Instrumental Odour Monitoring Systems (IOMS) in Practice: From Experimental Design to Hands-on Exploration of Industrial Field Monitoring Data

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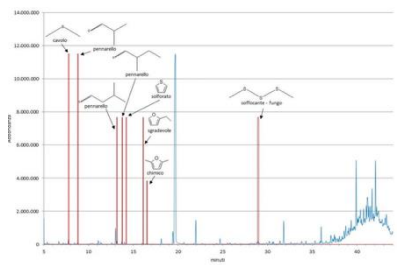
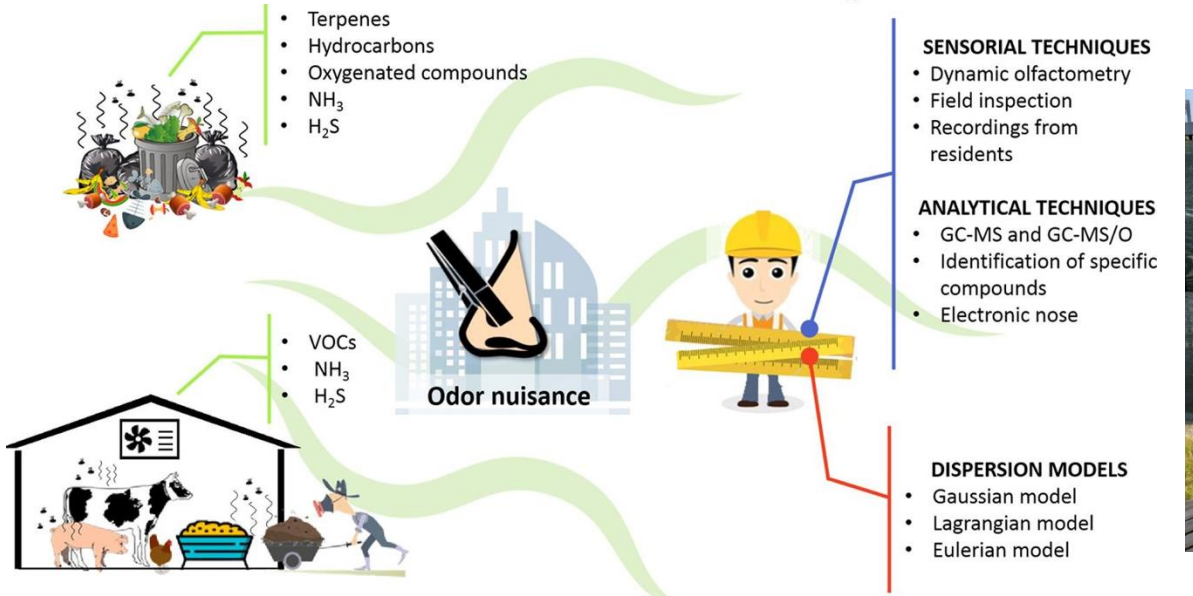


- The Olfactometric Laboratory of Politecnico di Milano was the **first olfactometric laboratory in Italy** (founded in 1997) and is currently the **reference centre for odour measurement and control** in Italy
- The lab includes all **cutting-edge technologies for odour monitoring**, besides the **technical competences regarding plants & processes**, which are needed to study **solutions for reducing odour impacts**



Laboratorio Olfattometrico

E-Noses at Polimi

Laboratorio Olfattometrico

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Odour pollution

- Odour pollution is the **presence of odorants in ambient air** at concentrations sufficient to be perceived and cause annoyance or reduced well-being.
- Unlike conventional pollutants, it is **defined by human perception rather than chemical thresholds**, making it inherently difficult to measure, regulate, and manage.
- In Europe, **odours are the 2nd cause of citizens' complaints** to local authorities.

Odour pollution

- The **respect of emission limits or of normal exposure limits do not guarantee absence of odours** because of the presence of compounds with very low odour detection threshold.
- Odour complaints often reflect a fear about possible **health risks**, even though this is generally not the case.
- The odour threshold (OT) values for many compounds are much lower than their exposure limits (expressed as time-weighted-average threshold limit value (TWA-TLV)), giving that **most dangerous compounds can be smelled at much lower concentrations than those causing adverse effects on health**. For instance, the OT for H_2S is ≈ 1 ppb, whereas its TWA-TLV is 1 ppm. This is however **not the case for some compounds (e.g., benzene)**.

TABLE 1. Symptoms from low to high concentrations of H_2S

Exposure level	Concentration, ppmv	Symptom
Low	0–10	Irritation of the eyes, nose, and throat
Moderate	50–200	Coughing Hoarseness Shortness of breath Pneumonia Loss of smell (> 100 ppmv)
High	200–500	Changes in respiratory tissue (200–400 ppmv per laboratory animals) Rapid respiratory distress and failure (acute exposure at > 500 ppmv for 1 to 4 hours)[2]
Very high	> 2,000	Coma and death after single breath[4] Known as "knockdown effect" with immediate immobilization and unconsciousness, possibly from disruption of oxidative metabolism in the brain

Environmental Odour Monitoring

Regulatory framework

Cina

GB 14554-93 national standard

National standard in force since 1994 specifying emission limits for 8 odour pollutants, composite odour concentration limits and site boundary limits for fugitive sources. Considered outdated given China's industrial evolution; revision has been under consideration for years and remains pending.

GB 14554-93

8 regulated substances

Revision pending

Japan

Offensive Odor Control Law (1972)

One of the earliest dedicated odour laws globally. Regulates 22 specified offensive odour substances by concentration at site boundary. Local governments may designate regulated areas and set their own standards. Dual approach: chemical concentration limits and an odour index tied to human olfactory perception.

22 regulated substances

Odour index system

Local authority powers

United States

State and local level regulation

No federal odour regulation — the EPA does not directly regulate odours. Some states set ambient dilution-to-threshold (D/T) limits measured with field olfactometers. States without specific rules delegate to local governments via nuisance ordinances. The Clean Air Act addresses air pollutant toxicity, not odour perception.

State D/T limits

Nuisance ordinances

Odour Control Plans

Europe

Composite regulatory framework

No single legislative instrument — odour management integrates technical standards with permitting and transparency obligations. Significant heterogeneity across Member States in emission limits, receptor-based criteria and setback distances. IED 2024 and IEP-R 2024 redefine authorisations, BAT definitions and EMS obligations.

