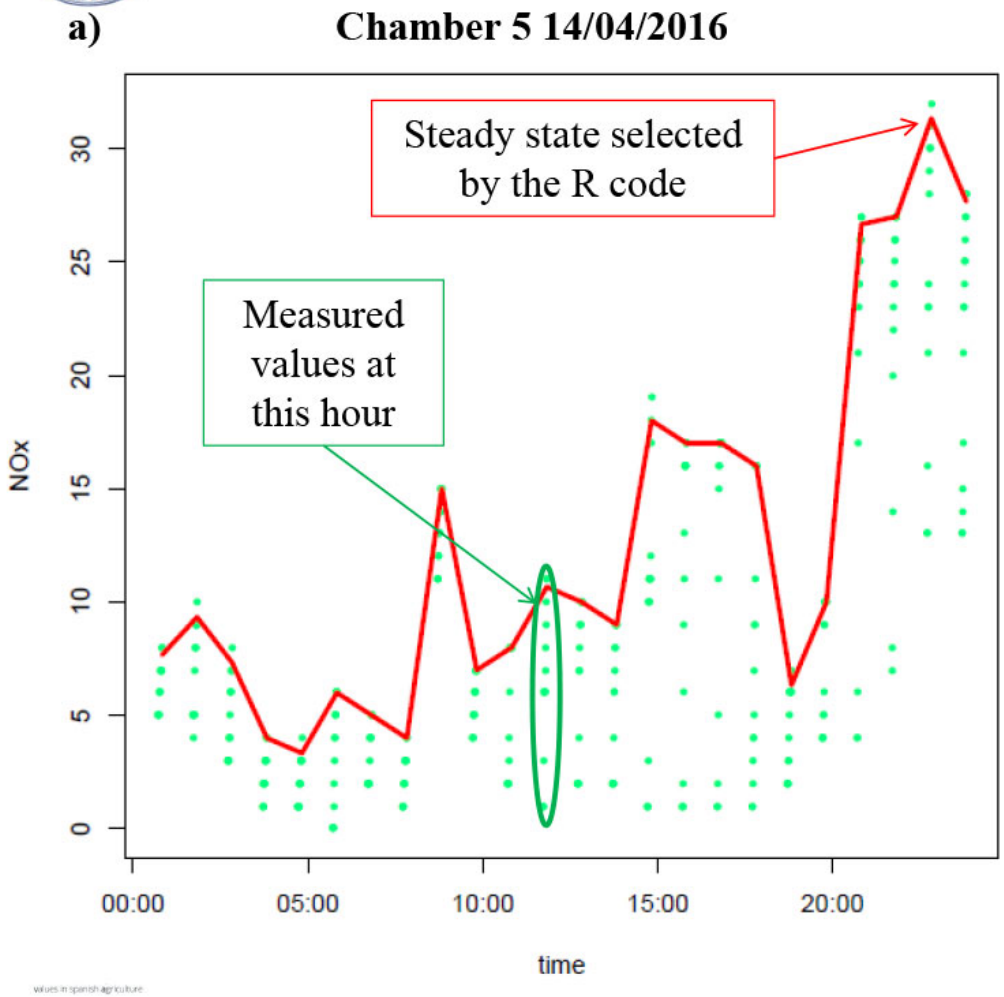
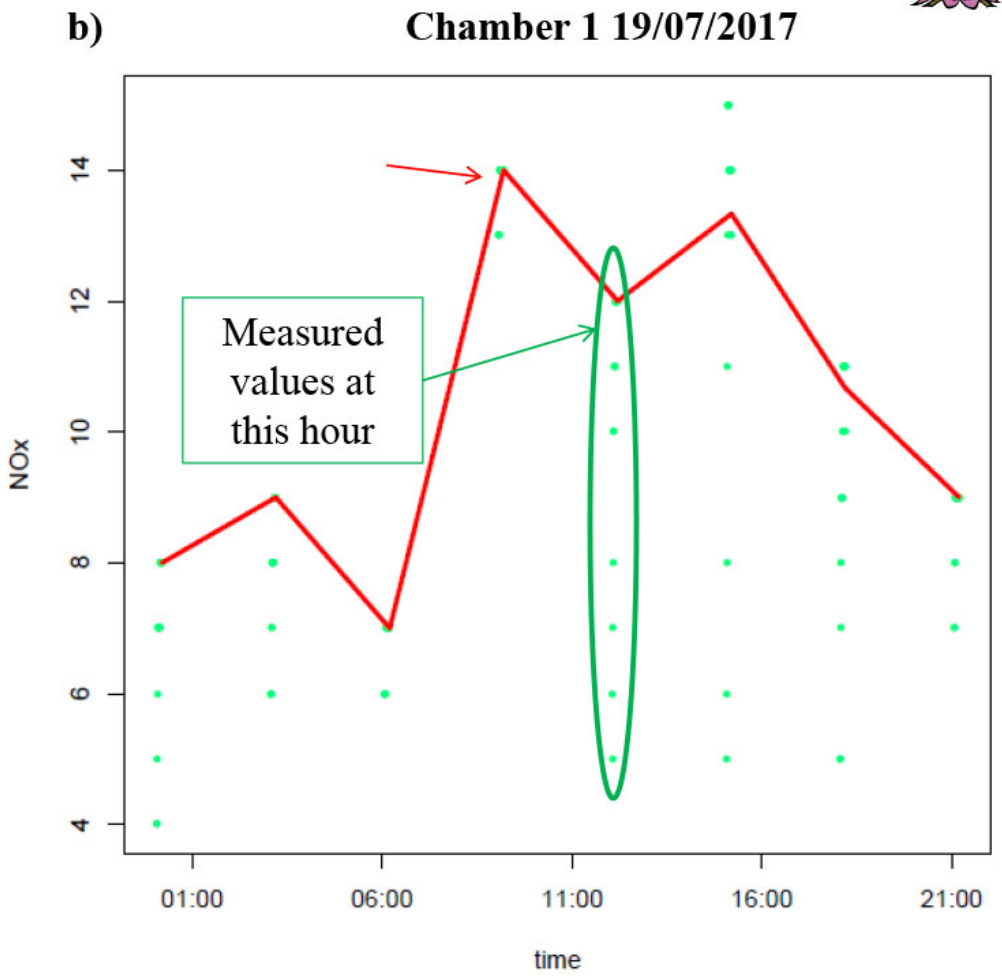
Programming code

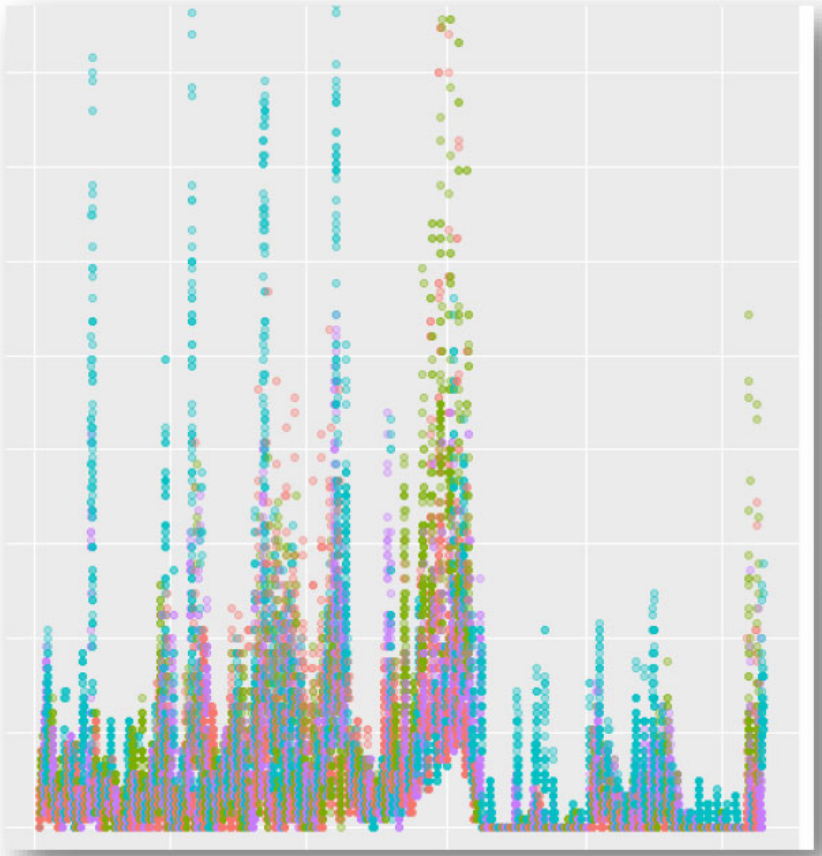


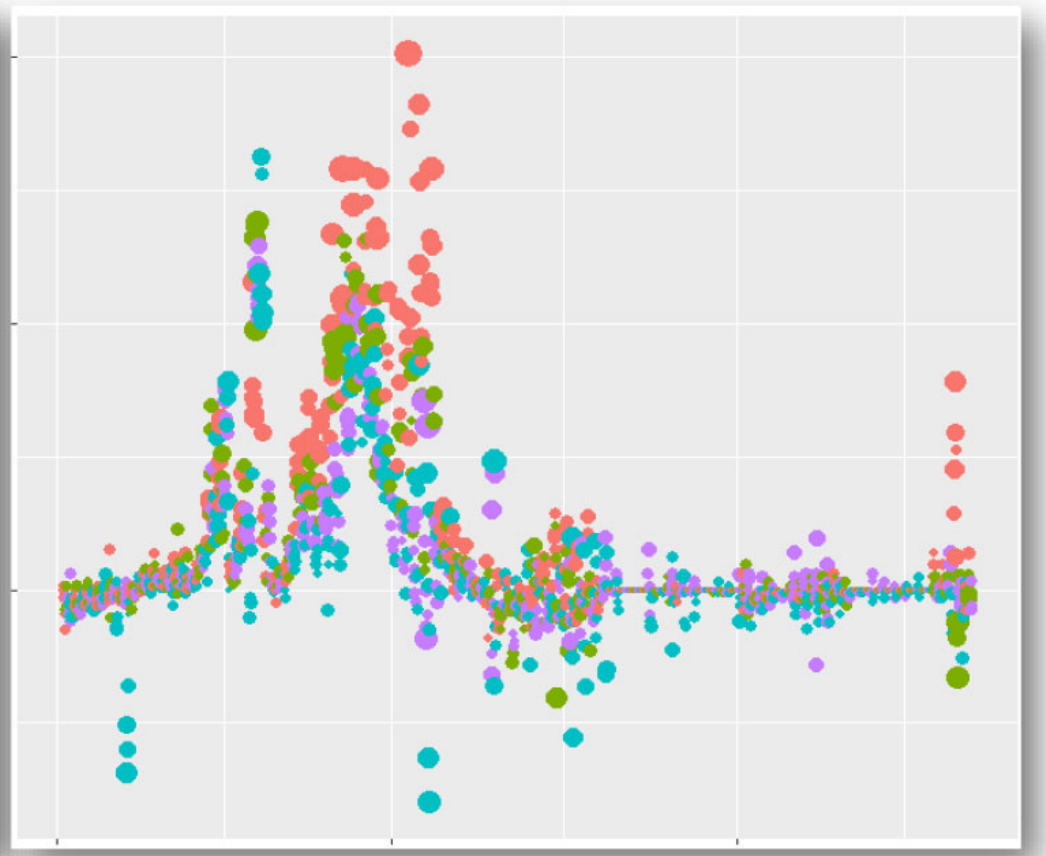
