La gestione dei reflui zootecnici e il territorio campano: una bufala che deve girare

10 Giugno 2020

STEFANIA PINDOZZI

Outline

LINEE DI RICERCA

Gestione dei reflui zootecnici : le emissioni gassose

Formazione

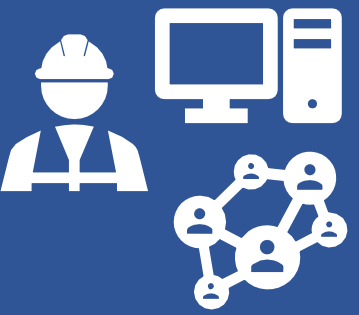
Tecniche di misura

Formazione

LAUREA IN INGEGNERIA PER L'AMBIENTE E IL TERRITORIO

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

PERCORSO PROFESSIONALE



DOTTORATO IN SCIENZE E TECNOLOGIE PER LA GESTIONE FORESTALE E AMBIENTALE

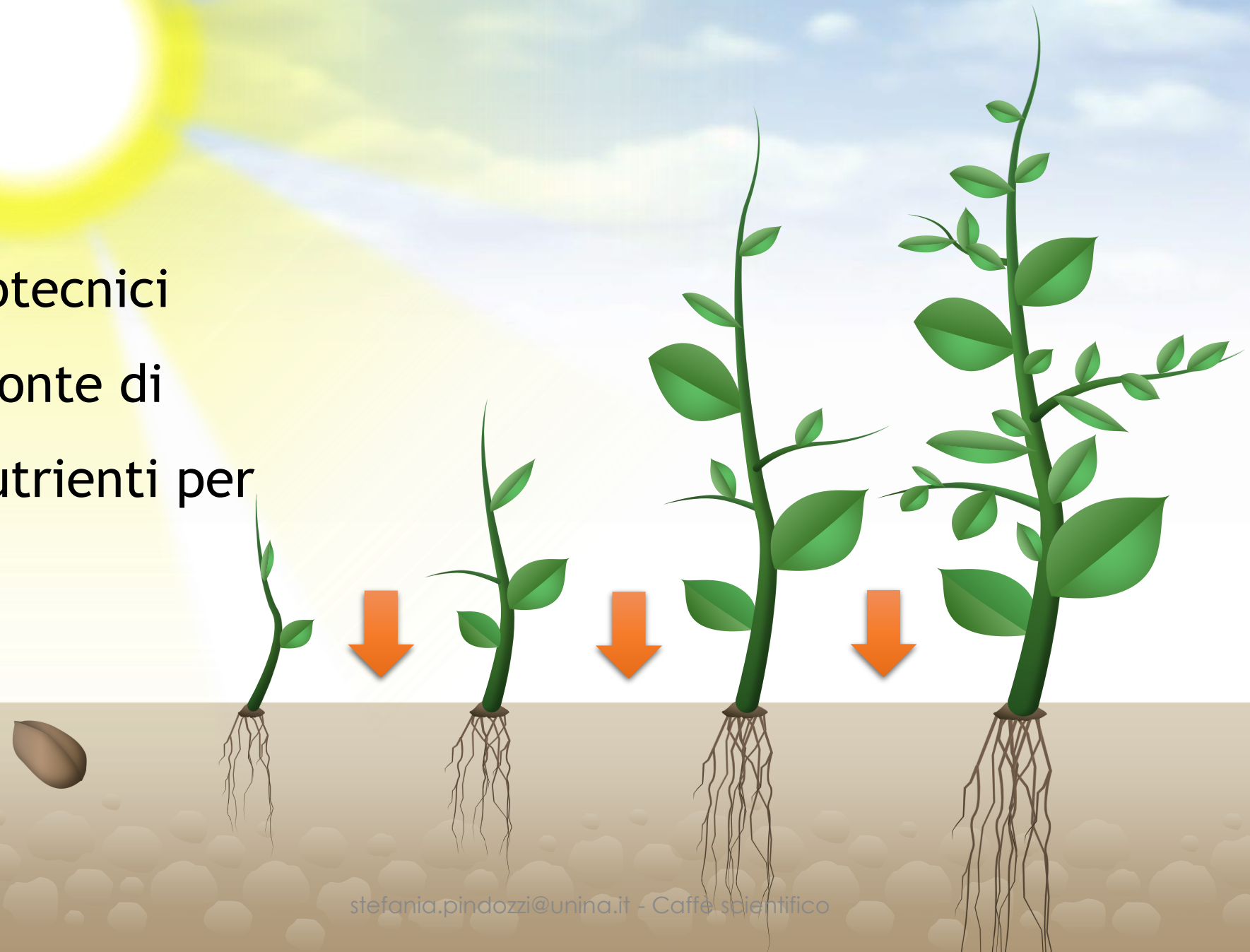
UNIVERSITÀ DEGLI STUDI DELLA Tuscia

Rifiuto o risorsa?

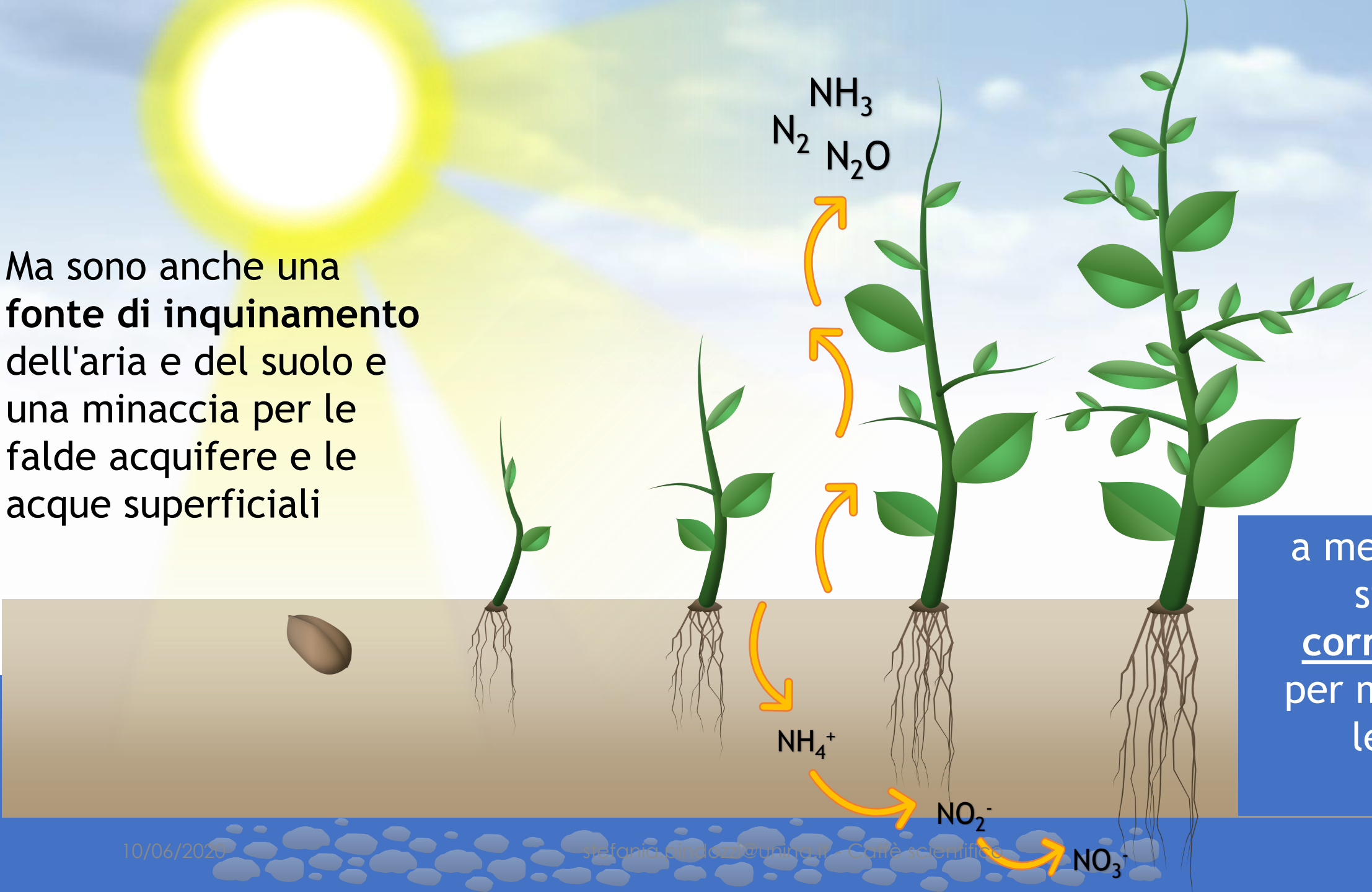
Il problema ambientale

Risorsa ma...

I reflui zootecnici sono una fonte di preziosi nutrienti per le piante



Ma sono anche una **fonte di inquinamento** dell'aria e del suolo e una minaccia per le falde acquifere e le acque superficiali



a meno che non siano **gestiti correttamente** per minimizzare le perdite di nutrienti

"

"The main objective is to reduce **water pollution** caused or induced by nitrates from agricultural sources and prevent further such pollution"

—Nitrates Directive (1991)

The action programmes to reduce pollution must contain mandatory measures relating to

1

periods when application of animal manure and fertilisers to land is prohibited

2

capacity of and facilities for storage of animal manure

3

limits to the amounts of animal manure and fertilisers applied to land, which should ensure balanced fertilisation

Le attività agricole sono responsabili del **94% delle emissioni totali di ammoniaca** (**dato 2014** nell'EU-28), con una riduzione solo del 7% dal 2000 al 2014

Come se non bastasse

!

Air Pollution Modeling and Its Application XIX pp 548-556 | Cite as

On the Role of Ammonia in the Formation of $PM_{2.5}$

Authors | Authors and affiliations

C. Mensink, F. Deutsch

Conference paper

806 Downloads

Part of the NATO Science for Peace and Security Series Series C: Environmental Security book series (NAPSC)

Abstract

We studied the formation and composition of $PM_{2.5}$ using the EUROS model. This model contains comprehensive modules (CACM, MADRID) for the formation of secondary atmospheric aerosols and their precursors. Some spatial and temporal patterns in which ammonia emissions can be associated with elevated $PM_{2.5}$ and PM_{10} concentrations are analysed. Especially the episode of 15–16 April 2007 revealed some interesting features, e.g. the importance of the impact of temperature, relative humidity and hygroscopic water on $PM_{2.5}$ and PM_{10} concentrations. A hypothesis is formulated in which it is stressed that ammonia can be a provider of an abundant amount of condensation nuclei in the form of ammonium nitrate and ammonium sulphate which, under favourable meteorological conditions, attract hygroscopic water, leading to rapid increase in the $PM_{2.5}$ mass fraction.

Environmental Pollution 218 (2016) 86–94

Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

$PM_{2.5}$ pollution is substantially affected by ammonia emissions in China

Yiyun Wu [a], Baojing Gu [a, b, *], Jan Willem Erisman [c, d], Stefan Reis [e, f], Yuanyuan Fang [g], Xuehe Lu [h], Xiuming Zhang [a, i]

L'ammoniaca è un precursore del particolato atmosferico

AGI AGENZIA ITALIA — ultimo aggiornamento 18 min fa — SEARCH

Stabili i nuovi casi di coronavirus, decessi al minimo dal 7 marzo — </> EMBED

CRONACA

È ufficiale, il coronavirus è trasportato dal particolato atmosferico

Possibile "indicatore" precoce di future recidive dell'epidemia da Covid-19. Studio effettuato da Sima, ricercatori dell'Università di Bari, Bologna e Trieste, e dell'ateneo di Napoli "Federico II"

SIMA — UNIVERSITÀ

Relazione circa
virus nella pop

Leonardo Setti -
Fabrizio Passari
Gianluigi de Gen
Alessia Di Gilio -
Jolanda Palmisa
Paolo Buono - U
Gianna Fornari -
Maria Grazia Per
Andrea Piazzalu
Pierluigi Barbier
Emanuele Rizzo
Alessandro Mia

The Potential role of Particulate Matter in the Spreading of COVID-19 in Northern Italy: First Evidence-based Research Hypotheses

Leonardo Setti[1], Fabrizio Passarini[2], Gianluigi De Gennaro[3], Pierluigi Barbieri[4], Maria Grazia Perrone[5], Andrea Piazzalunga[6], Massimo Borelli[7], Jolanda Palmisani[3], Alessia Di Gilio[3], Prisco Piscitelli[8], Alessandro Miani[8]