EN 13725 — olfactometry

EN 16841 — field inspection

IED 2024 / IEP-R 2024

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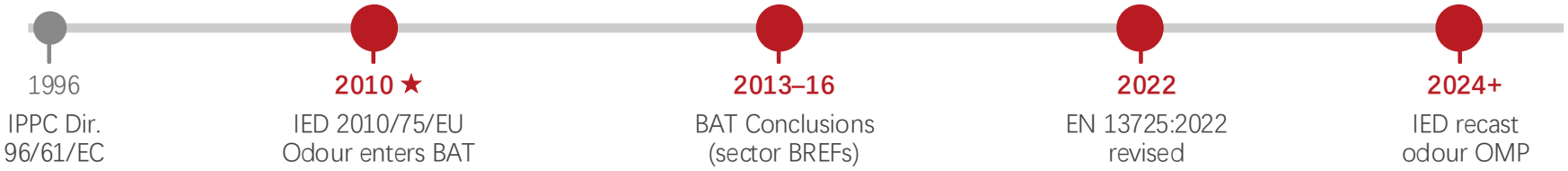
IED 2024 / IEP-R 2024

Odour pollution – IED 2010/75/EU

The **Industrial Emissions Directive (IED) 2010/75/EU** (2010) made odour nuisance a formal permit condition in Europe, directly linking it to Best Available Techniques (BAT) obligations.



IED Scope

~50,000 large EU installations (energy, waste, chemicals, food, livestock) subject to integrated environmental permit.

BAT & Odour

BAT Conclusions explicitly require odour monitoring via EN 13725 and emission limit values per sector BREF. https://eippcb.jrc.ec.europa.eu/reference

Permit Conditions

Competent authorities set binding odour limits; operators must implement site-specific Odour Management Plans (OMPs).

EN 13725 Link

The IED designates dynamic olfactometry as the reference measurement method — ouE/m³ is the regulatory unit.

IED 2010/75/EU

Each industrial activity giving rise to pollution **referred to in Chapters II to VI can operate only if it holds a permit** (Art. 4).

An application for a permit shall include a description of:

(a) the **installation and its activities**;
(b) the **raw and auxiliary materials**, other substances and the energy used in or generated by the installation;
(c) the **sources of emissions** from the installation;
(d) the **conditions of the site** of the installation;
(f) the **nature and quantities of foreseeable emissions** from the installation into each medium as well as identification of significant effects of the emissions on the environment;
(g) the proposed **technology and other techniques for preventing or reducing emissions** from the installation;
(h) measures for the **prevention, preparation for re-use, recycling and recovery of waste** generated by the installation;
(j) measures planned to **monitor emissions** into the environment;
(k) the main **alternatives to the proposed technology**, techniques and measures studied by the applicant in outline.

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(d) the **conditions of the site** of the installation;

(f) the **nature and quantities of foreseeable emissions** from the installation into each medium as well as identification of significant effects of the emissions on the environment;

Permits identify **Emission Limit Values** (ELV) for each pollutant that have to be respected for the different emission sources

IED 2.0 – 4th August 2024

Protect health & environment — minimise the impact of industrial and intensive livestock emissions on people and nature across the EU.

Promote innovation — drive transformation through the most effective and viable emissions reduction techniques.

Stricter emission limits — tighten rules with lower emission limit values and more stringent conditions for granting derogations.

Streamline permitting — new Industrial Emissions Portal Regulation to enhance access to environmental data.

Circular economy & resource efficiency — new tools to support circular economy goals and reduce use of hazardous chemicals.

Wider activity coverage — extend scope to mining, battery manufacturing, waste landfills, and more intensive pig & poultry farms.

Strengthen public rights — broader public information, participation, access to justice, and the right to seek compensation for health damages.

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- **The IEPR replaces the European Pollutant Release and Transfer Register Regulation (E-PRTR).**
- It provides **public access to key environmental data from industrial facilities** in EU Member States, Iceland, Liechtenstein, Norway, Switzerland, Serbia and the UK through the Industrial Emissions Portal.

https://industry.eea.europa.eu/

- All **IED plant permits are PUBLIC** and can be found online!

IED 2.0: Directly mentioning odours as pollutants

Art. 3 – Definitions

(2) 'pollution' means the direct or indirect introduction, as a result of human activity, of substances, vibrations, heat, noise **or odours** into air, water or land, which can be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment;

Art. 12 – Applications for permits

(c) the sources of emissions from the installation, **including odours**;

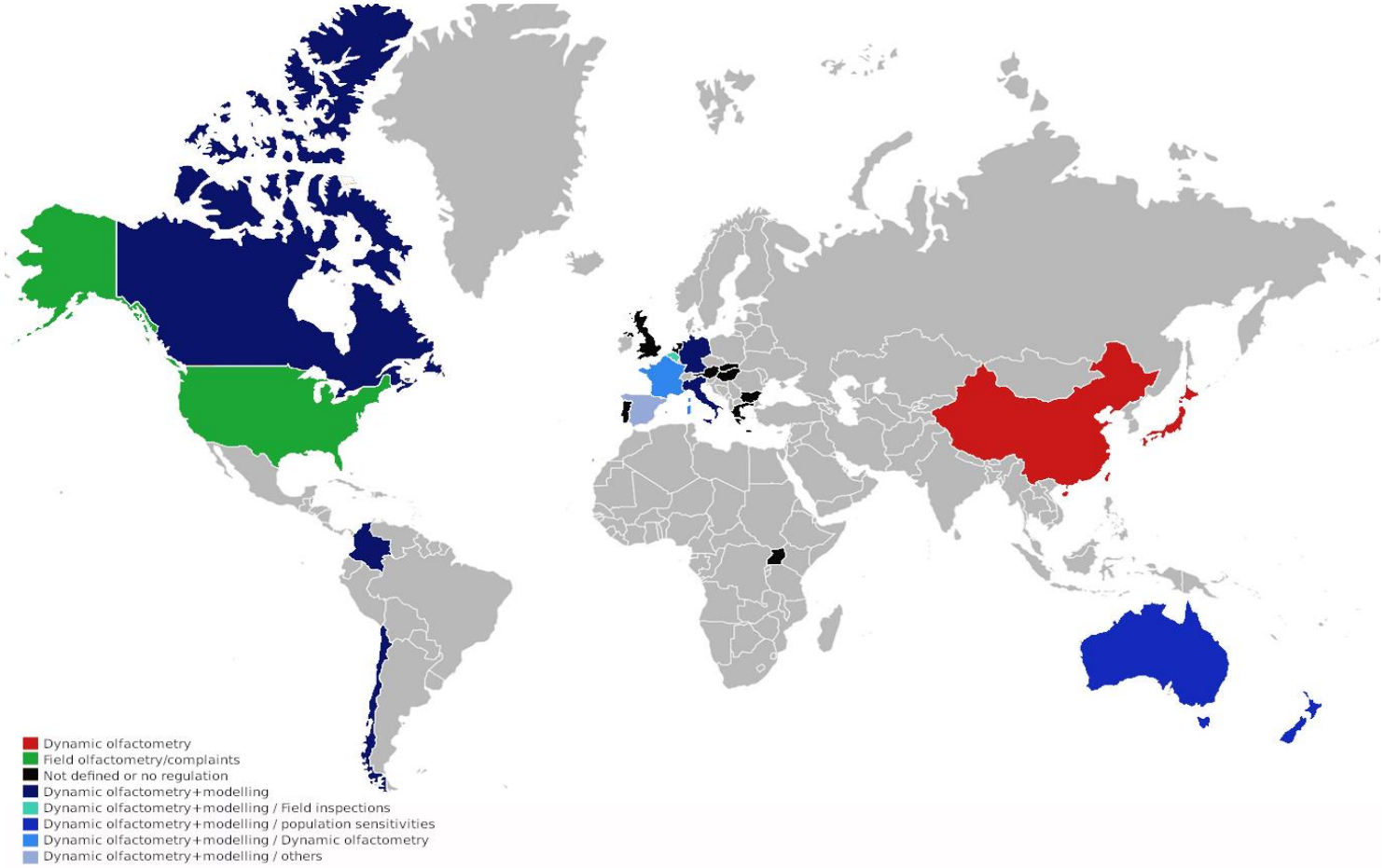
(f) the nature and quantities of foreseeable emissions, **including odours,** from the installation into each medium, as well as an identification of significant effects of the emissions on the environment;

