



The 75th EAAP Annual Meeting
4th September 2024
Florence, Italy



UNIVERSITAT
POLITÈCNICA
DE VALÈNCIA

Towards automated monitoring of ammonia emissions from naturally ventilated pig houses

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MINISTERIO
DE CIENCIA
E INNOVACIÓN



Financiado por
la Unión Europea
NextGenerationEU



Plan de Recuperación,
Transformación y
Resiliencia



AGENCIA
ESTATAL DE
INVESTIGACIÓN

Introduction

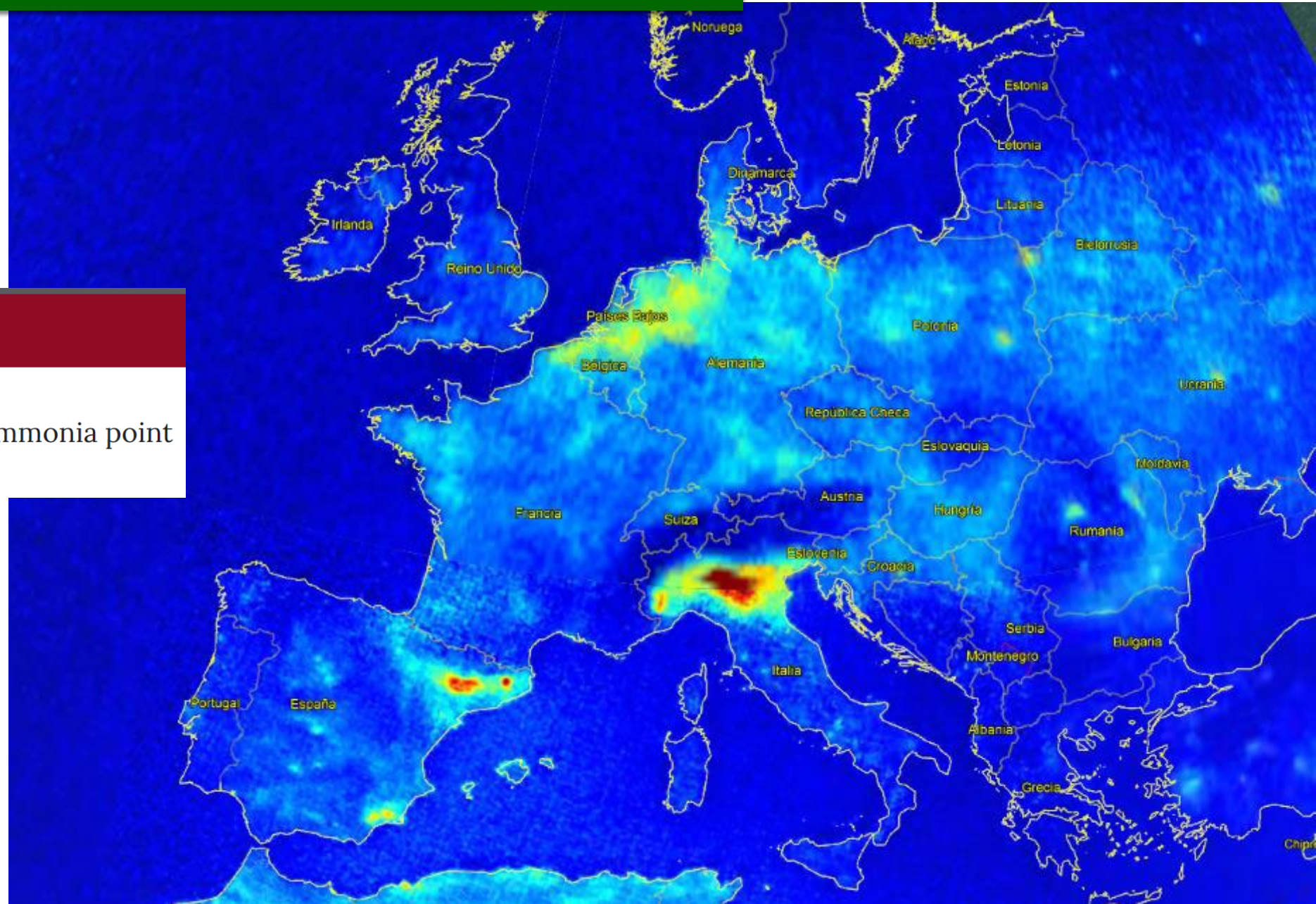
This is a global pollution problem

MENU ▾

nature
International journal of science

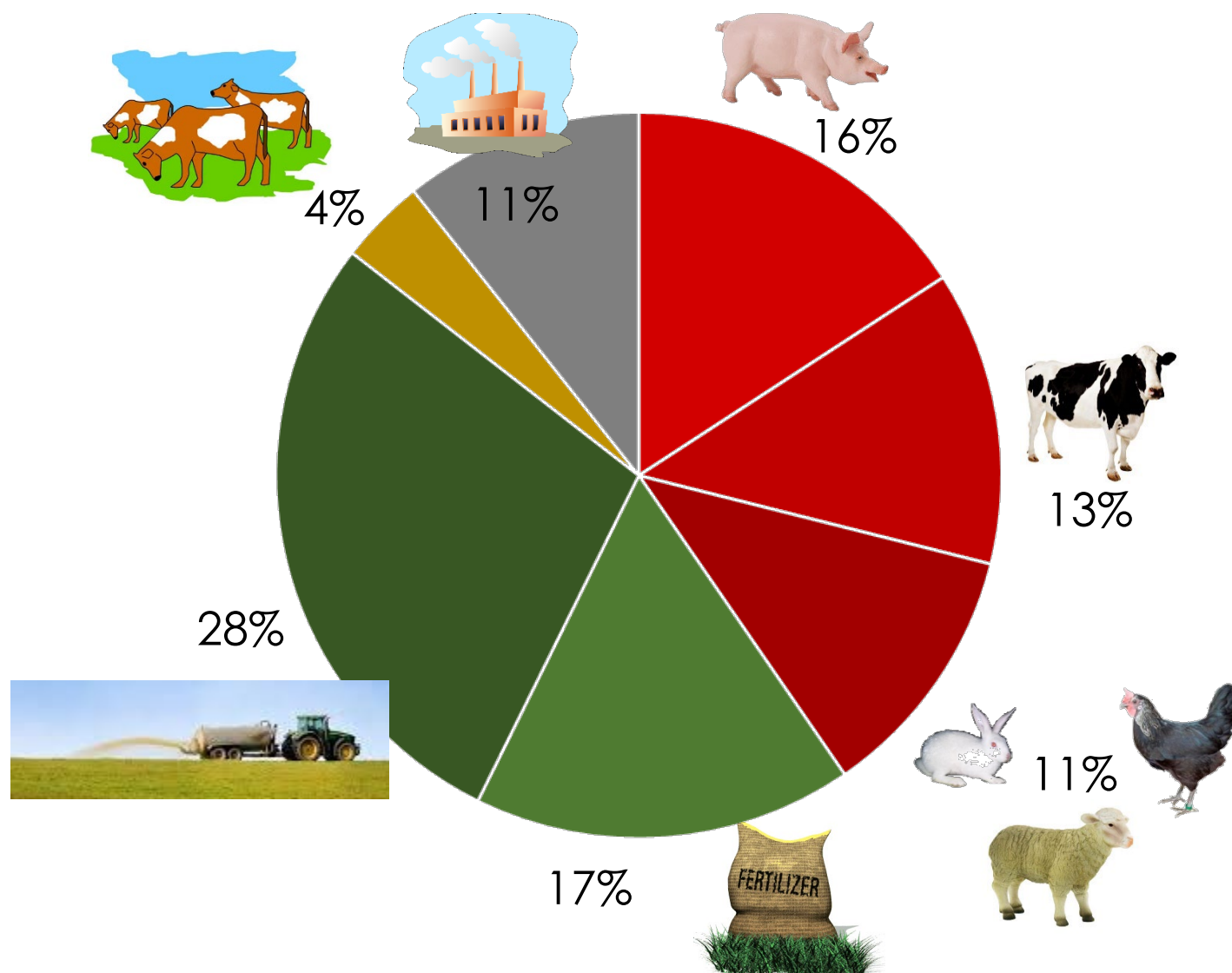
Letter | Published: 05 December 2018