Programming code





Finally…





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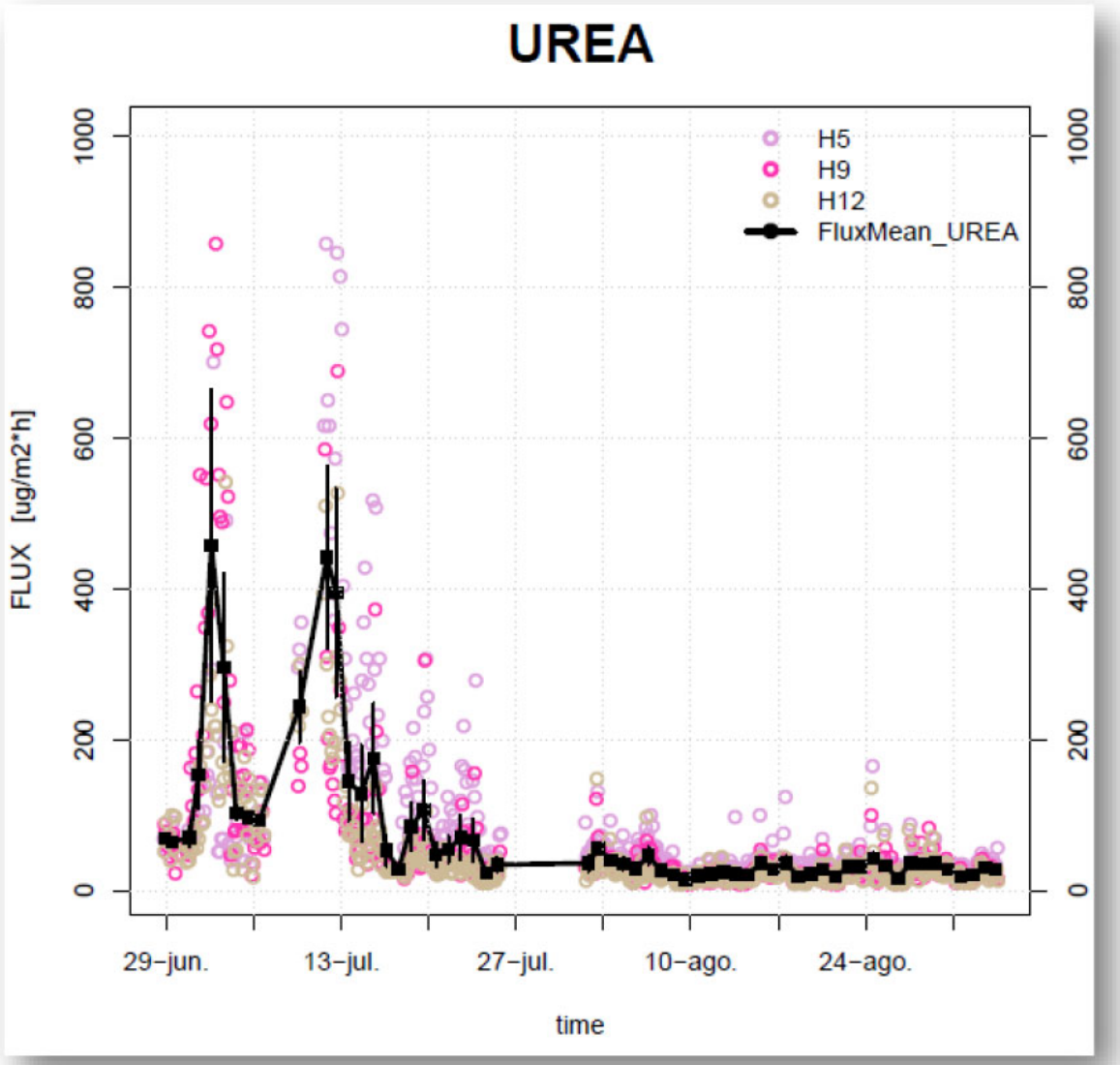
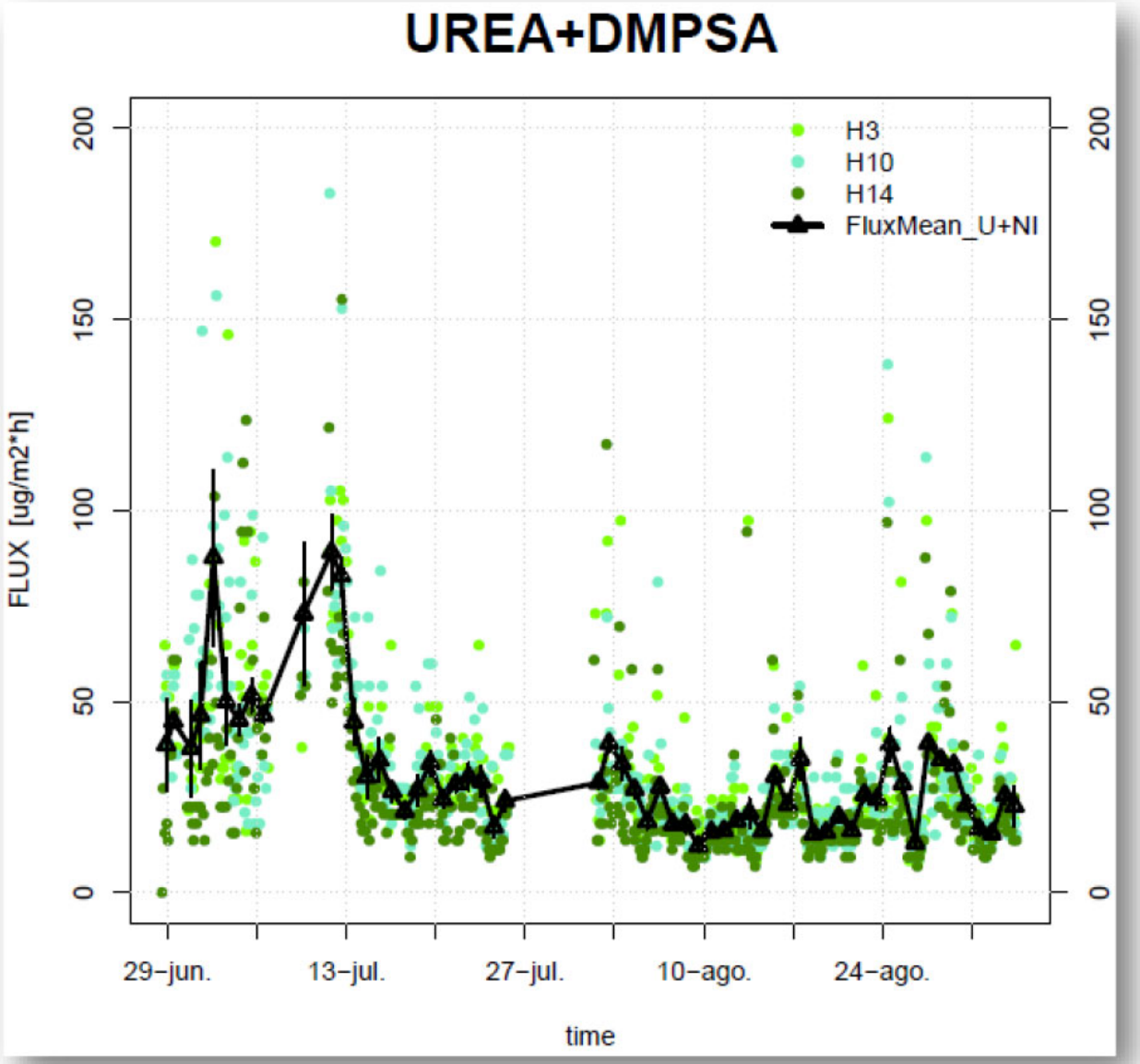