All IED installations will have to **foresee odour emission management, ELV for odour emissions, and odour monitoring plans**
There is a **BREF document** on how to monitor emissions to air and water from IED Installations https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-12/ROM_2018_08_20.pdf

Regulatory approaches in Europe

The **most common approach** in European regulations is based on:

- **Quantification of emissions** by means of dynamic olfactometry (EN 13725:2022)
- **Impact evaluation** by means of odour dispersion modelling
- Citizen science and IOMS are often foreseen as complementary approaches to get a **deeper insight on the problem**



Source: Izquierdo C. et al. (2021). Analysis of existing regulations in odour pollution, odour impact criteria 2, D-NOSES, H2020-SwafS-23-2017-789315.

Odour measurement

- In order to devise proper strategies to manage and regulate odour pollution, there is the **need for specific methods for odour measurement and for odour impact assessment**
- **Measuring odours is a challenging issue**, as it entails the problem of **objectifying a sensation**; different methods can be used with the purpose of characterizing environmental odours.

STANDARDIZED MEASUREMENT METHODS

Dynamic Olfactometry
EN 13725:2022

Dispersion modelling
Integrated approach

Field inspections
EN 16841-1/2

Chemical Characterization
GC-MS and related

Citizen Science
UNE 77270:2023

IOMS
Continuous real-time monitoring

Instrumental Odour Monitoring Systems

Definition

Any instrument capable of continuously monitoring air and producing an odor-related metric as output

They include "electronic noses", but also monitoring tools based on different operating logics (e.g. chemical analysers, GCs)

IOMS: Why?

- The electronic nose is currently the only existing instrumental method for **real-time measuring odours in the field**
- It can be involved for long monitoring periods to:
  - Detect odour presence/absence (type A)
  - Classify odours, recognizing its origin (type B)
  - Estimate odour concentration (type C)

Among instrumental approaches, IOMS is the only method capable to provide a QUALITATIVE characterization of odours

IOMS: Why?

- **Diffuse sources**, difficult to model due to the difficulty of estimating an emitted flow rate (e.g. non-aspirated sheds, tanks, caissons, open storage, etc.)



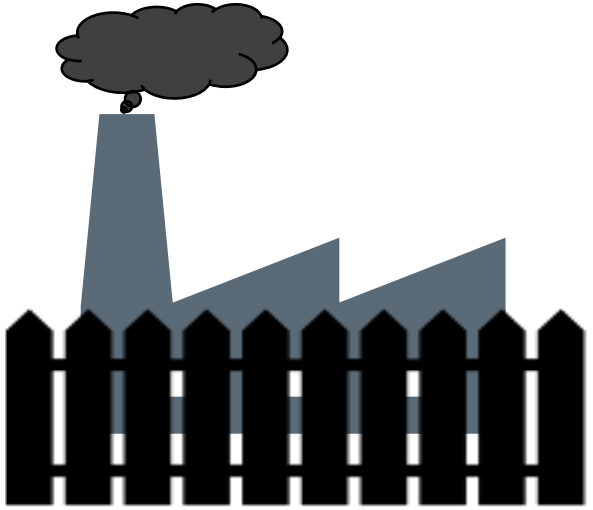

- **Variable emissions over time** (e.g. foundries, asphalt production, discontinuous or "countryside" processes, etc.)
- **Presence of several plants in the area**, so the assessment of the olfactory impact on the citizen should take into account the different sources, which are not necessarily additive

IOMS: Where?

Receptor

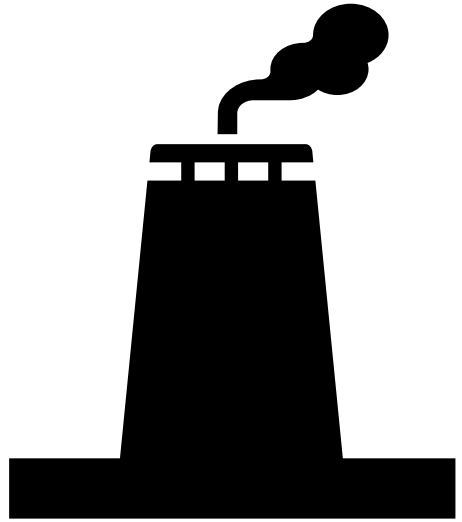
A. Detection
B. Classification

Plant Fenceline



A. Detection
B. Classification
C. Quantification

Emission Source



A. (Classification)
B. Quantification

IOMS: Where?