Industrial and agricultural ammonia point sources exposed

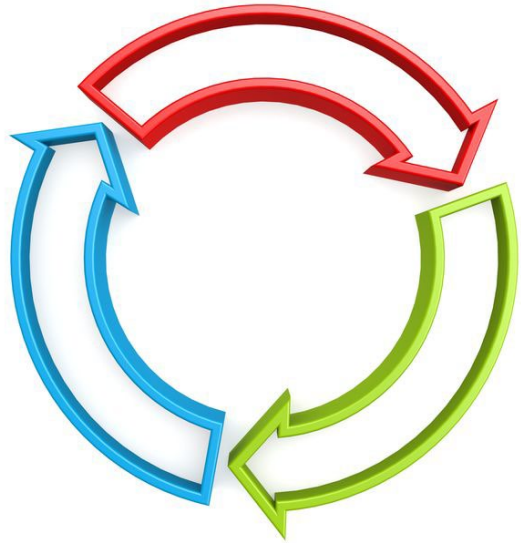


Mostly derived from livestock

Share of
 NH_3 emissions



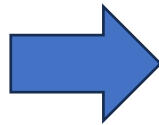
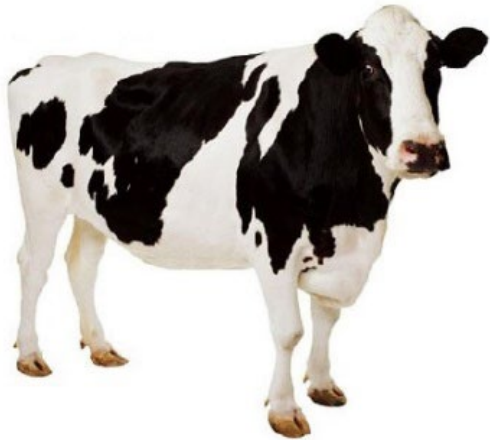
Advances in sensors and ICT



Sensors: better and cheaper

Connectivity: (real time)

Computing: (hardware and software)



Must create **ADDED VALUE**

Objective

*To create the basis to develop an application to conduct
real-time emission measurements
in naturally ventilated pig farms*

Fattening pig farm located in Teruel (Spain)
2 growing periods (Summer- Autumn 2023 and Winter-Spring 2024)