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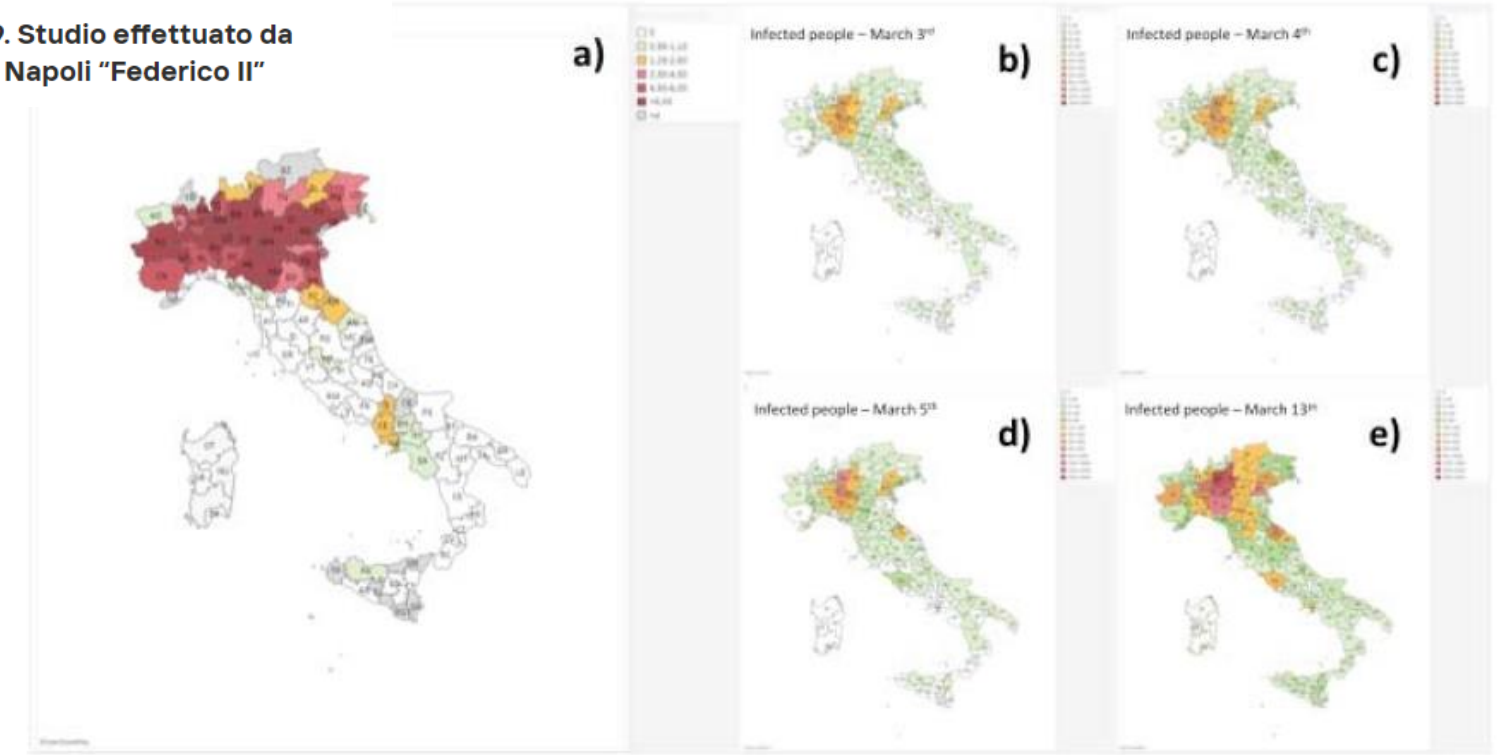
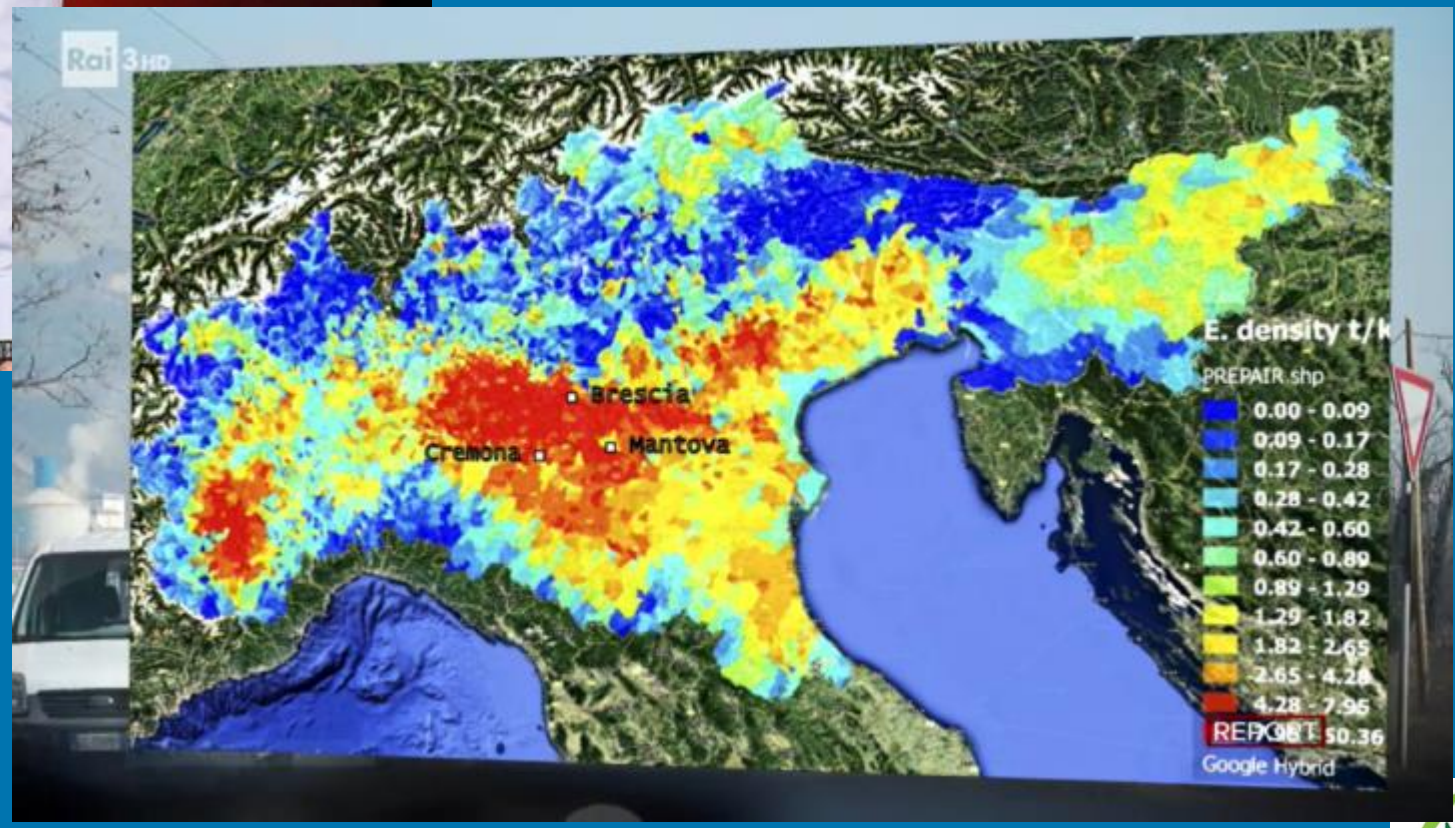


Il coronavirus viaggia in PM10, è confermato - Euronews

In Lombardia sono allevati il 27% dei bovini e il 34% dei suini italiani (BDN, 2019)

Puntata di report del 13 Aprile 2020

Esiste una correlazione tra il particolato atmosferico e la veicolazione dei virus



Sotto accusa le tecniche di spandimento e i calendari flessibili

...

Atmospheric Environment 115 (2015) 141–148

Contents lists available at ScienceDirect

Atmospheric Environment

journal homepage: www.elsevier.com/locate/atmosenv

An inventory of the emission of ammonia from agricultural fertilizer application in China for 2010 and its high-resolution spatial distribution

Peng Xu [a], Yisheng Zhang [a], Weiwei Gong [b], Xikang Hou [c], Carolien Kroeze [d], Wei Gao [e], Shengji Luan [a, *]

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[b] Division of Environment and Resources Research, Transport Planning and Research Institute, Ministry of Transport, Beijing 100028, China
[c] Department of Ecology, College of Urban and Environmental Sciences, Peking University, Beijing 100871, China
[d] Environmental Systems Analysis Group, Wageningen University, Droevendaalsesteeg 3, 6708 PB Wageningen, The Netherlands
[e] Laboratory of Water and Sediment Sciences, Ministry of Education, College of Environmental Sciences and Engineering, Peking University, Beijing 100871, China

HIGHLIGHTS

- We present a high-resolution inventory for 2010 agricultural fertilizer application.
- It is based on activity data, regional emission factors and related parameters.
- City-level and 1 km gridded emissions in China are presented.
- Source apportionments, temporal and spatial patterns and uncertainties are analyzed.
- Emissions are correlated with temperature, planting time and cultivation practices.

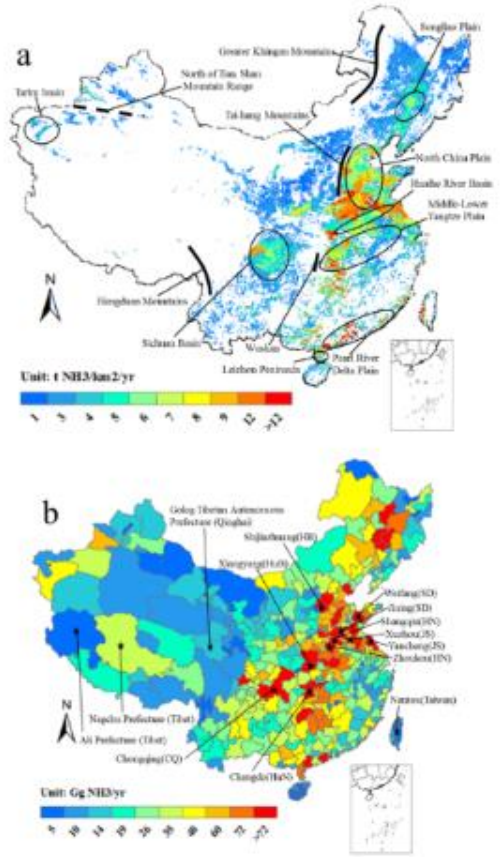
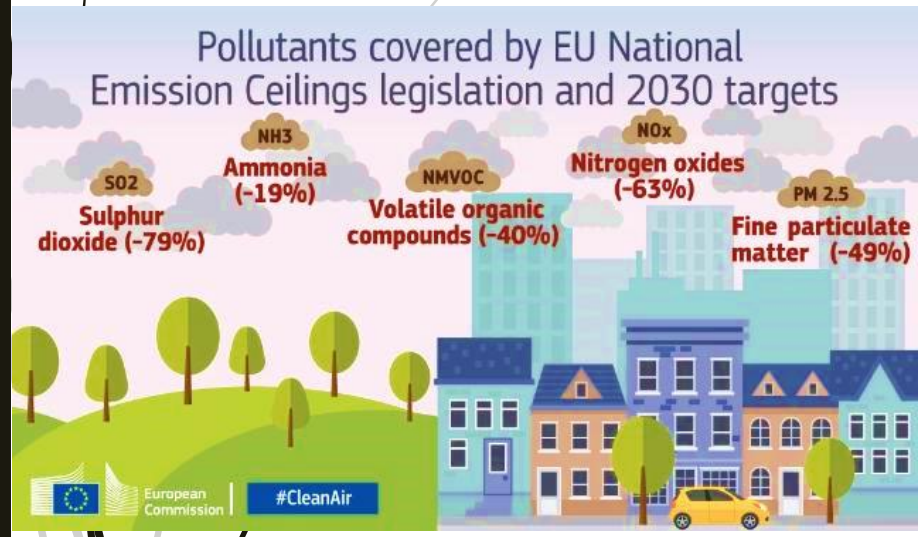


Fig. 4. Spatial pattern of NH_3 emissions of China's agricultural fertilizers: (a) NH_3 emission density and (b) emissions from cities.