- **Emission sources**
  - Continuous estimation of the odour concentration
  - Real-time assessment of abatement systems' efficiency
  - Process control

- **Plant fenceline**
  - Continuous characterization of ambient air in terms of quality and concentration
  - Real-time identification of anomalous emissions associated to altered operating conditions
  - Validation of odour events signaled at receptors by citizens or another IOMS

- **Receptor**
  - Direct assessment of the odour impact associated
  - Recognition of odour provenance, in case of multiple presence of industrial activities on the territory

IOMS: Where?

- **Emission sources**
  - C
  - R
  - P
- **Plant**
  - C
  - R
  - V
- **Rece**
  - D
  - R
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Different systems and experimental approaches (training, data pre-treatment and processing algorithms) may be required according to the specific application and to the desired output

IOMS Technical Requirements

for reliable field deployment

Long-term continuous characterization
Sustained operation over medium-to-long monitoring periods without performance degradation

Stable and reproducible responses
Consistent sensor output over time to ensure comparability across measurement campaigns

Detection of diluted mixtures
Sensitivity to highly diluted odour plumes, particularly in receptor-based monitoring scenarios

High sensor sensitivity
Ability to resolve low-concentration odour signals against background noise

Variable atmospheric conditions
Robust outdoor installation design to withstand fluctuating temperature, humidity and weather

Interference compensation
Active correction for temperature and humidity effects on sensor response

! IOMS are not plug-and-play instruments !

Reliable operation requires a dedicated training phase to build source-specific models and appropriate machine learning to compensate for drift and environmental interferences

Experimental protocol
from industrial process analyses to results interpretation

1 Contextualization of the odour problem
- Analysis of the industrial process
- Review of technical documentation and environmental permit
- Plant inspection

2 Definition of monitoring goals and IOMS installation site
- Definition of odour classes
- Parametric dispersion modelling
- Selection of monitoring sites

3 IOMS training
- Execution of olfactometric campaign at main emission sources
- Preparation and IOMS analysis of diluted odour samples
- Tuning and preliminary testing of training models

4 Field performance testing & monitoring
- Specific field tests
- Real-time analysis at monitoring sites

5 Interpretation of monitoring results
- Data analysis & reporting
- Compliance assessment
- Actionable recommendations

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   - Data analysis & reporting
   - Compliance assessment
   - Actionable recommendations

IOMS Odour Monitoring under new IED

- Huge opportunity for IOMS to be introduced in IED installations permits and **prescribed** as systems for continuous odour emission monitoring
- Potential **exponential market increase** of E-Noses for environmental odour monitoring

- E-Noses used as environmental monitoring tools within permits are gaining a **"legal" value**: requirements of high accuracy and long-term stability to ensure reliability of results over time
- Urgent need for **standardized quality protocols** for performance verification

Technical standards on IOMS in Europe

In Italy:

- UNI 11761:2023 regarding environmental odour monitoring by IOMS
- Definition of performance verification protocols for IOMS considering 3 levels
  1. Metrological verification to be carried out by the manufacturer using reference gas mixtures
  2. Field performance verification with real samples after training
  3. Periodical verification over time

In Europe:

- Since 2015, within CEN TC/264 “Air quality”, WG 41 is active with the goal to draft a European Norm (EN) regarding the use of IOMS for environemntal odour monitoring
- The standard (whose publication is expected in 2027) will be divided in 3 parts:
  1. Definitions and general aspects
  2. Technical specifications and QA/QC requirements
  3. Field validation (to be published as TS)

Technical standards on IOMS in Europe

Highlights

- They don't describe instrument hardware, but define **quality protocols for performance testing**
- Applicable to instrumental odour monitoring in:
  - ambient air
  - ambient air at the fence line of the source installation
  - odorous gas emissions, including waste gases upstream of odorant abatement devices
- Not applicable to:
  - direct determination of the odour concentration in ou_E/m^3
  - direct monitoring of hedonic tone (or pleasantness or unpleasantness)
  - direct assessment of odour annoyance
  - the monitoring of air quality for purposes of environmental health and safety
- 3 types of measurements:
  - Presence/absence measurement (Type A)
  - Odour class measurement (Type B)
  - Odour quantity measurement (Type C)
- **No acceptability criteria are fixed (yet)**!

https://store.uni.com/en/uni-11761-2023

Techical standards on IOMS: IEEE P2520.1

“Baseline Performance of Machine Olfaction Devices and Systems”

- The P2520.1 standard defines **performance benchmarks** based on three functional capabilities: **differentiation, identification, and quantification**.
- For each, the system is **tested against defined chemical mixtures under varying environmental conditions**, including changes in temperature and humidity, over extended time periods.

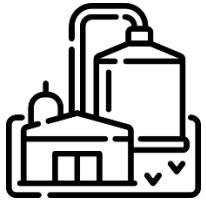
James Covington,
University of Warwick

Case Study: Monitoring of odour emissions from a waste treatment plant

1. Contexualization of the odour problem

ORGANIC FRACTION OF MUNICIPAL SOLID WASTE
80’000 ton/y

ANAEROBIC DIGESTION



BIOGAS → BIOMETHANE
4.7 M Sm^3/y

DIGESTATE → COMPOST

1. Contexualization of the odour problem

Authorized emissions in the environmental permit

EMISSIONS	SOURCE	ABATEMENT SYSTEM	POLLUTANTS
E02 - E04	Emergency flare for biogas combustion	-	-
E03	Buldings air extraction 4 scrubbers	Biofilter	Dust, Organic acids, mercaptans, NH_3, H_2S, odour and TVOC
E05	Boiler 991 kW	-	NO_x, CO, HCl, TOC, dust, SO_2

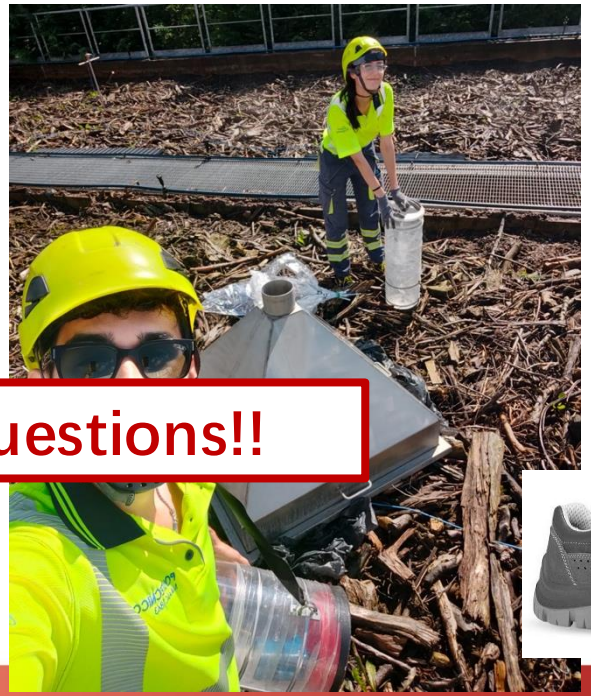
Only emission **E03 biofilter** has been included as odour emission to be considered

1. Contexualization of the odour problem

Plant Inspection

- Position and availability of sampling points (for training)
- Effective status of the plant (conformity to descriptions in the permit)
- Real dimensions of sources
- Air suction system
- Unforeseen (diffuse) emissions (e.g., openings, vents, etc.)