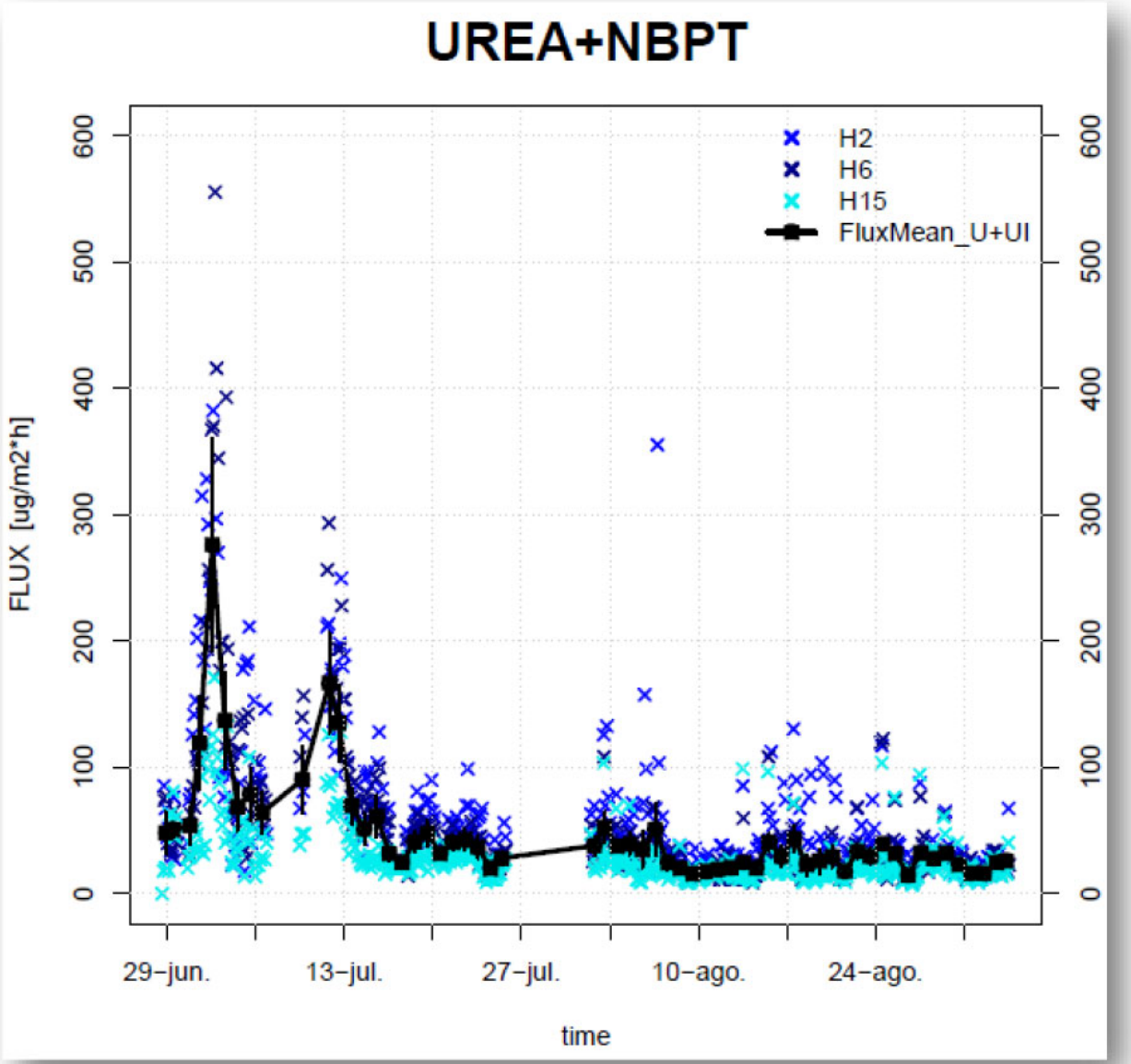
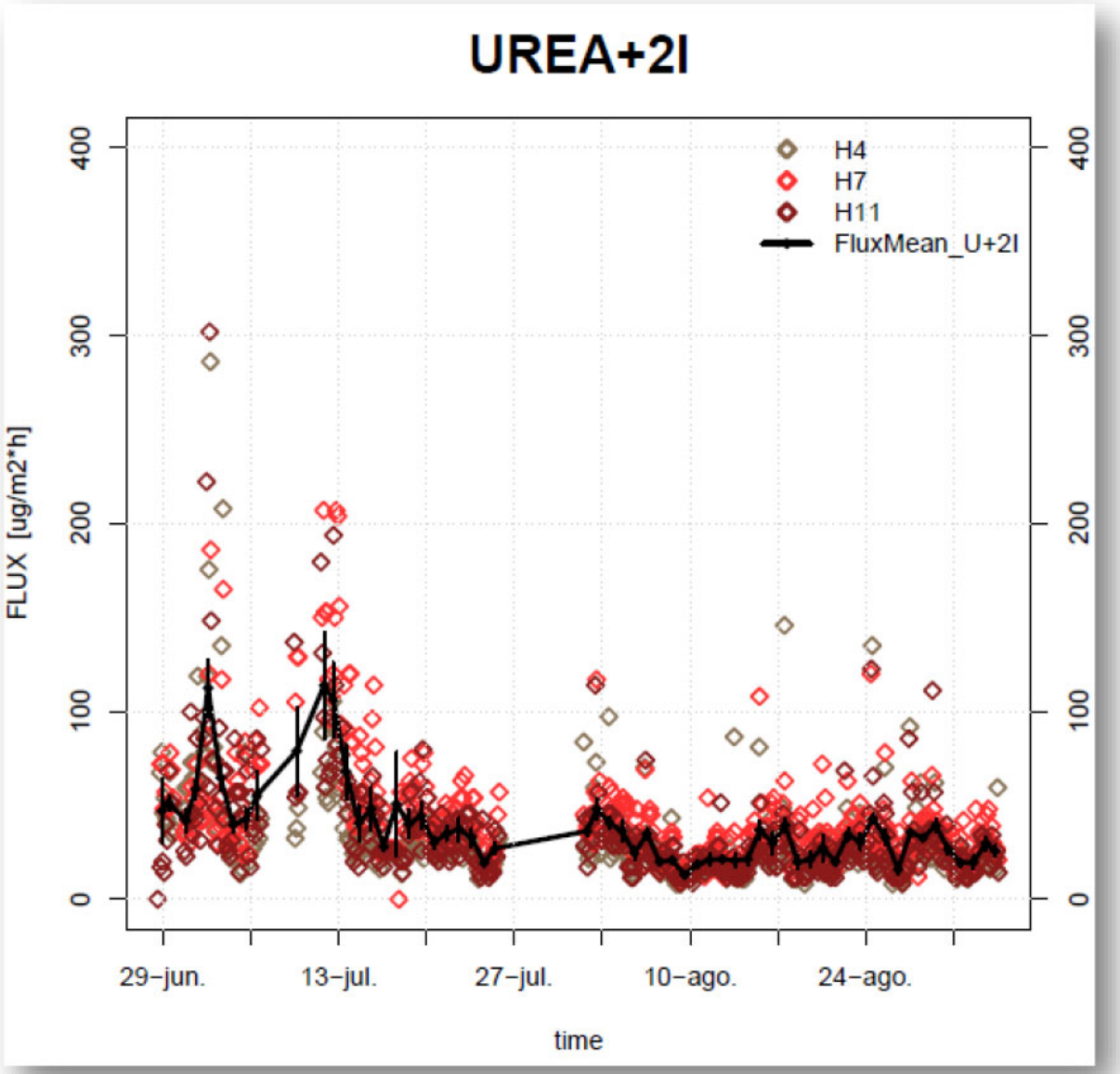
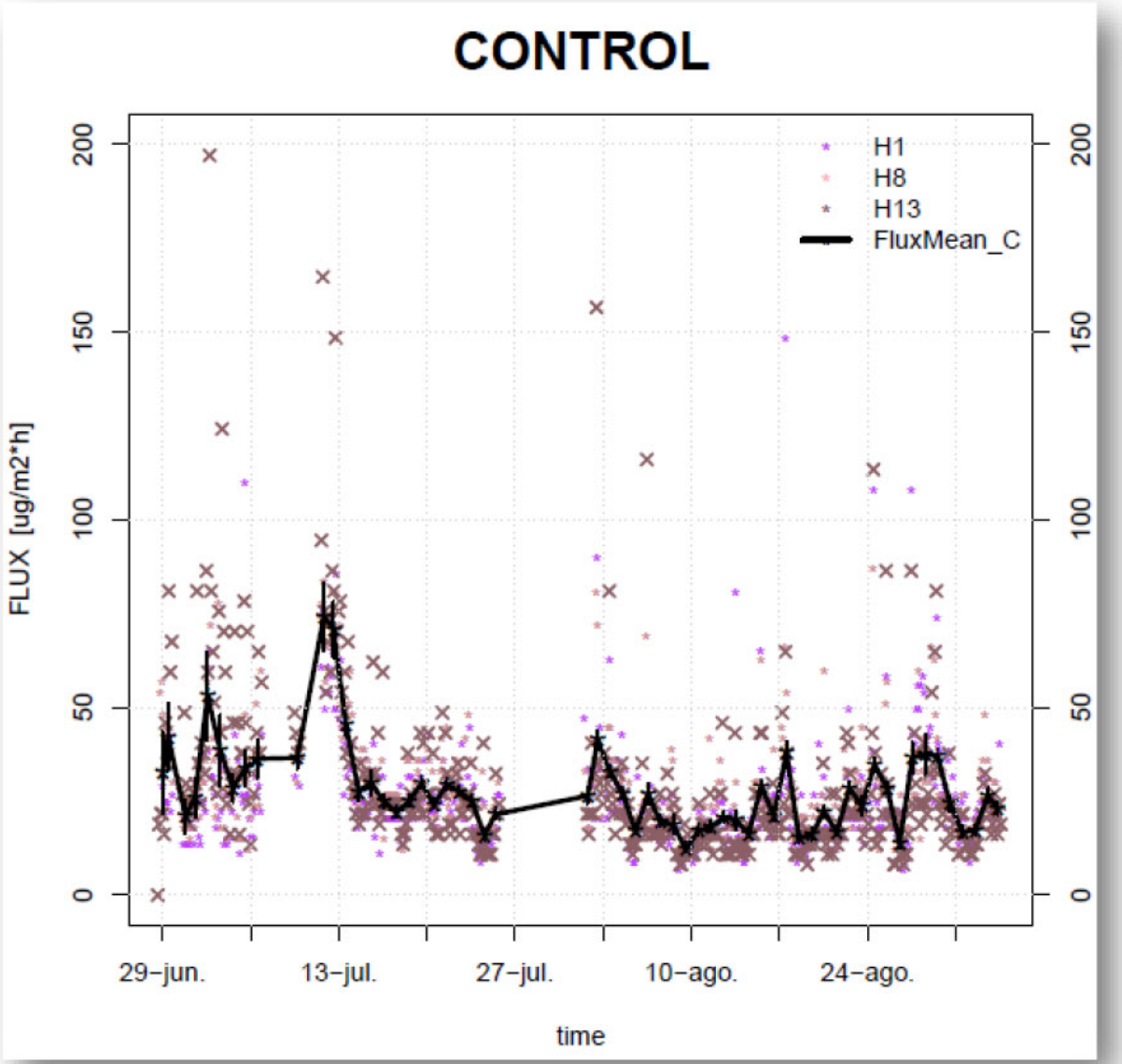

UREA
H5
H9
H12
FluxMean_UREA