"Air pollution is currently the most important environmental risk to human health, and it is perceived as the second biggest environmental concern for Europeans, after climate change (European Commission, 2017a)"

—https://www.eea.europa.eu//publications/air-quality-in-europe-2019

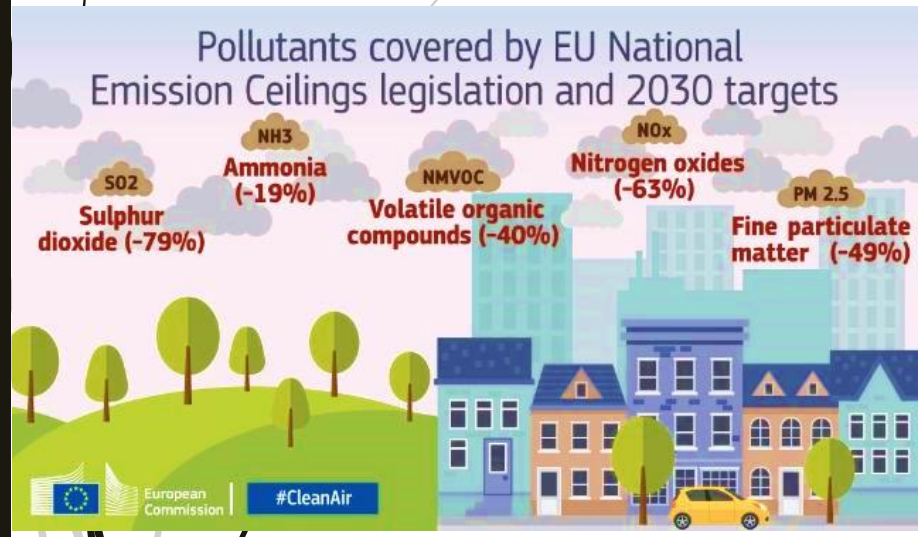
Direttiva National Emission Ceilings (NECD)



- Dal 2001 impone limitazioni sulle emissioni di
  - anidride solforosa, **ammoniaca**, ossidi di azoto e composti organici volatili
- Tuttavia, l'UE non ha ancora raggiunto i suoi obiettivi a lungo termine per la qualità dell'aria.

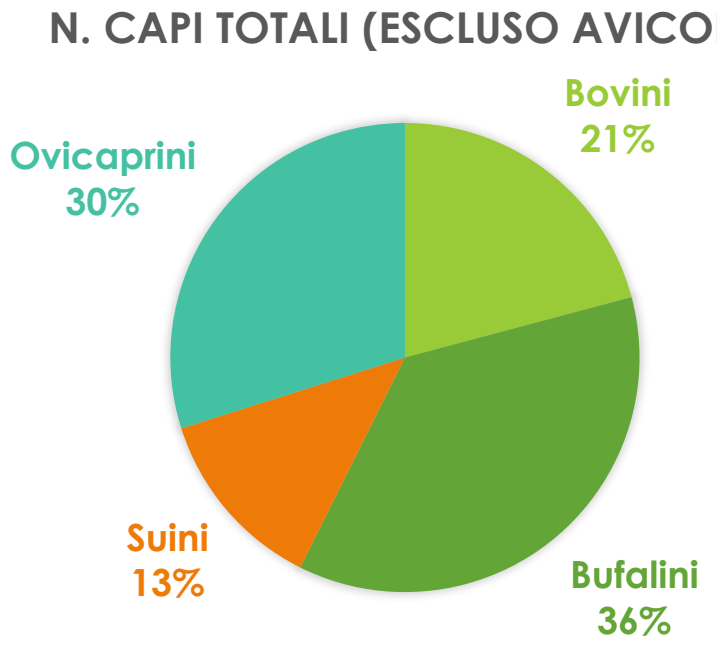
- Propone inoltre di limitare le emissioni di due nuovi inquinanti non contemplati dalla normativa vigente:
  - il metano
  - il particolato

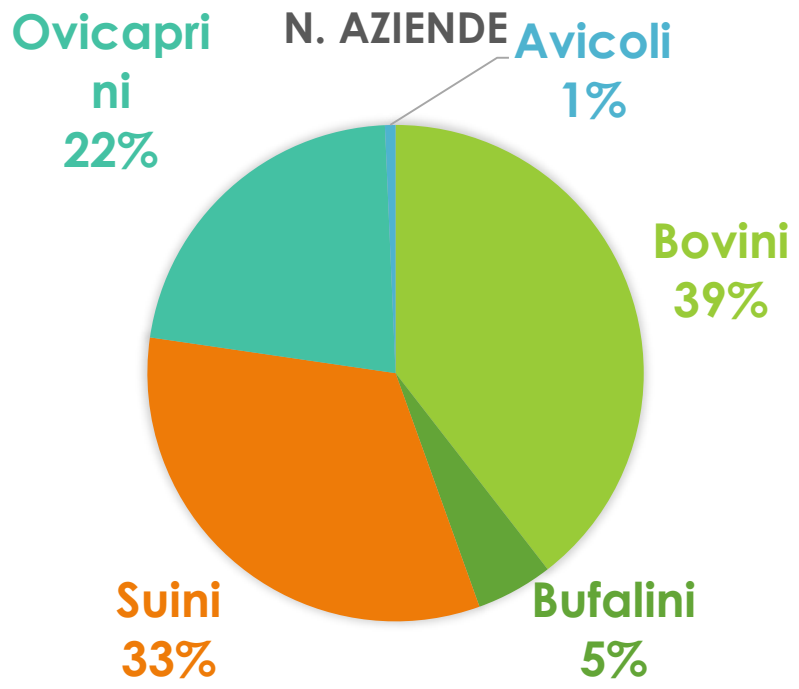
Direttiva National Emission Ceilings (NECD)



- Ogni Stato è chiamato ad aggiornare l'inventario delle emissioni in atmosfera
- Non esiste uno standard di misura per l'ammoniaca

In Regione Campania – dati 2018

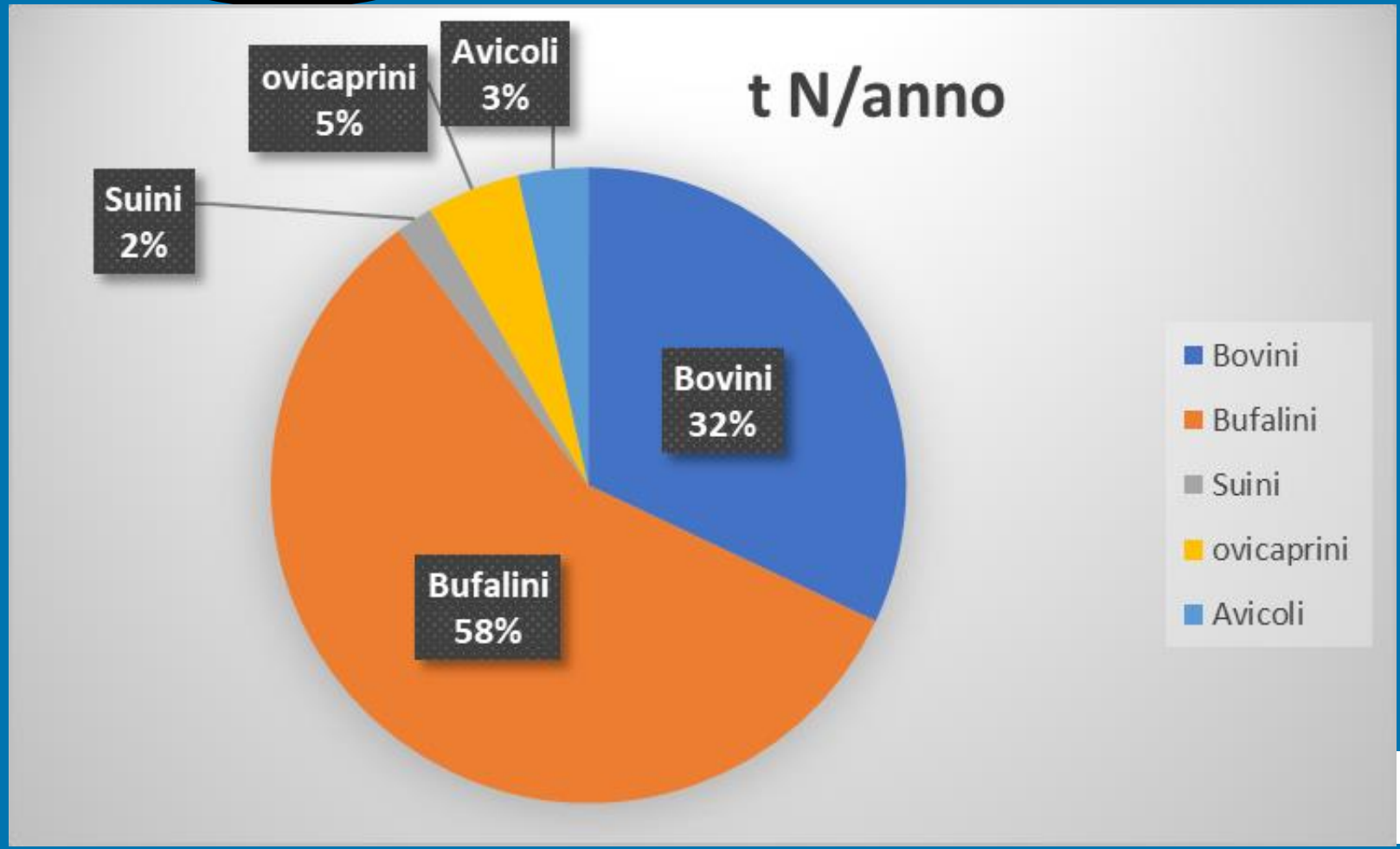




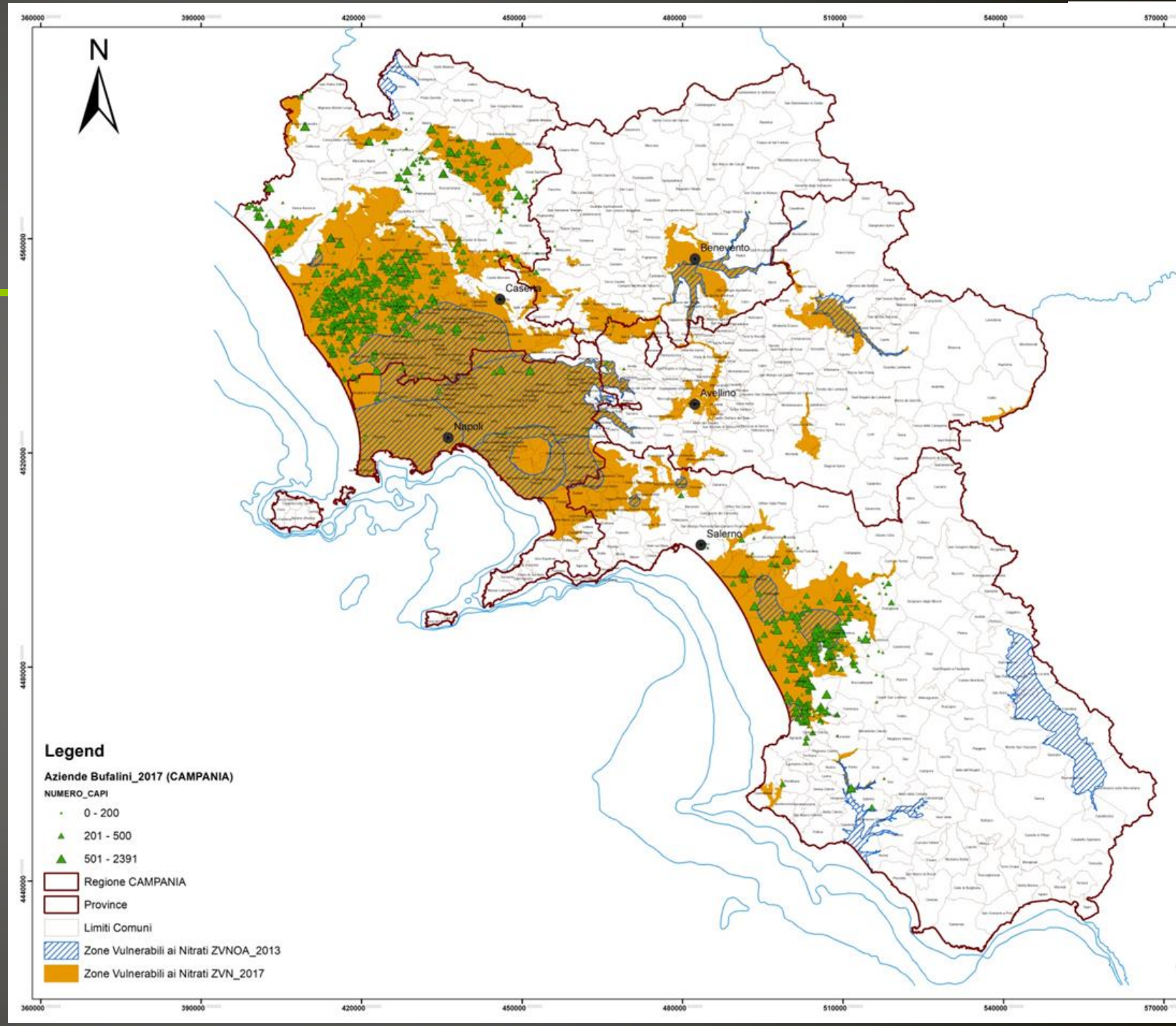
Nel 2018 la consistenza capi bufalini era pari al 73% del totale nazionale, di poco inferiore ai 300.000 capi

N

Osservando i carichi di azoto prodotti per specie allevata, si vede che gli allevamenti bufalini concorrono per il **58% del totale** dell'azoto prodotto in regione (dati 2018)



Distribuzione Aziende bufaline nel 2017 rispetto alla delimitazione ZVNOA del 2017



Obiettivo della ricerca

Stima delle emissioni di ammoniaca della specie bufalina in clima Mediterraneo

stefania.pindozzi@unina.it - Caffè scientifico

10/06/2020

Tecniche di misura dell'ammoniaca

Hindawi

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International Journal of Agronomy

Journal overview | For authors | For reviewers | For editors | Table of C

International Journal of Agronomy / Published Special Issues / **Special Issue**

Publishing date
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Status
Closed

Submission deadline
26 Jul 2019

Lead Editor
Stefania Pindozzi[1]

Guest Editors
Nunzio Fiorentino[1] | Marco Carozzi[2]

Effectiveness of Livestock Manure Fertilization and Nitrogen Losses Assessment

This issue is now closed for submissions.
More articles will be published in the near future.