Inspection report with description of emission sources and definition of sampling strategy

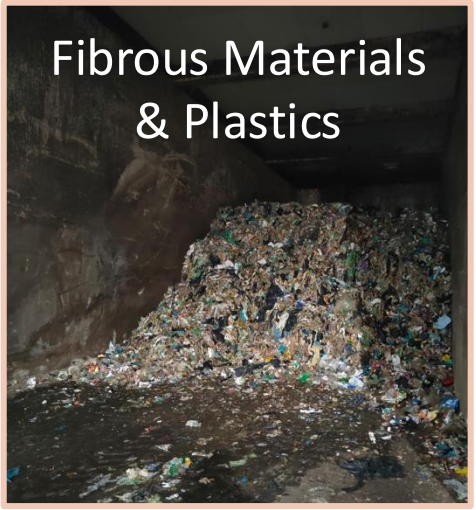


Keep eyes (and noses!) opened, and ask questions!!

1. Contexualization of the odour problem

Other odour emissions

- **Fuggitive leaks** from:
  - Organic waste storage and pre-treatments sheds;
  - Plastic storage and Compost maturation shed;
  - De-Sandblasting section;
  - Biogas upgrading section;



2. Definition of monitoring goals and IOMS installation site

Objectives

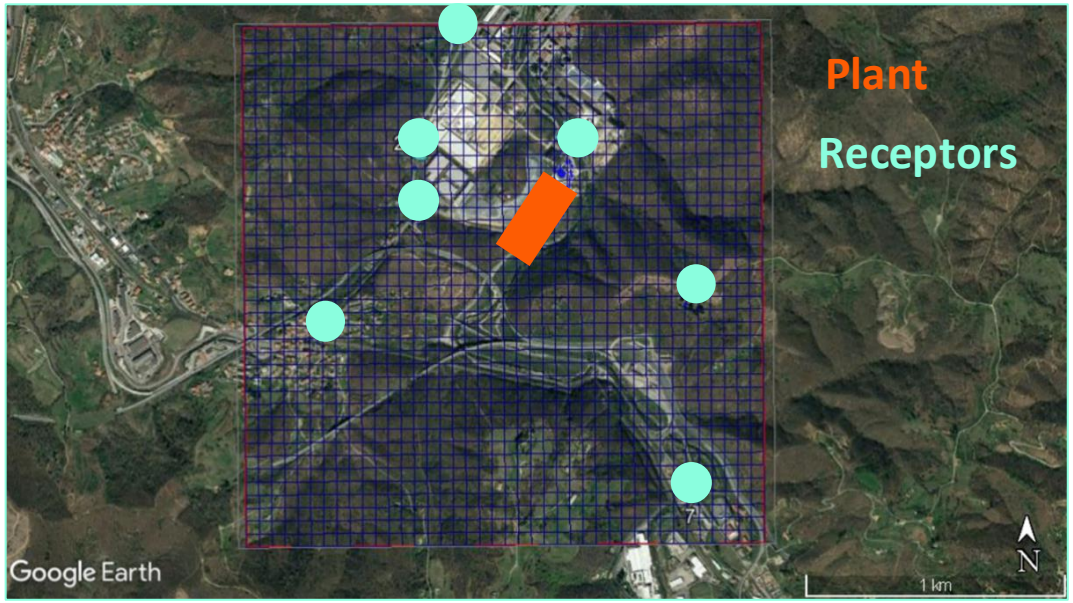
- Development of a monitoring network at the fenceline for:
  - Real-time assessment of the odour concentration
  - Qualification of the detected odours
  - Definition of an alarm threshold for the odour concentration

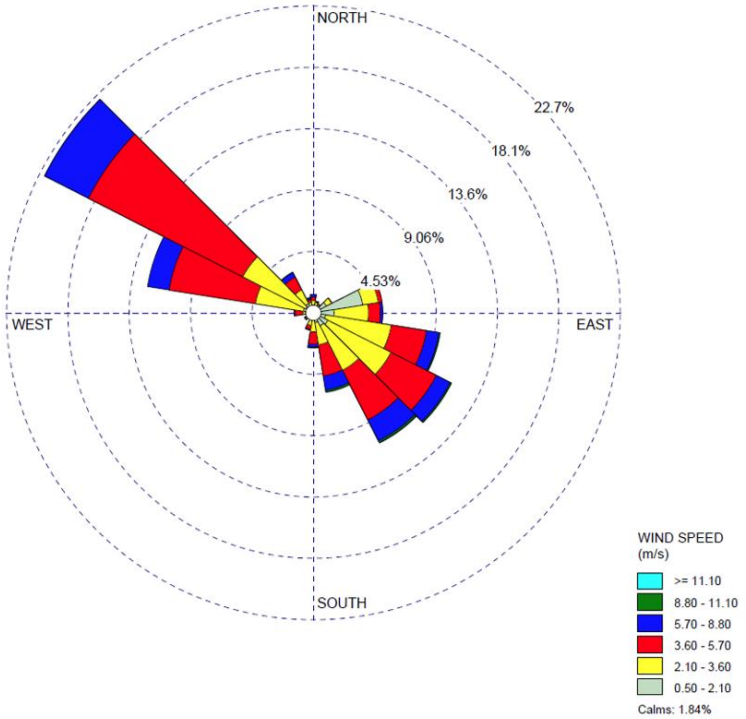
Peculiarities

- Quantification of complex odour emissions
- Management of environmental interferences
- Drift compensation