Material and Methods



2 identical buildings



980 animals/building

Measurements

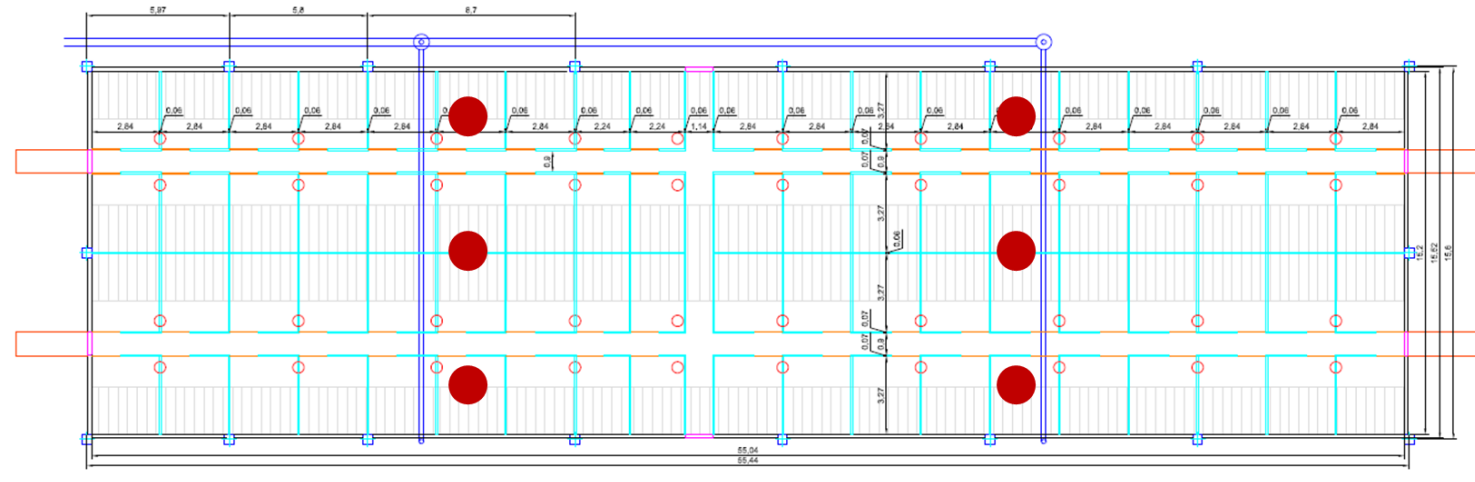
Ambient

Temperature

Relative humidity

NH₃ conc. DPFQ 500-NH3

CO₂ conc. CO2 GAS-DIS-CO



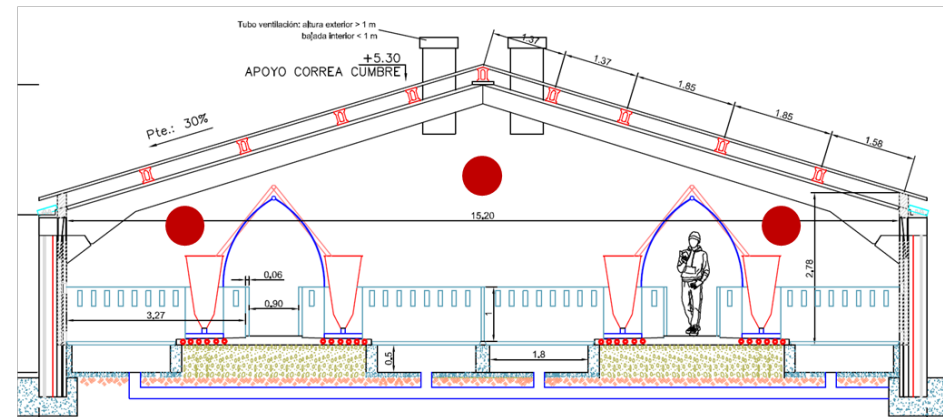
Performance

Numbers of animals

Initial and final weight

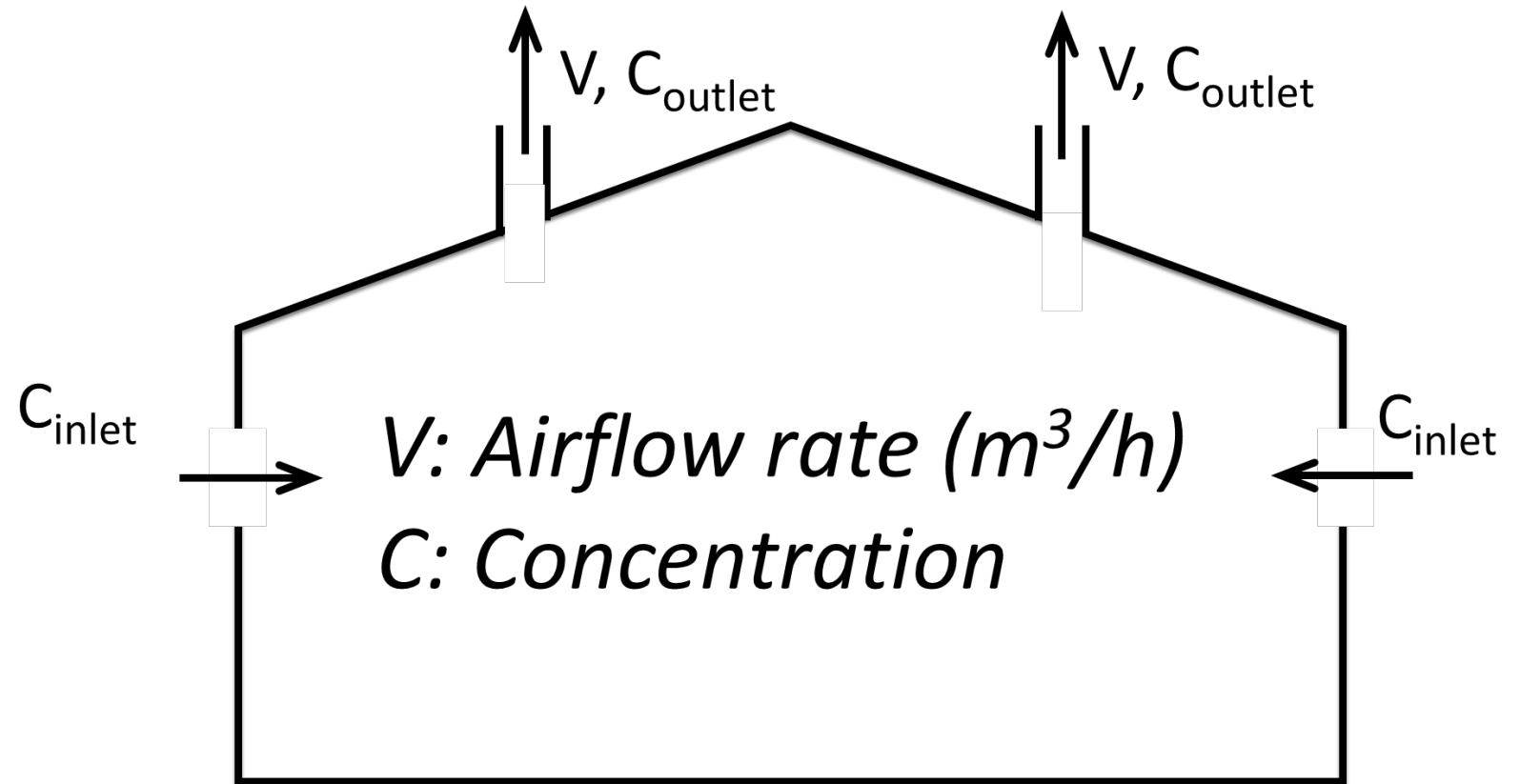
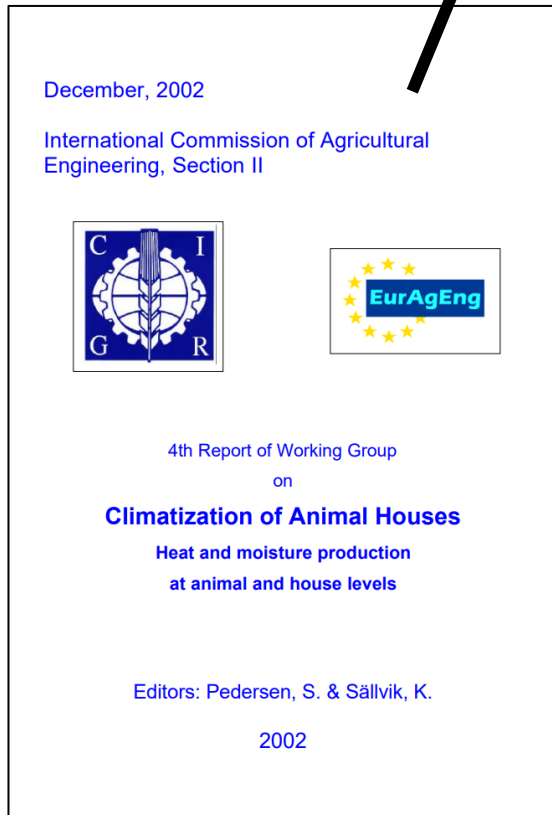
Feed consumption