Description

1 **Review**

2 **Ammonia emissions assessment following field fertilization: Chamber**
3 **and Micrometeorological methods comparison**

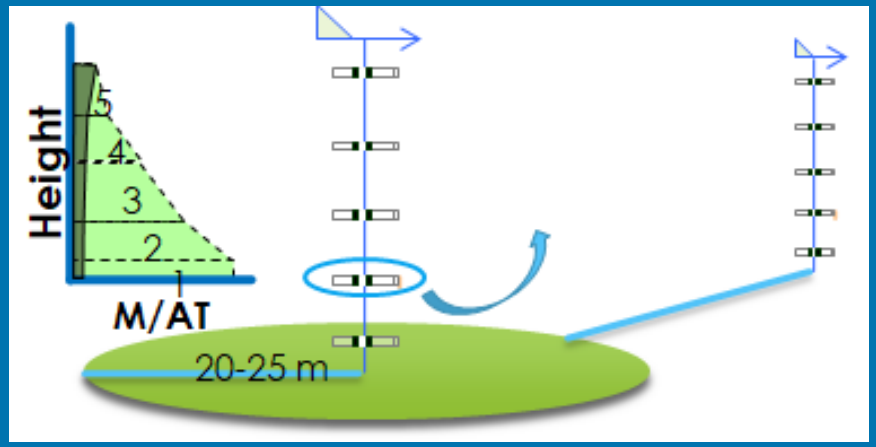
4 Ester Scotto di Perta[a], Nunzio Fiorentino[a], Marco Carozzi[b], Elena Cervelli[a], Stefania Pindozzi[a]*

5 [a]Department of Agricultural Sciences, University of Naples Federico II, Portici (NA) Italy;

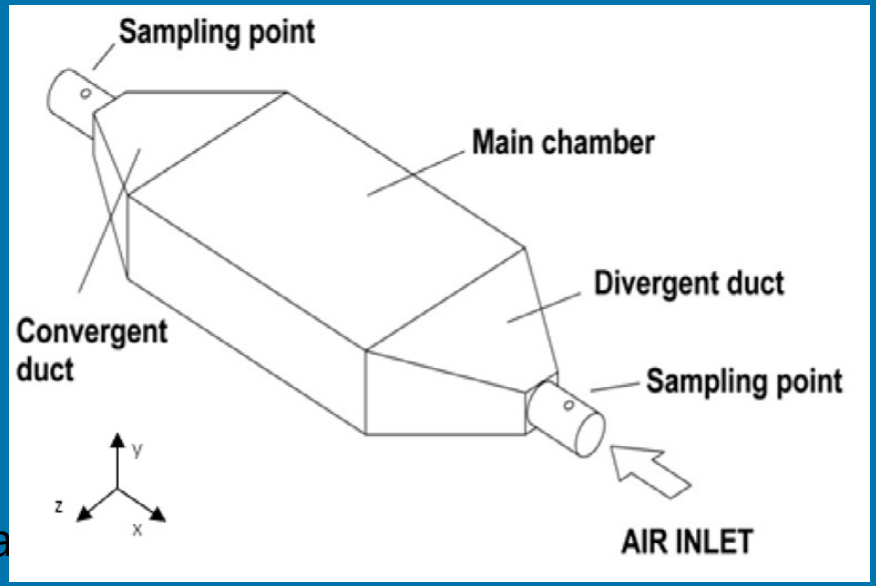
6 [b] INRA-AgroParisTech, Thiverval-Grignon, France

7 *Corresponding author at: Department of Agricultural Science, University of Naples Federico
8 II, via Università 100, 80055 Portici (NA), Italy. *E-mail address:* stefania.pindozzi@unina.it

Micrometeorological method



Chamber method



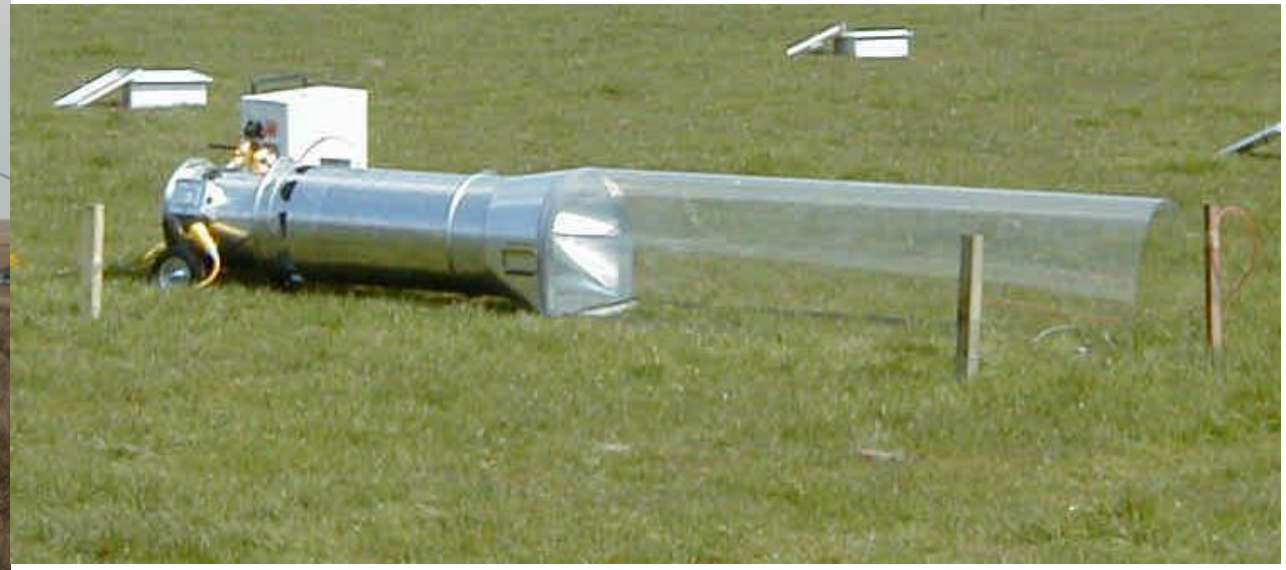
Tecniche di misura dell'ammoniaca

Metodo Micrometeorologico

Asta fissa con shuttle rotanti

Metodo delle camere

Wind tunnel: Geometrie ingombranti per raddrizzare il flusso



Innovazioni apportate

Metodo Micrometeorologico

Asta rotante con glass tube

Metodo delle camere

Geometria ottimizzata e guide channel per raddrizzare il flusso

Computers and Electronics in Agriculture 125 (2016) 137–148

Contents lists available at ScienceDirect

Computers and Electronics in Agriculture

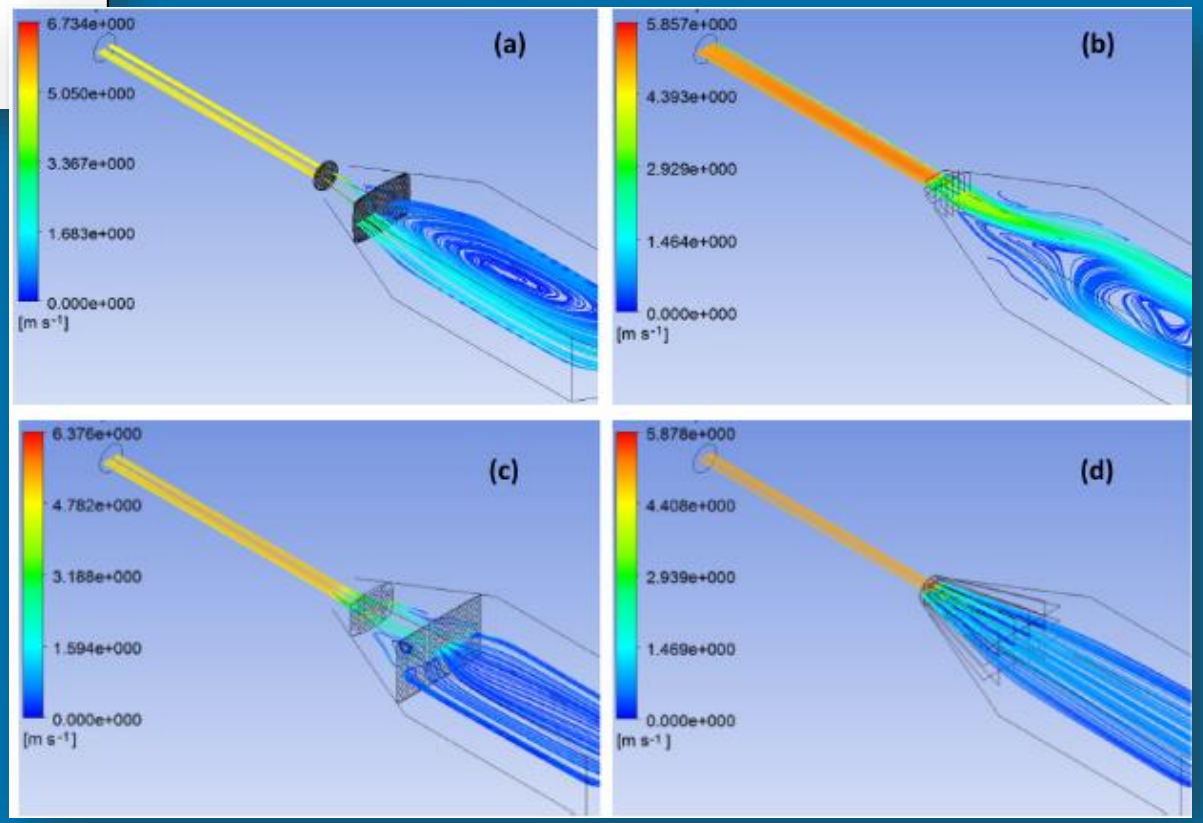
journal homepage: www.elsevier.com/locate/compag

Original papers

Study of aerodynamic performances of different wind tunnel configurations and air inlet velocities, using computational fluid dynamics (CFD)

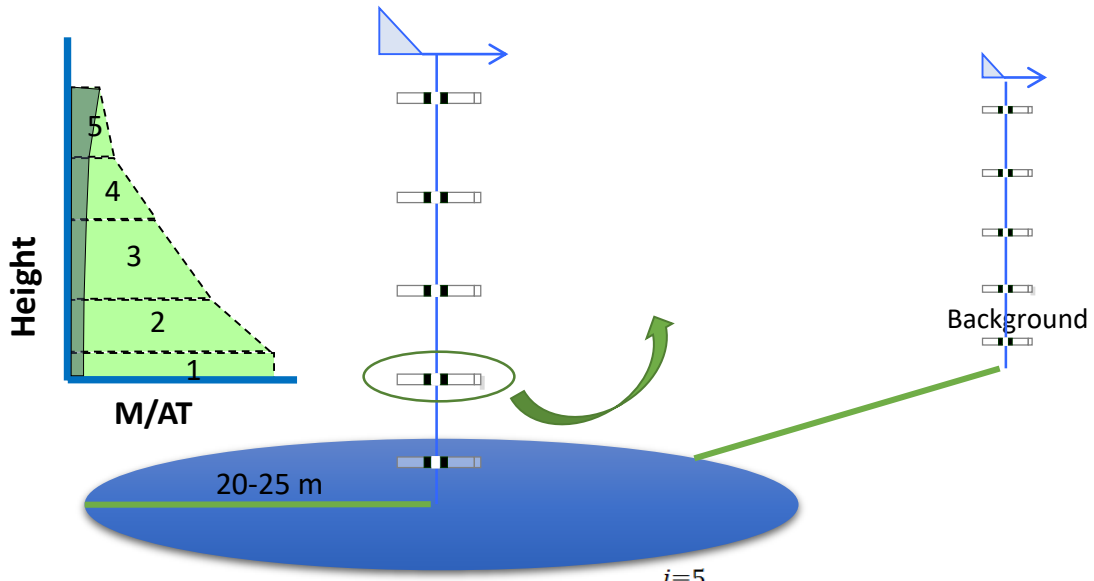
Ester Scotto di Perta [a,b], Maria Angela Agizza [c], Giancarlo Sorrentino [d], Lorenzo Boccia [a], Stefania Pindozzi [a,*]