FLUX [ug/m2*h]
0
200
400
600
800
1000
29−jun.
13−jul.
27−jul.
10−ago.
24−ago.
time


UREA+DMPSA
H3
H10
H14
FluxMean_U+NI
FLUX [ug/m2*h]
0
50
100
150
200
29−jun.
13−jul.
27−jul.
10−ago.
24−ago.
time


UREA+NBPT
H2
H6
H15
FluxMean_U+UI
FLUX [ug/m2*h]
0
100
200
300
400
500
600
29−jun.
13−jul.
27−jul.
10−ago.
24−ago.
time


UREA+2I
H4
H7
H11
FluxMean_U+2I
FLUX [ug/m2*h]
0
100
200
300
400
29−jun.
13−jul.
27−jul.
10−ago.
24−ago.
time


CONTROL
H1
H8
H13
FluxMean_C
FLUX [ug/m2*h]
0
50
100
150
200
29−jun.
13−jul.
27−jul.
10−ago.
24−ago.
time

For more information...

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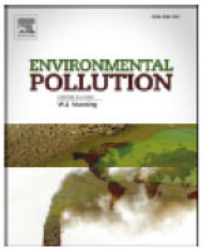

Nitrification inhibitor DMPSA mitigated N2O emission and promoted NO sink in rainfed wheat☆

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THANK YOU

ANY QUESTIONS???