Pit slurry emptying



Calculations

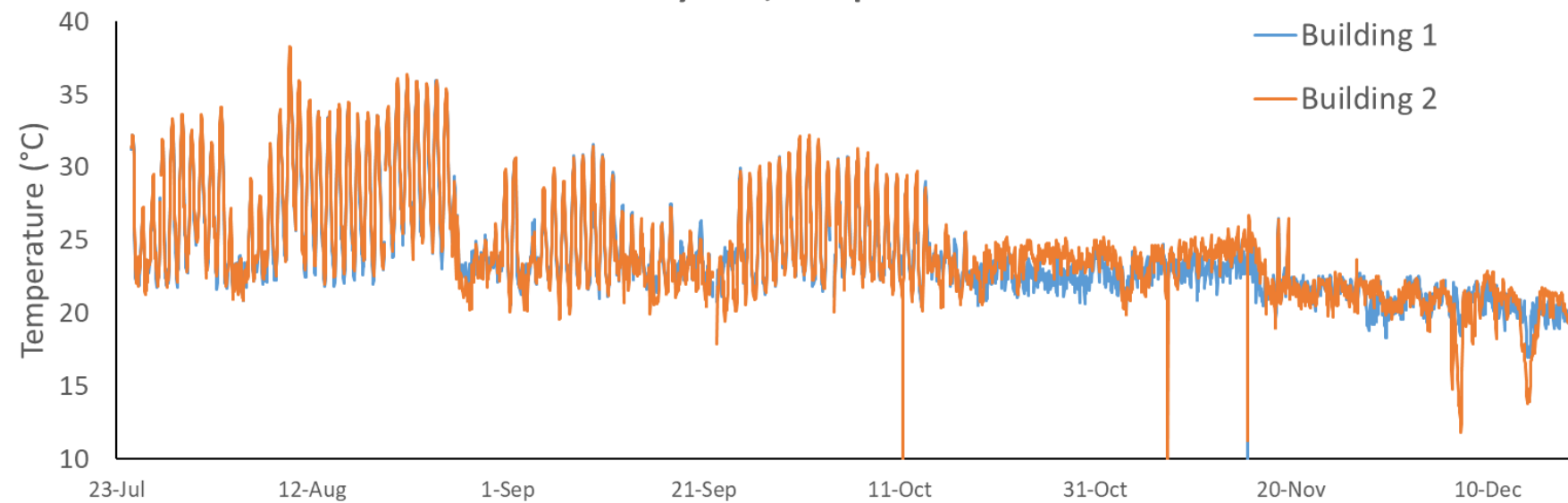
$$E = V \times (C_{\text{outlet}} - C_{\text{inlet}})$$