[a] Department of Agriculture, University of Naples Federico II, Via Università 100, Portici (NA), Italy
[b] Department of Agriculture, Forestry, Nature and Energy (DAFNE), University of Tuscia, Via S. Camillo de Lellis s.n.c., 01100 Viterbo, Italy
[c] Interdepartmental Research Center For Environment, I.R.C. Env, Italy
[d] Department of Chemical, Materials and Production Engineering, University of Naples Federico II, P.le Tecchio 80, Napoli, Italy

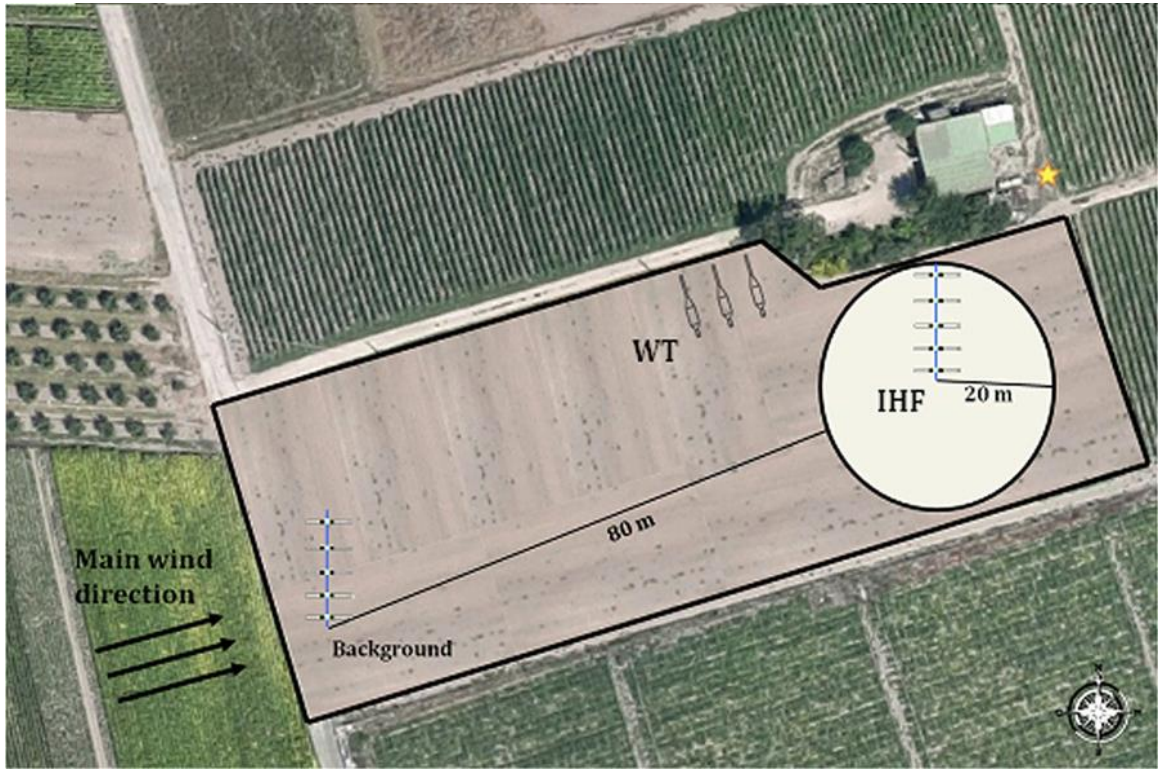


Prove di campo

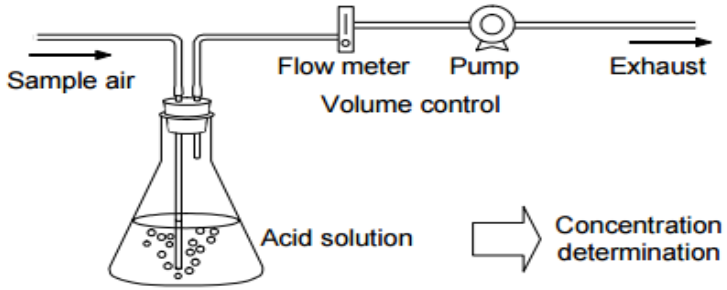
- **IHF with glass tubes**



$$F_{vertical} = \frac{1}{x}\sum_{i=1}^{i=5}\left[\left(\frac{M}{AT_{urea}} - \frac{M}{AT_{bkg}}\right)\cdot \Delta H\right]_i$$



- **Wind tunnels with acid traps**

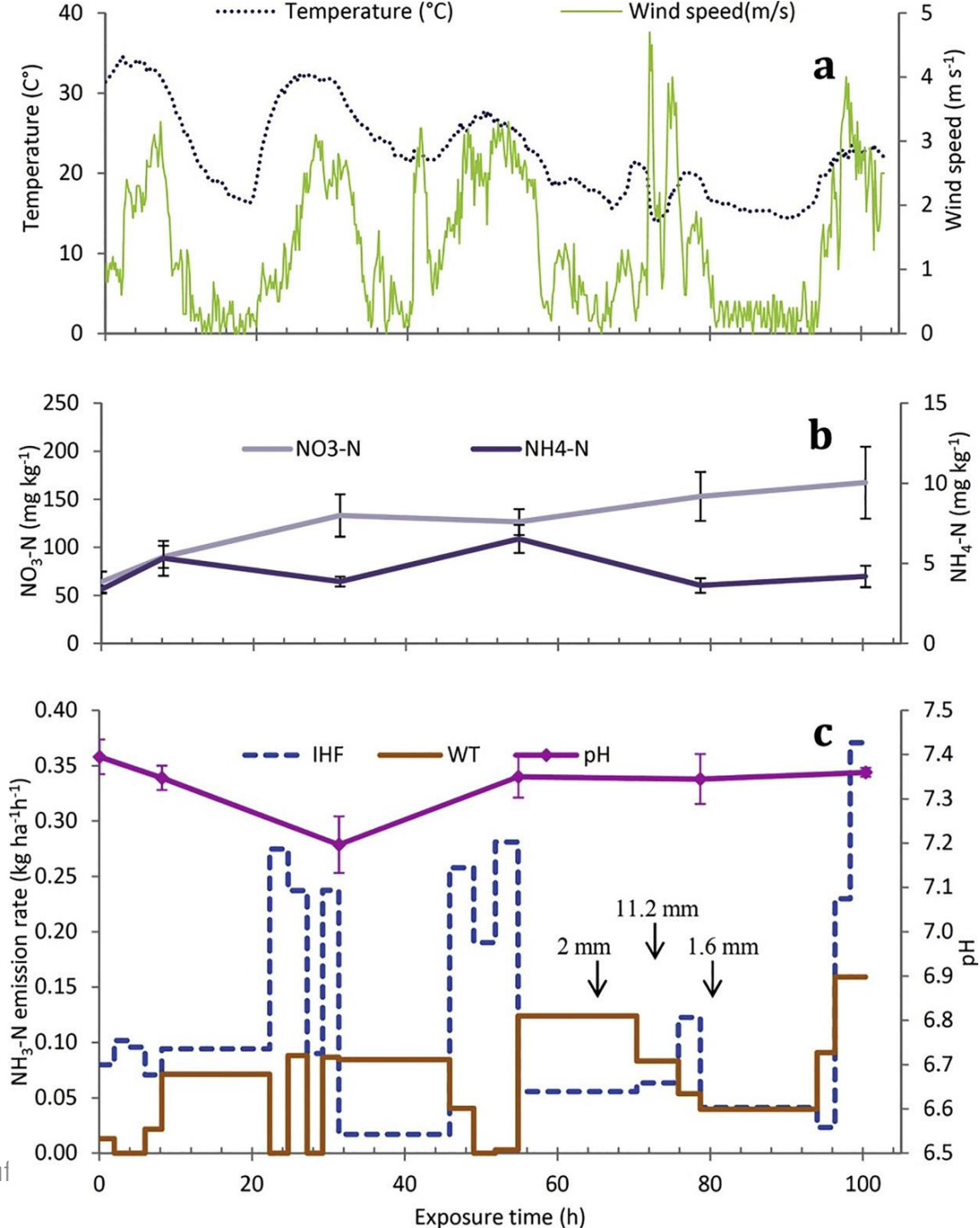


$$J = \frac{QC_{air}}{A}$$

Prova con urea

Risultati

- Sono stati forniti **200 kg N /ha**
- **Nelle prime 80 ore** il flusso è stato molto **basso**.
- Le emissioni totali di ammoniaca sono state di 9.9 kg N/ha per IHF e 7.4 kg N/ha per WT
- Un evento di pioggia ha fatto ripartire le emissioni