2. Definition of monitoring goals and IOMS installation site

- Parametric modelling of odour emissions



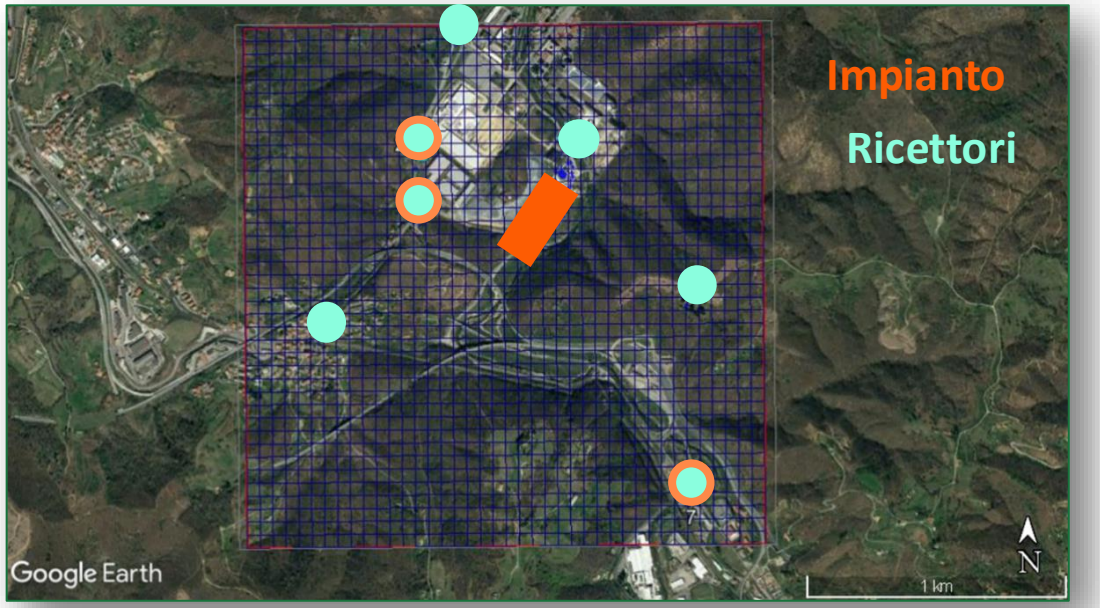


Receptors

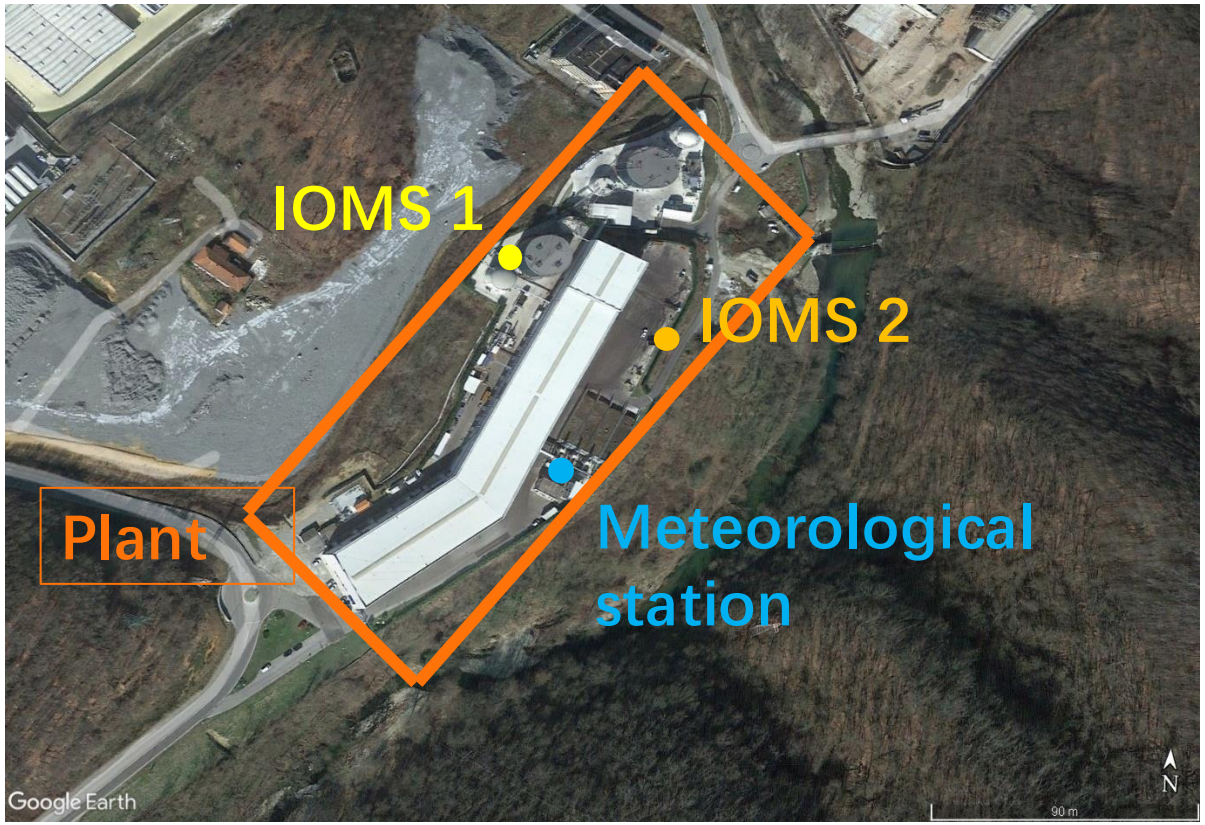
Plant

2. Definition of monitoring goals and IOMS installation site

- Parametric modelling of odour emissions



Most impacted receptors
Receptors
Plant



2. Definition of monitoring goals and IOMS installation site

IOMS network

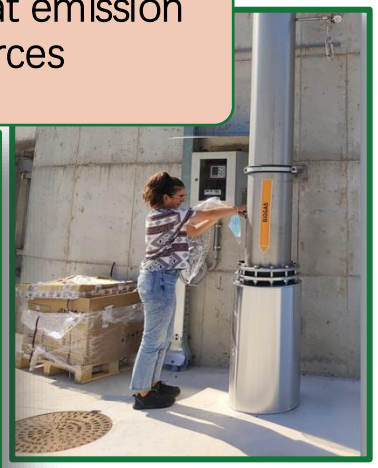
- 2 Ellona outdoor e-noses:
  - 4 SMOX sensors
  - 2 elettrochemical sensors (H_2S, NH_3)
  - 1 Photo Ionization Detector (total VOCs)

Meteorological station

- 1 Davis Instrument station measuring:
  - Wind speed and direction
  - Temperature, pressure and relative humidity
  - Solar radiation