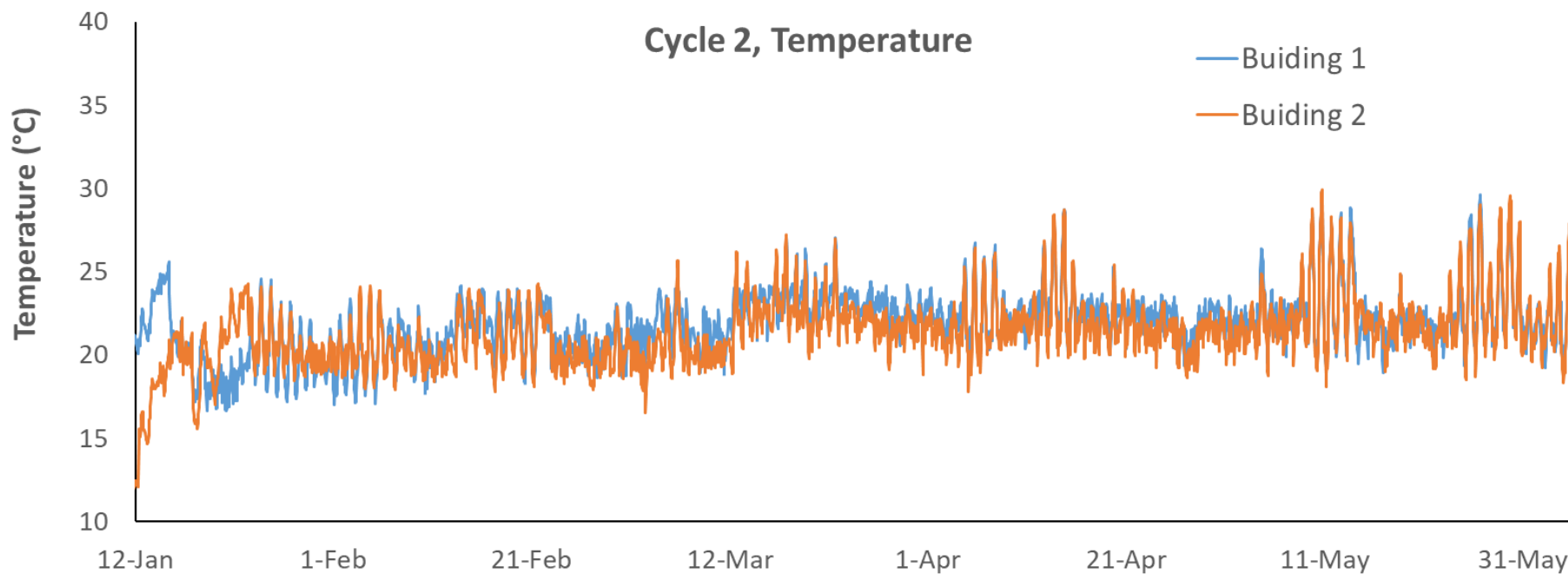
Results and Discussion

Temperature

Cycle 1, Temperature

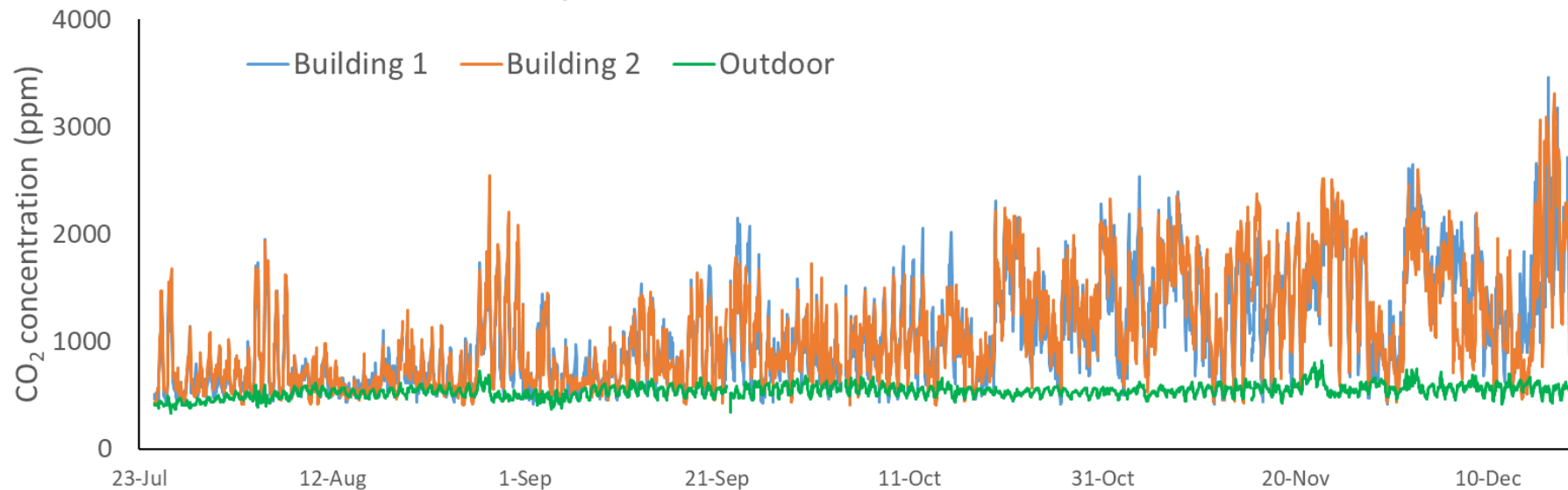


Cycle 2, Temperature

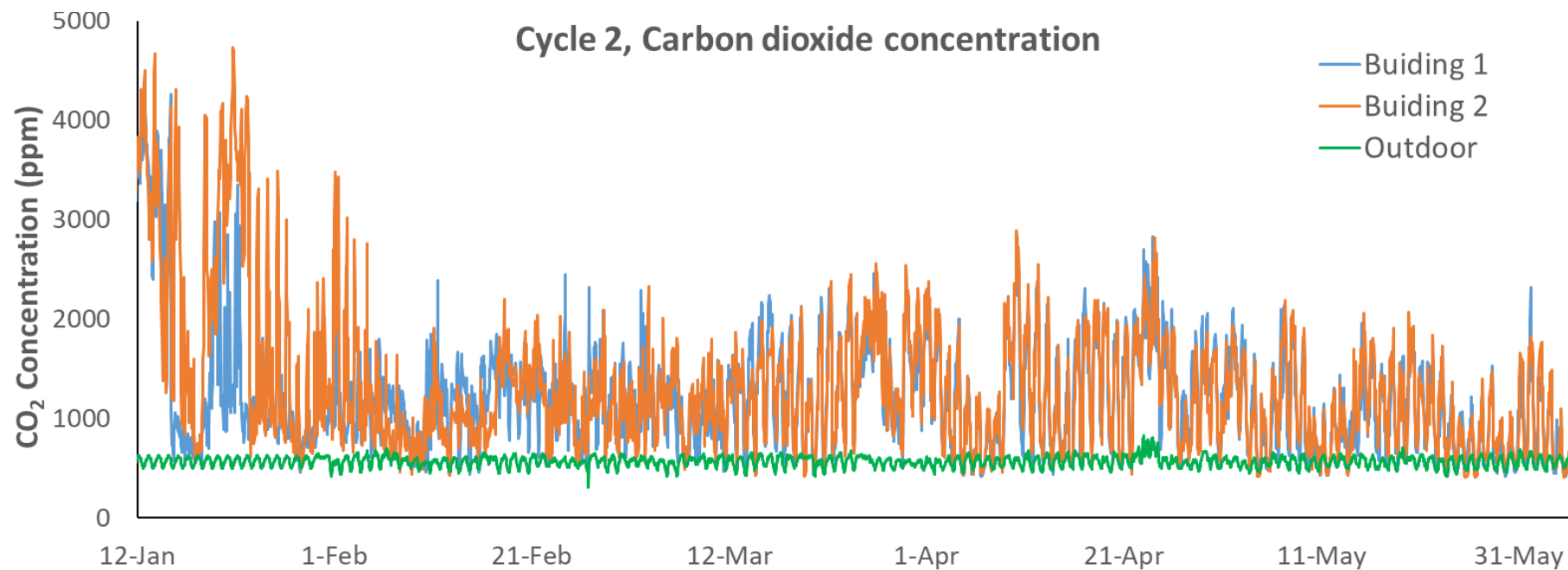


Carbon dioxide conc.