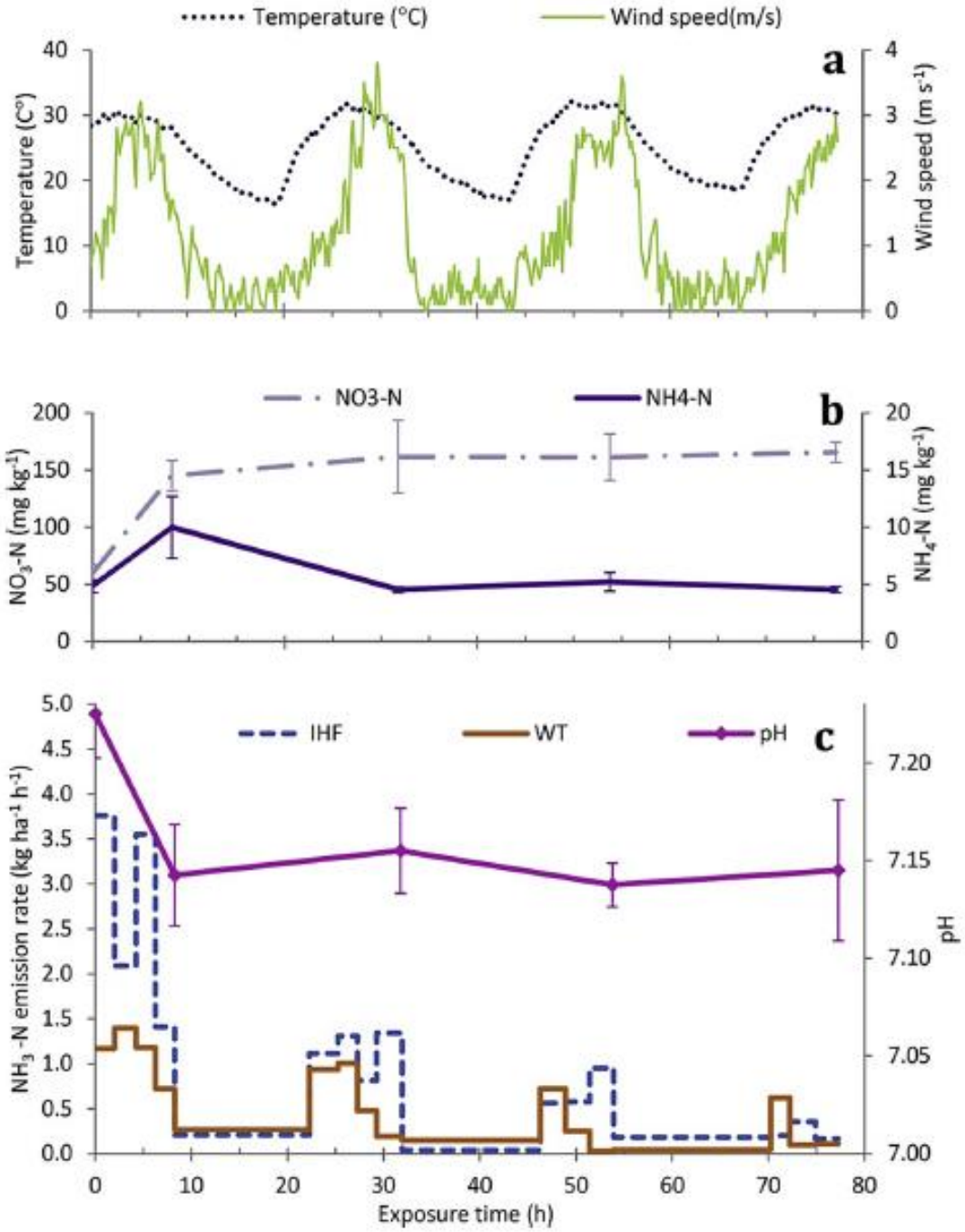


stefania.pindozzi@unina.it - Cat

Prova con refluo bufalino tal quale

Risultati

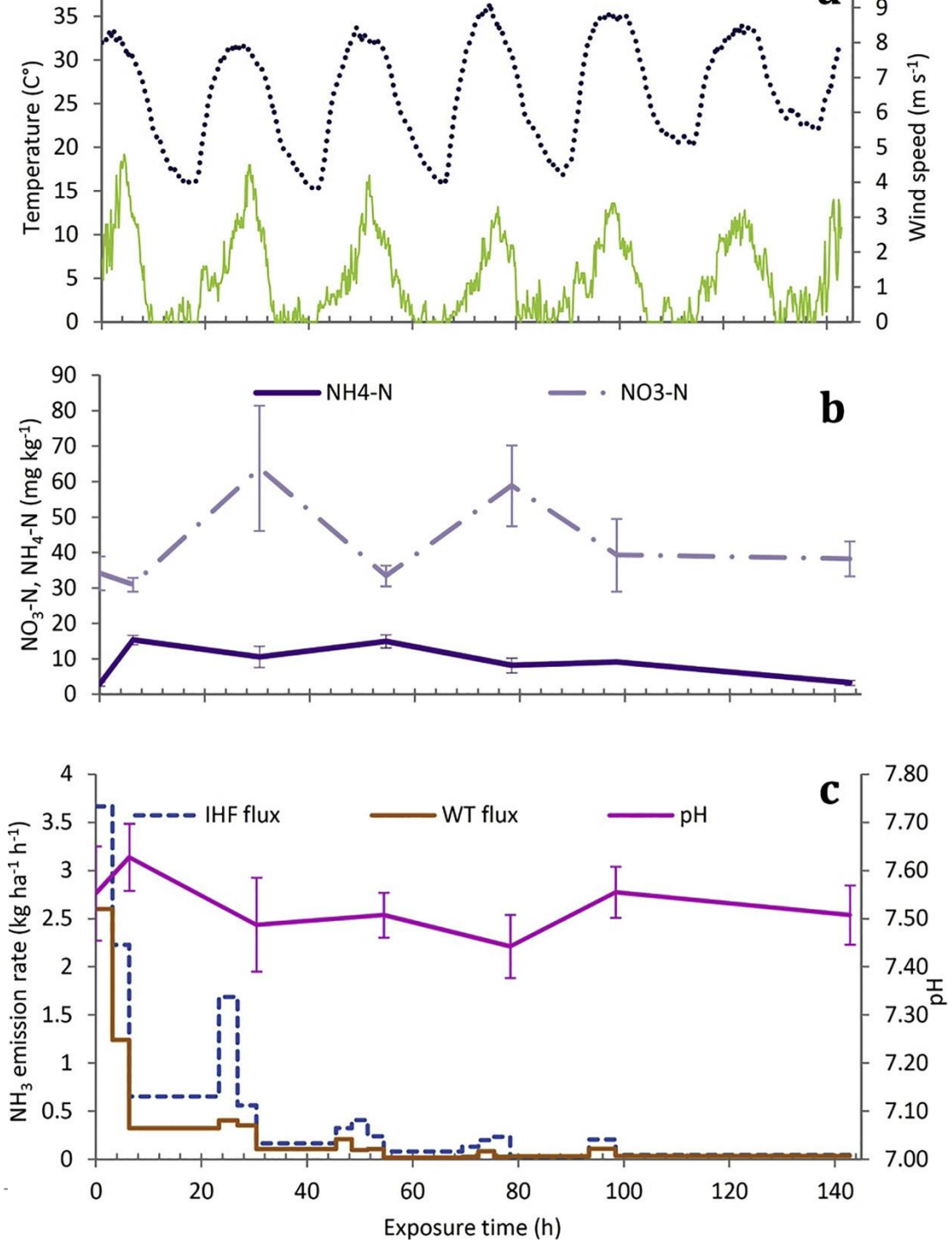
- Sono stati forniti **400 kg N/ha**
- **Le principali emissioni di ammoniaca si sono verificate nelle prime 24-48 ore** e il processo si è concluso dopo soli 4 giorni.
- Le perdite sono pari a circa 46 kg N/ha (per metodo IHF) e 26.5 kg N/ha per WT circa corrispondenti a circa il 50% e 30% del TAN applicato



Prova digestato da reflui bufalini

Risultati

- Sono stati forniti **176 kg N /ha**
- **Circa il 70% delle emissioni di ammoniaca si sono verificate nelle prime 24 ore** e il processo si è concluso dopo soli 4 giorni.
- Le perdite sono pari a circa 49 kg N/ha (per metodo IHF) e 26.4 kgN/ha per WT
- Le perdite corrispondono a circa l'84% (IHF)e il 45% (WT) del TAN totale applicato



Agricultural and Forest Meteorology 265 (2019) 48–55

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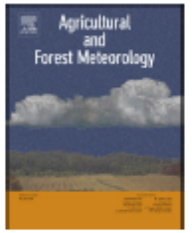
Agricultural and Forest Meteorology

journal homepage: www.elsevier.com/locate/agrformet



Prolonged sampling time increases correlation between wind tunnel and integrated horizontal flux method

Ester Scotto di Perta[a,b], Nunzio Fiorentino[a], Laura Gioia[a], Elena Cervelli[a], Salvatore Faugno[a], Stefania Pindozzi[a,*]

[a] Department of Agricultural Sciences, University of Naples Federico II, Portici, NA, Italy
[b] Department of Agricultural, Forestry, Nature and Energy (DAFNE), University of Tuscia, Viterbo, Italy

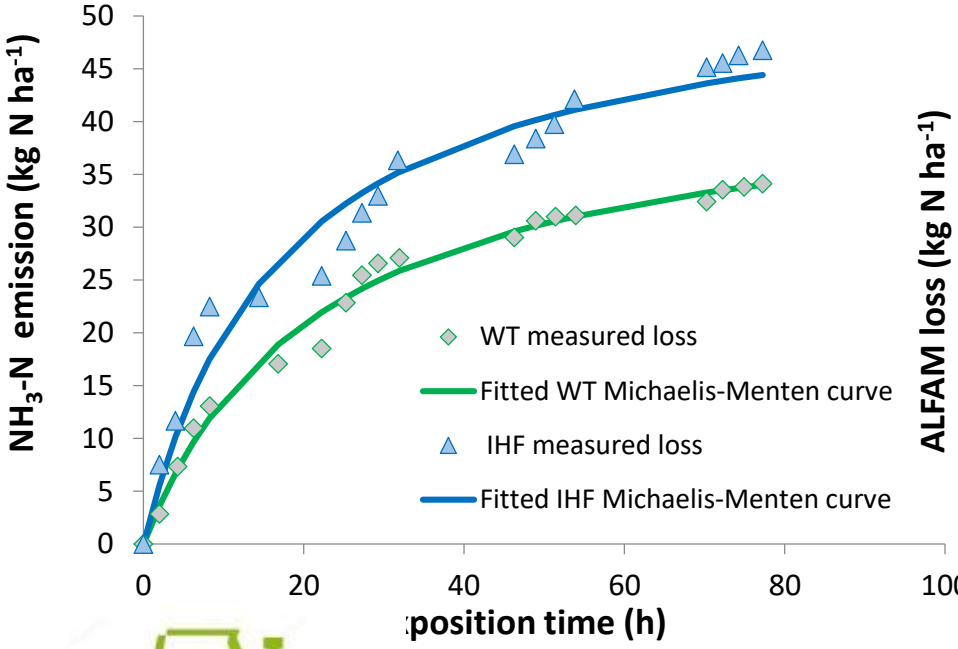
ARTI

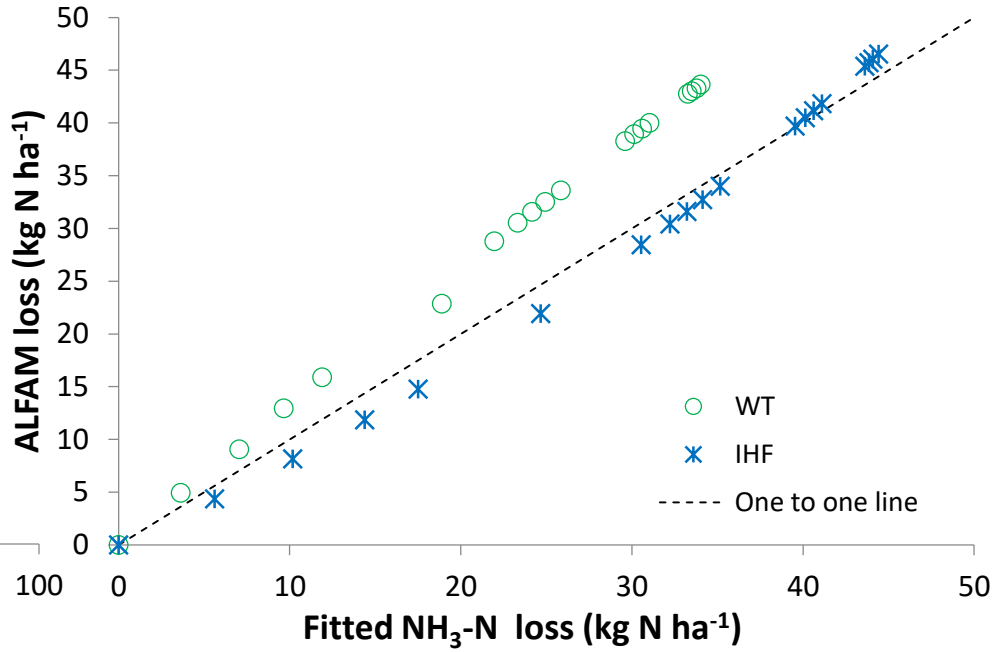
Table 4

Linear regression results between measurement methods. IHF rate (kg N ha^{-1} h^{-1}) was the independent variable (X variable), WT rate (kg N ha^{-1} h^{-1}) was the dependent variable (Y variable).

Trial	Parameters		Std.error	Lower 95%	Upper 95%	R^2
1-UR	Slope	−0.025	0.019	−0.250	0.199	0.003
	Intercept	0.055	0.107	0.015	0.095	
2-BM	Slope	0.306	0.070	0.158	0.454	0.56
	Intercept	0.216	0.107	−0.013	0.444	
3-BLD	Slope	0.639	0.050	0.531	0.746	0.92
	Intercept	−0.072	0.059	−0.199	0.055	

Results





ALFAM Model

Relations	R^2	Slope	Intercept	RRMSE	E	CRM
IHF fitted/IHF measured	0.964	1.013	-0. 782	8.957	0.971	-0.012
WT fitted/WT measured	0.989	0.995	0.004	5.128	0.989	-0.005
ALFAM_IHF/IHF fitted	0.993	0.927	2.597	5.550	0.990	-0.013
ALFAM_IHF/WT fitted	0.999	0.782	-0.291	33.446	0.543	0.228