3. IOMS training

Sampling at emission sources

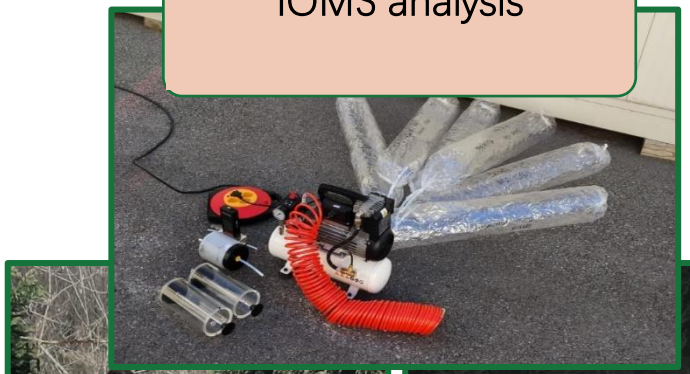


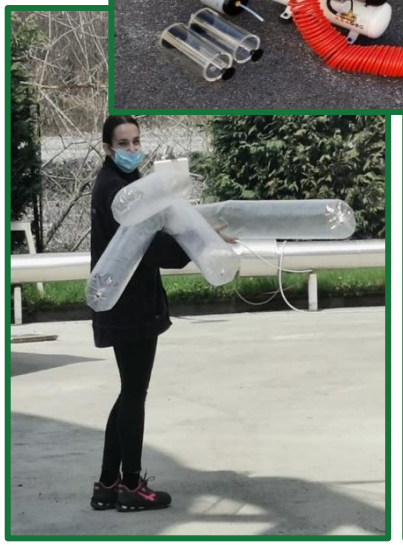
DILUITION
samples at different concentration levels are obtained by mixing defined volume of samples collected at source with odourless ambient air

Olfactometric characterization

DYNAMIC OLFACTOMETRY
Assessment of samples' odour concentration [ouE/m3]

IOMS analysis





3. IOMS training

FIELD CAMPAIGNS

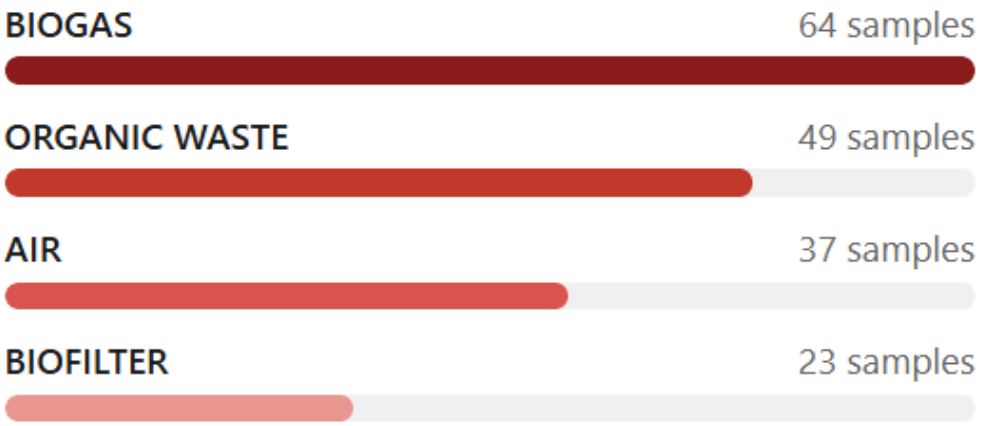
Several **sampling & testing campaigns** conducted in the field to cover emission variability and seasonality

TRAINING DATASET

Dataset includes **more than 100 samples** across 4 emission source categories, collected under diverse operating conditions