Cycle 1, Carbon dioxide concentration

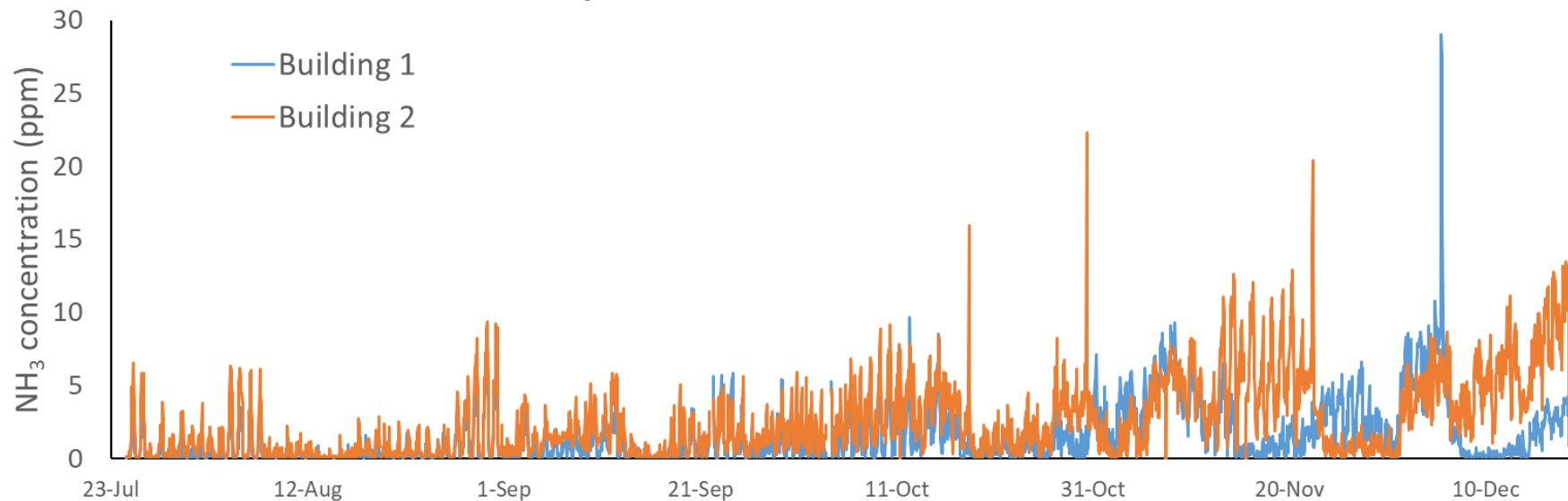


Cycle 2, Carbon dioxide concentration

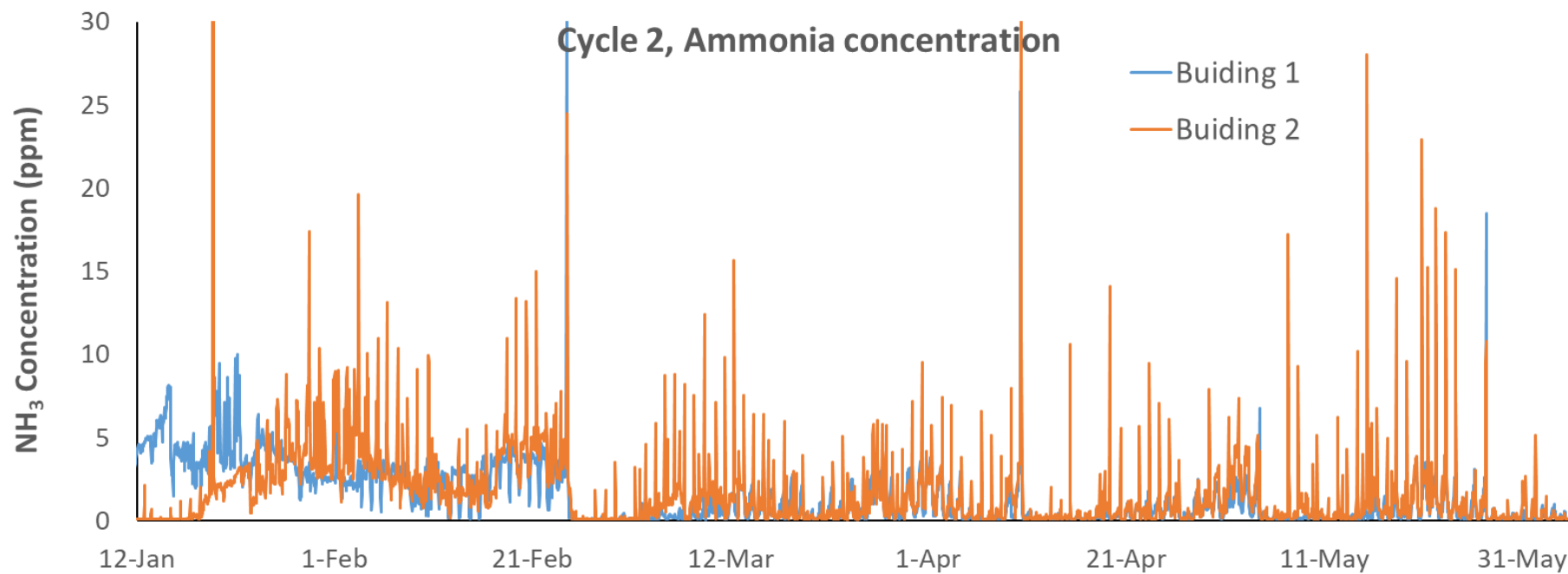


Ammonia concentrations

Cycle 1, Ammonia concentration

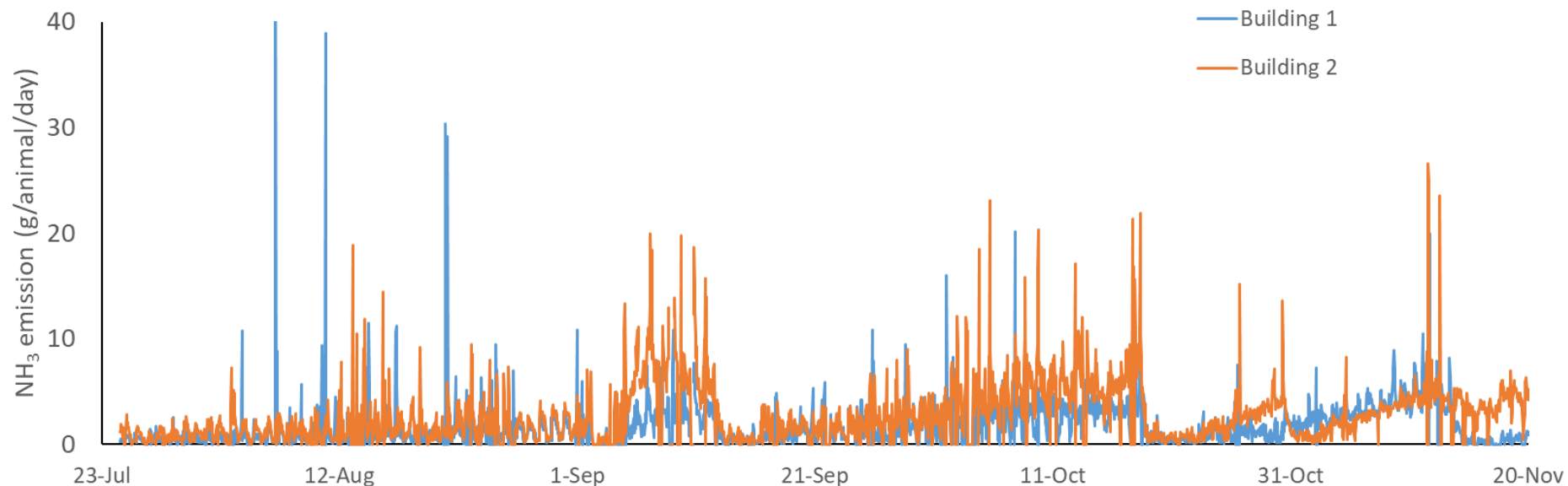


Cycle 2, Ammonia concentration

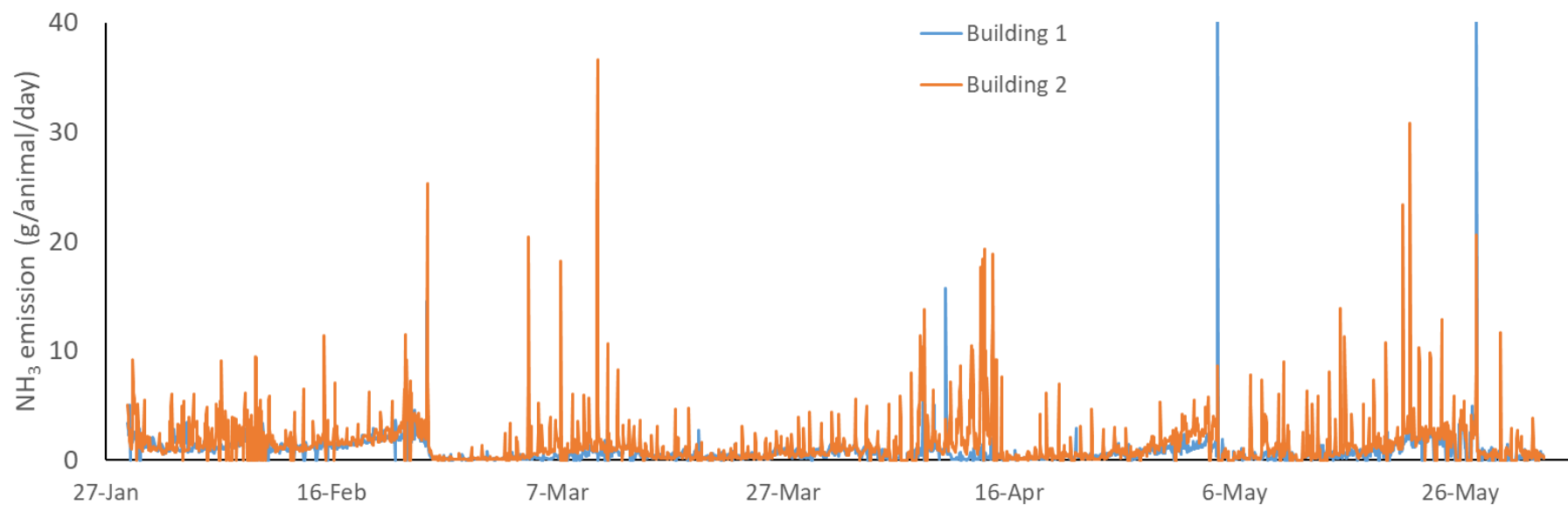


Ammonia emissions (hourly)

Cycle 1, Ammonia emission (hourly)

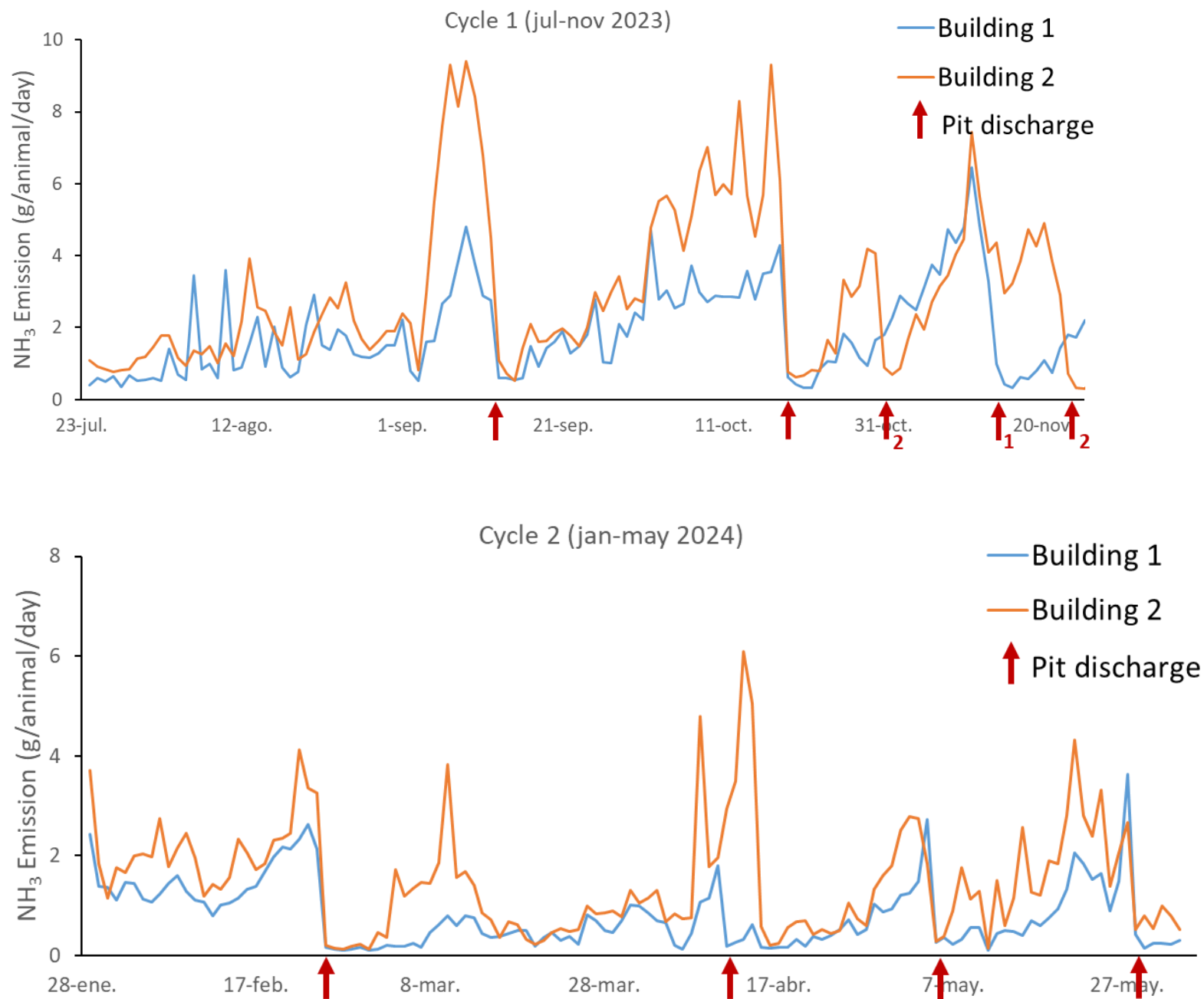


Cycle 2, Ammonia emission (hourly)



**~10%
Discarded
values**

Ammonia emissions (daily)



An APP for emission monitoring

Programming

- Python code

- Automatic data download from different cloud servers

- Automatic outlier detection and dataset cleaning

Challenges

- On-site sensor calibration

- Include other variables based on PLF (e.g. animal weight or activity)

- Automatic selection of sampling points

- System verification

Conclusions

#1 Ambient sensors provide useful information to **calculate emissions** in NV pig farms

#2 Emissions can be estimated **automatically**

#3 A preliminary app has been developed, but **intensive refinement work is needed**

Plans in three weeks

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EmiLi 2024 conference



International Symposium on
Gas and Dust Emissions
from Livestock

5th edition

24_26
September 2024
Valencia (Spain)

Universitat Politècnica de València
emili2024@upv.es

**ABSTRACT
SUBMISSION**

REGISTRATION

<https://emiliconference.com/>



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