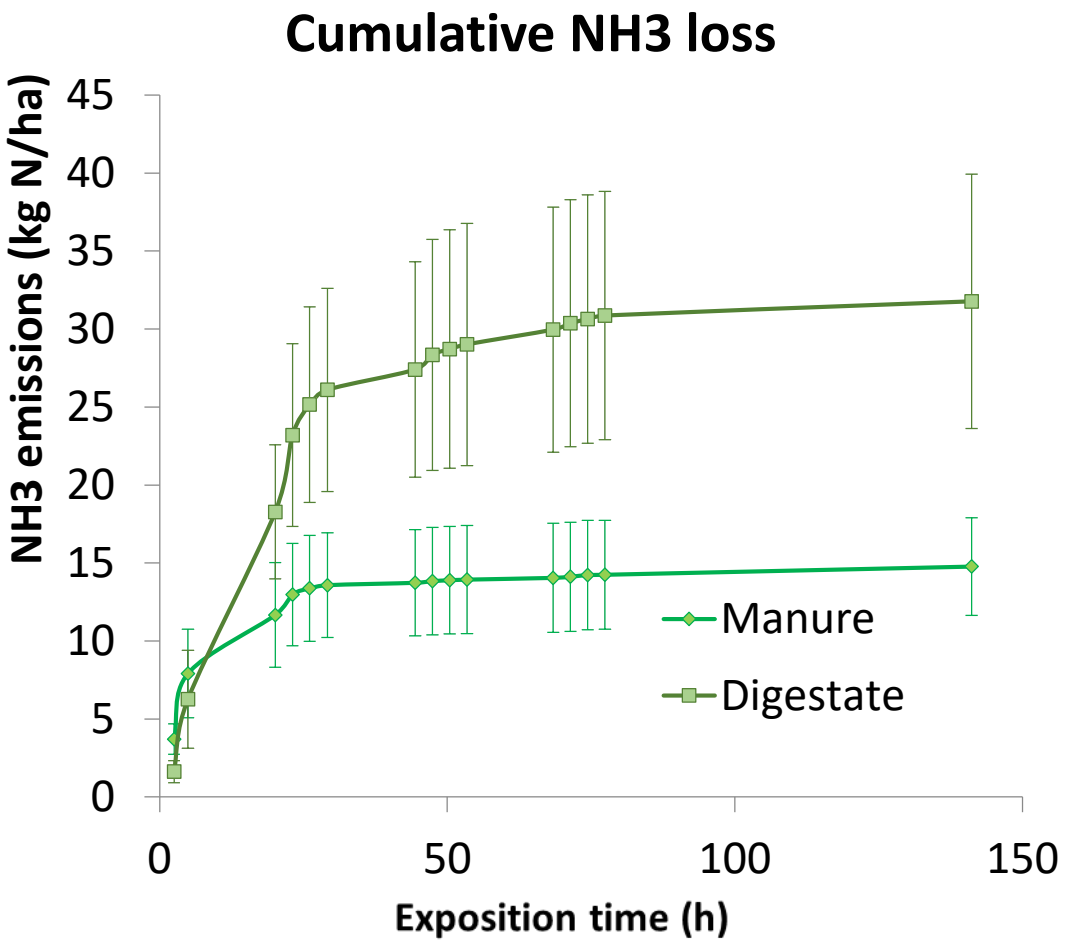
The ALFAM model was in particularly good accordance with IHF results for buffalo manure application to the field. In the same time, ALFAM model seemed to over predict the ammonia loss related to the wind tunnel.

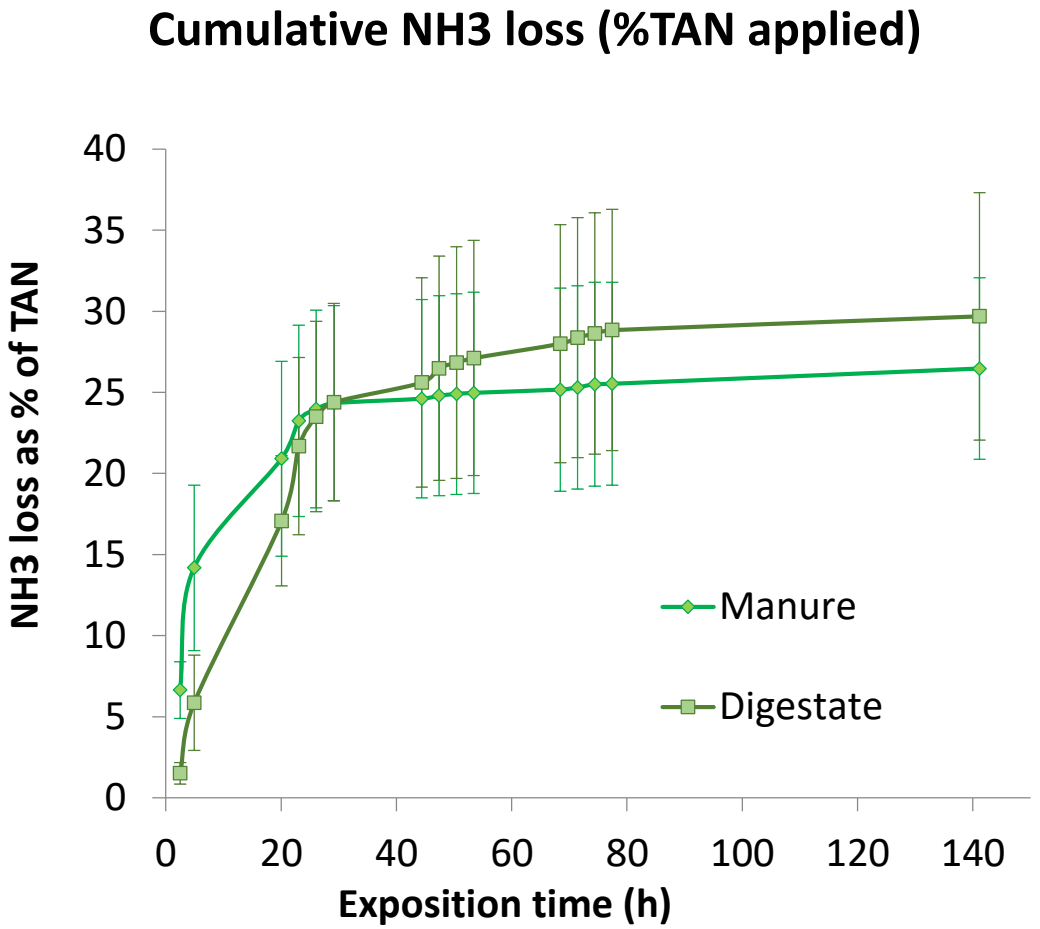



Confronto refluo tal quale vs digestato

Risultati

- Sono stati forniti **200 kg N /ha**
- Il Digestato sembra emettere di più…
- Ma se normalizzato rispetto al TAN le differenze si riducono

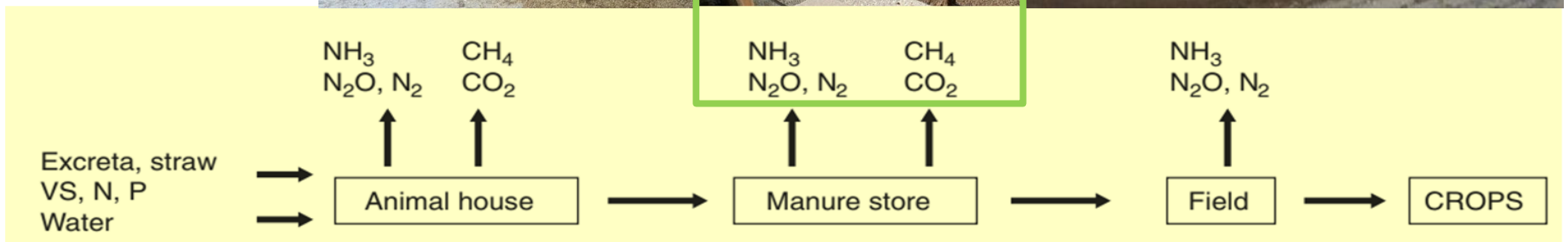




Allo stoccaggio?

AMMONIA
METHANE

EMISSIONS

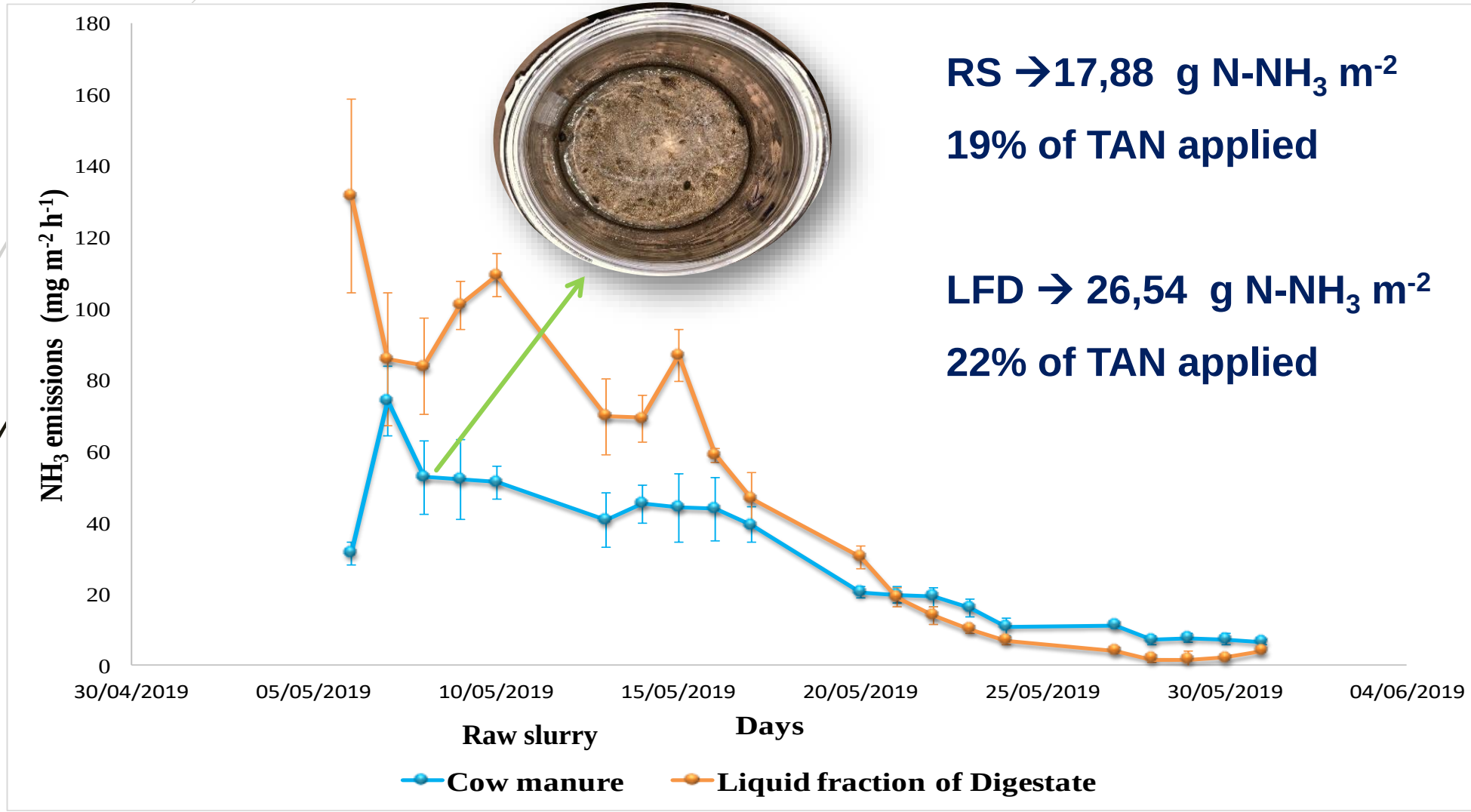


*** Flow diagram of N and C losses during management of deep litter (Sommer et al., 2013).*

Simulazione dello stoccaggio in camera termostatata (refluo bovino)

Refluo tal quale vs frazione liquida del digestato

Risultati


180
160
140
120
100
80
60
40
20
0
NH3 emissions (mg m-2 h-1)
30/04/2019
05/05/2019
10/05/2019
15/05/2019
20/05/2019
25/05/2019
30/05/2019
04/06/2019
Days
Raw slurry
Cow manure
Liquid fraction of Digestate
RS →17,88 g N-NH3 m-2
19% of TAN applied
LFD → 26,54 g N-NH3 m-2
22% of TAN applied

Monitoring of NH3 and CH4 emissions from dairy cows under storage conditions

Publisher: IEEE

Cite This

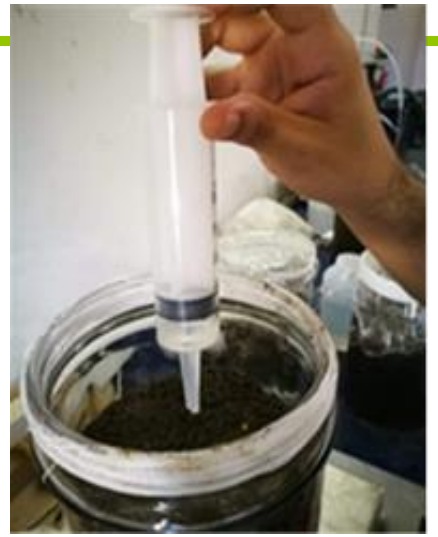
PDF

4 Author(s) Ester Scotto di Perta ; Elena Cervelli ; Salvatore Faugno ; Stefania Pindozzi All Authors

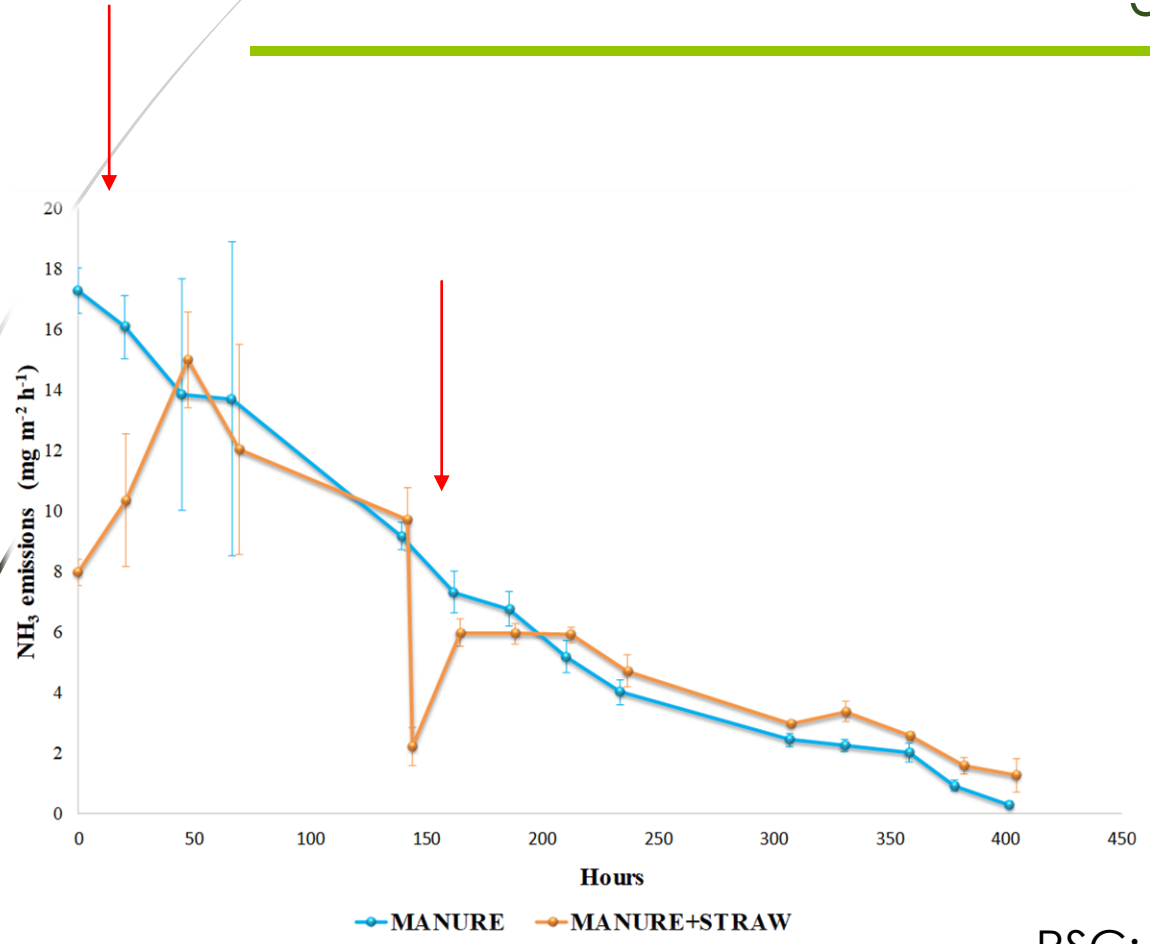
Abstract:
Cattle breeding is almost diffused around the world, with a growth of 7% in the last ten years. The increase in manure production makes cattle farms responsible for ammonia (NH 3) and methane (CH 4) emissions into the atmosphere. Many treatments have been adopted to reduce gaseous emissions, in order to comply with European regulations. Anaerobic digestion (AD) and solid-liquid separation (SLS) can modify the physical and chemical characteristics of manure, which are related to NH 3 and CH 4 emissions. The literature on the effect of the combination of both treatments on CH 4 and NH 3 emissions is still limited. Raw slurry (RS) and liquid fraction of digestate (LFD) were monitored during storage under controlled conditions, measuring NH 3 and CH 4 emissions with the dynamic chamber technique. The air sampled was analyzed using a gas-sensitive semiconductor and electrochemical sensors (Aeroqual, series 500). Results show that SLS and AD reduced the organic matter of manure, thus CH 4 emissions during storage, which accounts for 27% less than RS. On the other hand, AD increased the NH 3 emissions (48,5% more than RS) because of the higher Total Ammoniacal Nitrogen content of LFD. Only studying both gasses and

Tecniche di mitigazione allo stoccaggio (con paglia)





risultati
Flusso emissioni NH_3 – stoccaggio



- NH_3 1° giorno:

RCP = 8 mg m^{-2} h^{-1}

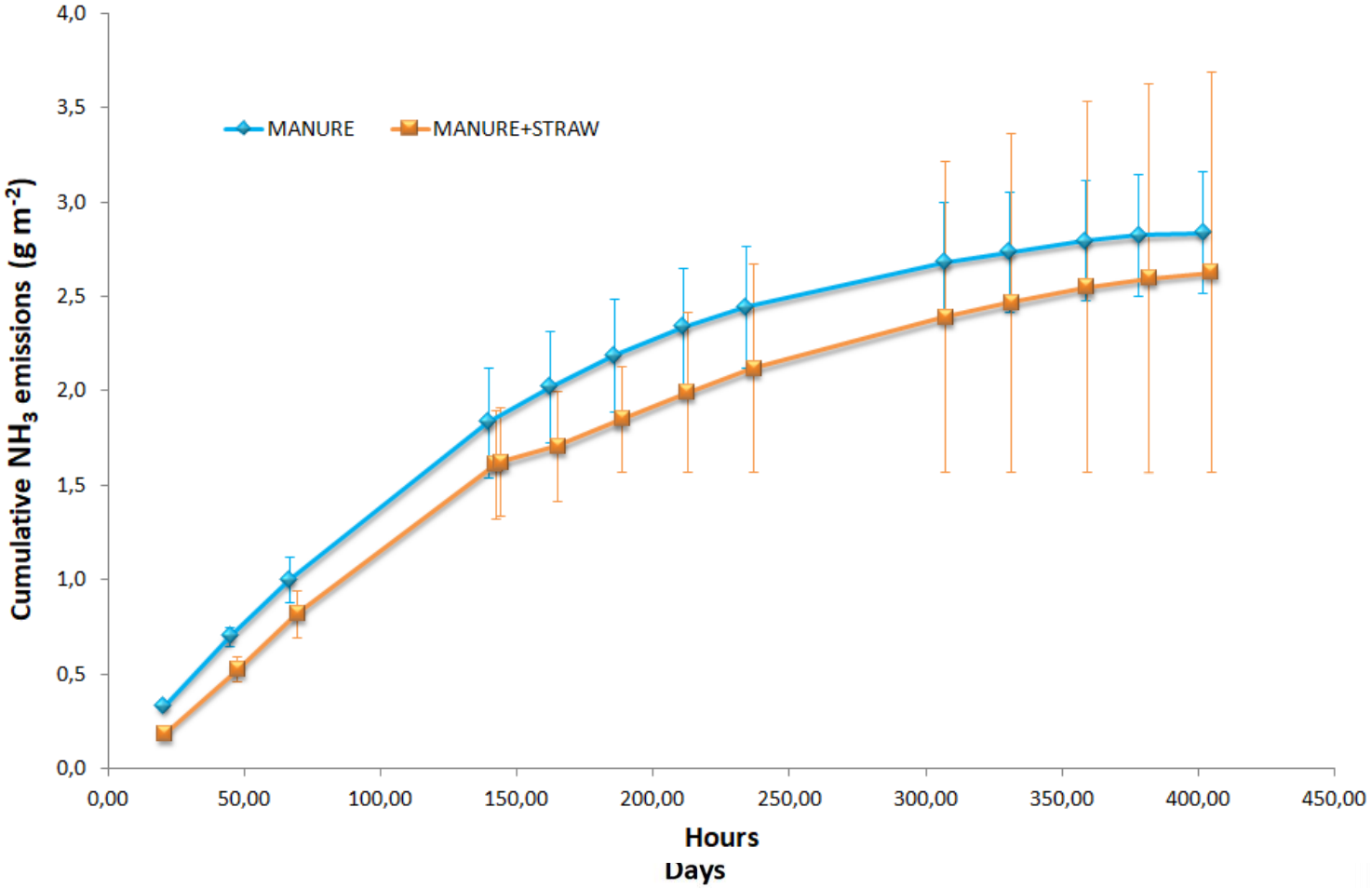
RSC = 17,3 mg m^2 h^{-1}

- NH_3 6° giorno 2° applicazione paglia:

RCP da 9,7 mg m^{-2} h^{-1} a 2,2 mg m^{-2} h^{-1} in due ore

RSC: Refluo Senza Copertura
RCP: Refluo Coperto con Paglia

Risultati
emissioni cumulate – stoccaggio



- Differenza di emissioni totali: **7,3%**

RSC: Refluo Senza Copertura
RCP: Refluo Coperto con Paglia

Risultati
Proprietà della paglia

- RCP: minore evaporazione
- RCP: emissioni inferiori
- Dopo la fase di stoccaggio:

RCP → TAN: 0,18 g kg^{-1}

RSC → TAN: 0,31 g kg^{-1}

- Capacità della paglia di assorbire parte dell'azoto contenuto nel refluo*

RSC: Refluo Senza Copertura
RCP: Refluo Coperto con Paglia

sustainability

MDPI

Article

Influence of Treatments and Covers on NH_3 Emissions from Dairy Cow and Buffalo Manure Storage

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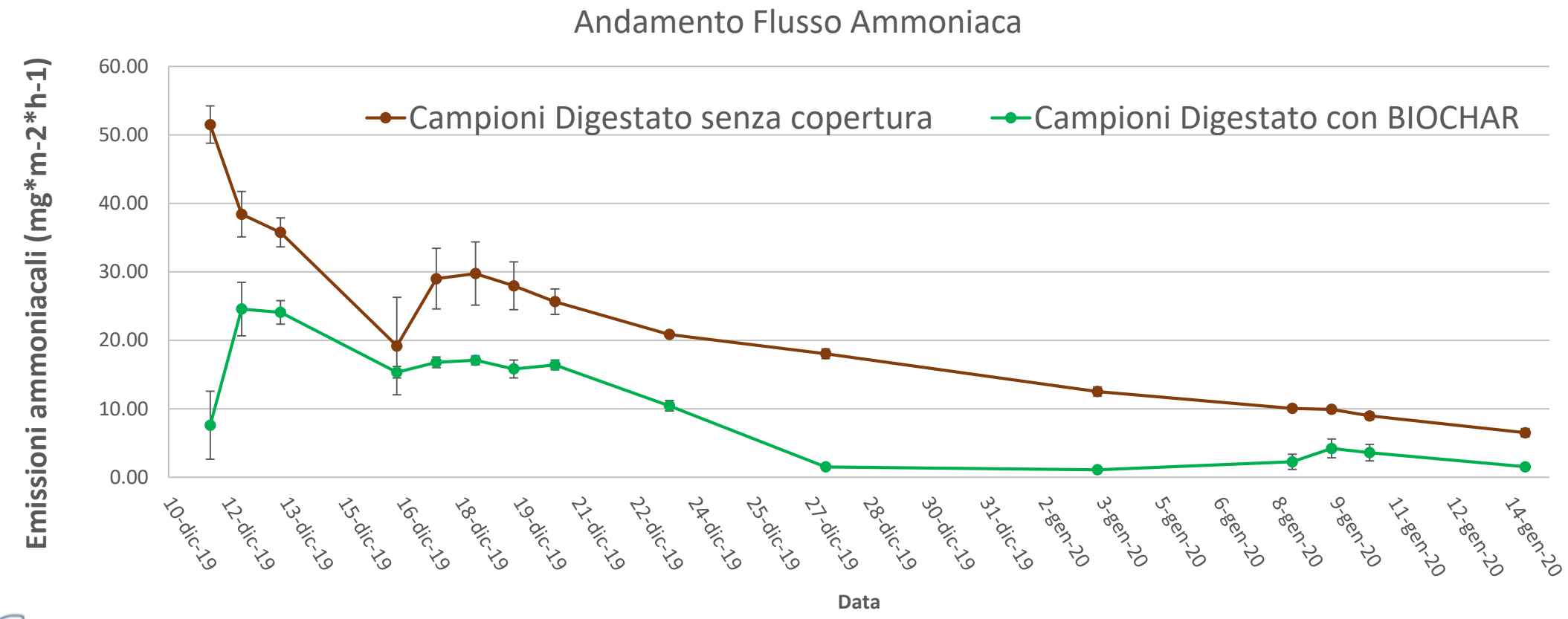
check for updates

Copertura con biochar



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RIDUZIONE
DELLE EMISSIONI
DI AMMONIACA
E GESTIONE
DELLE RISORSE IDRICHE
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Grazie

Stefania

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