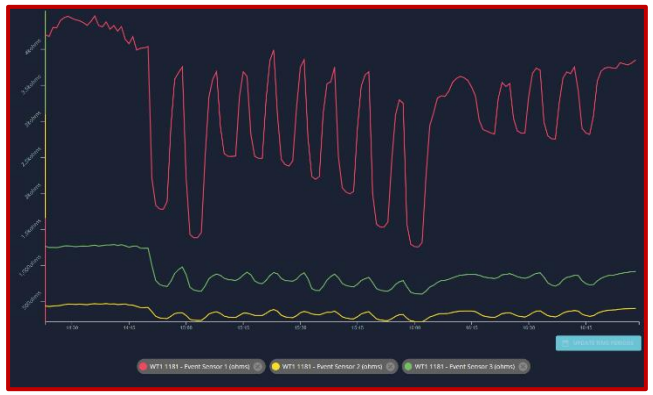
SAMPLE BREAKDOWN BY SOURCE

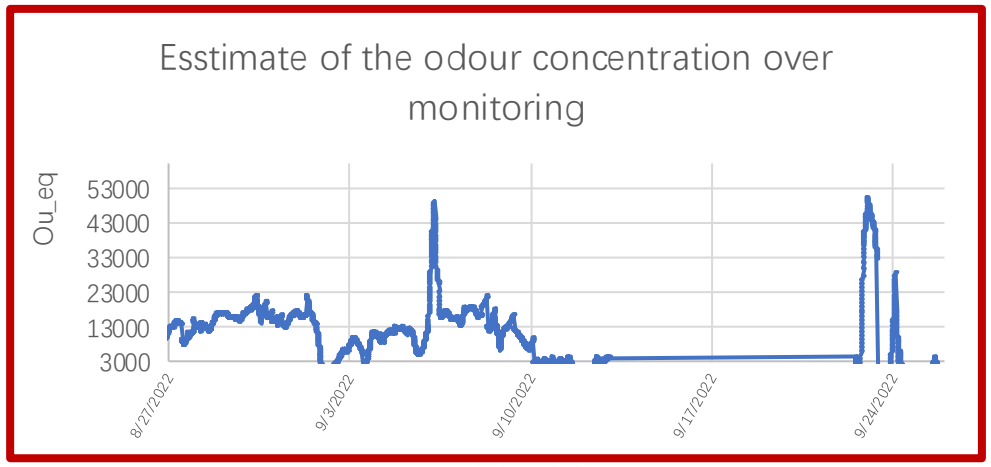
173 total samples

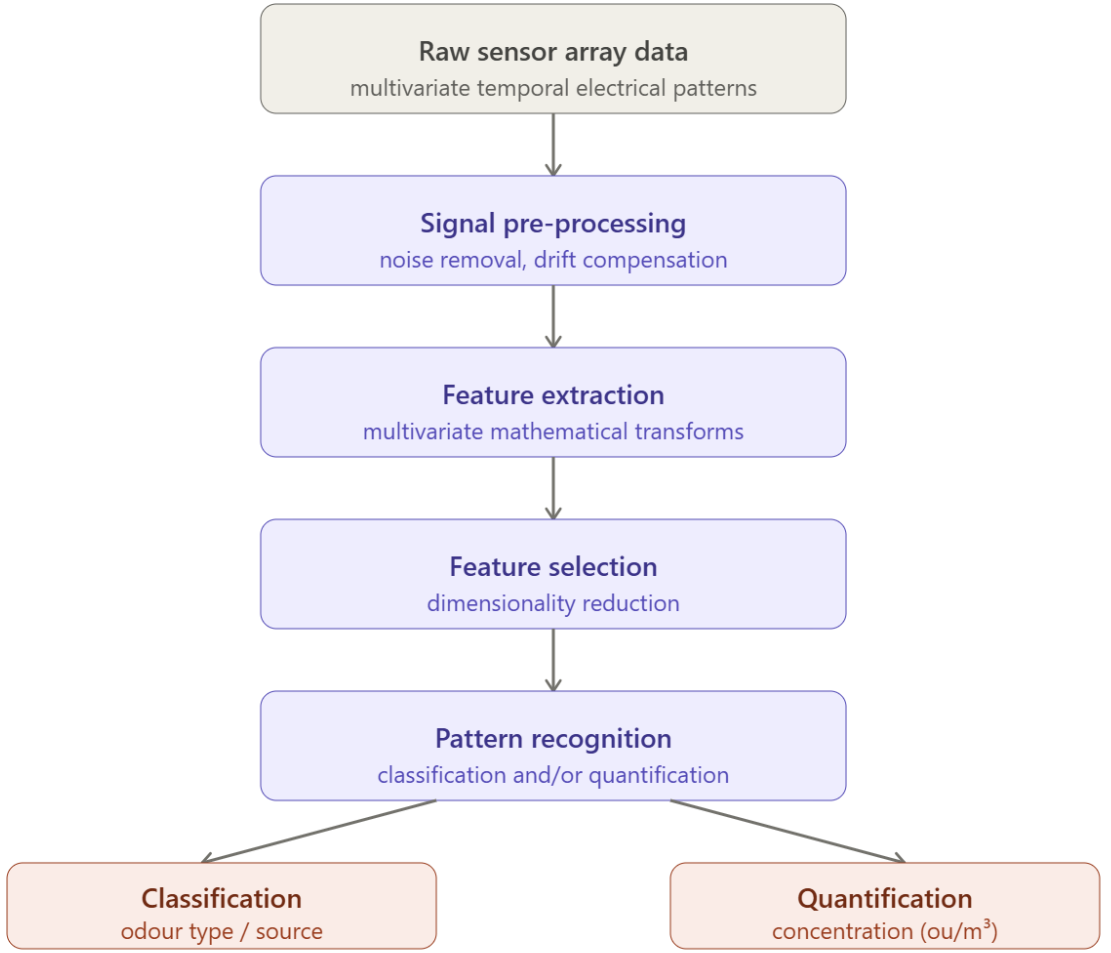


3. IOMS training

from sensors signals to monitoring data

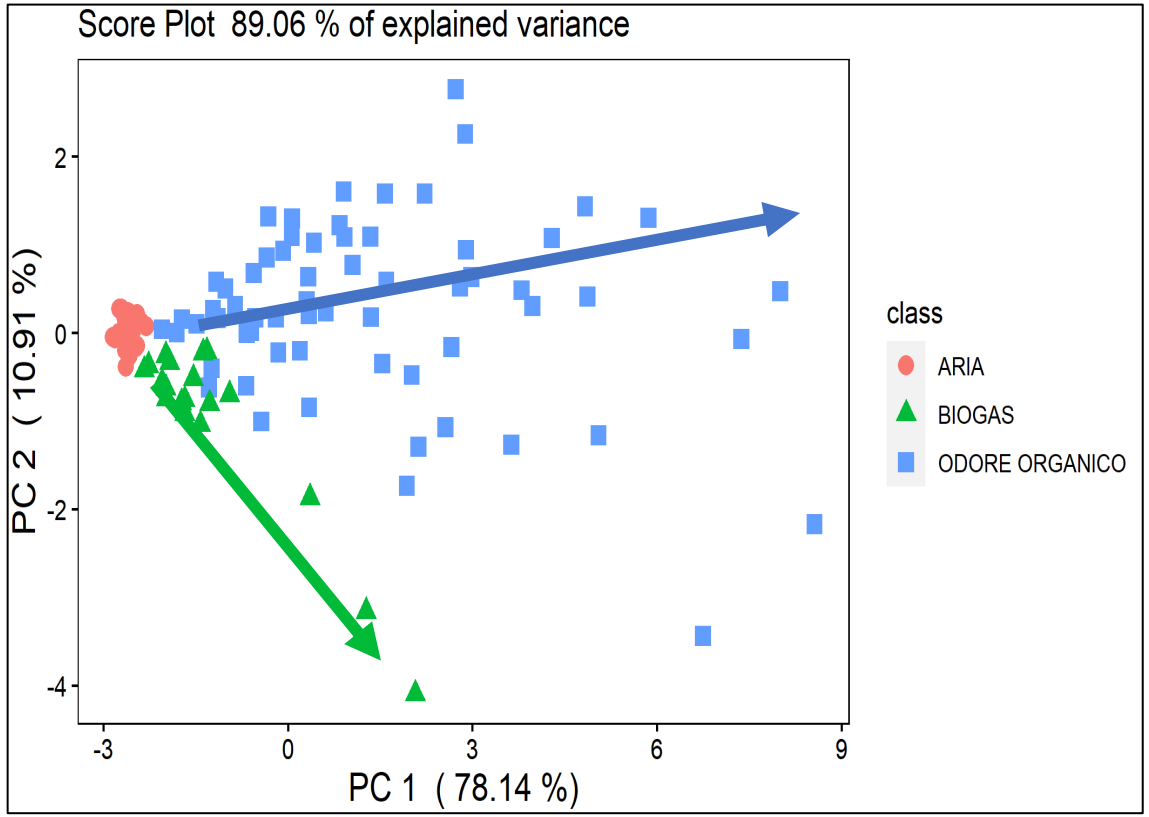




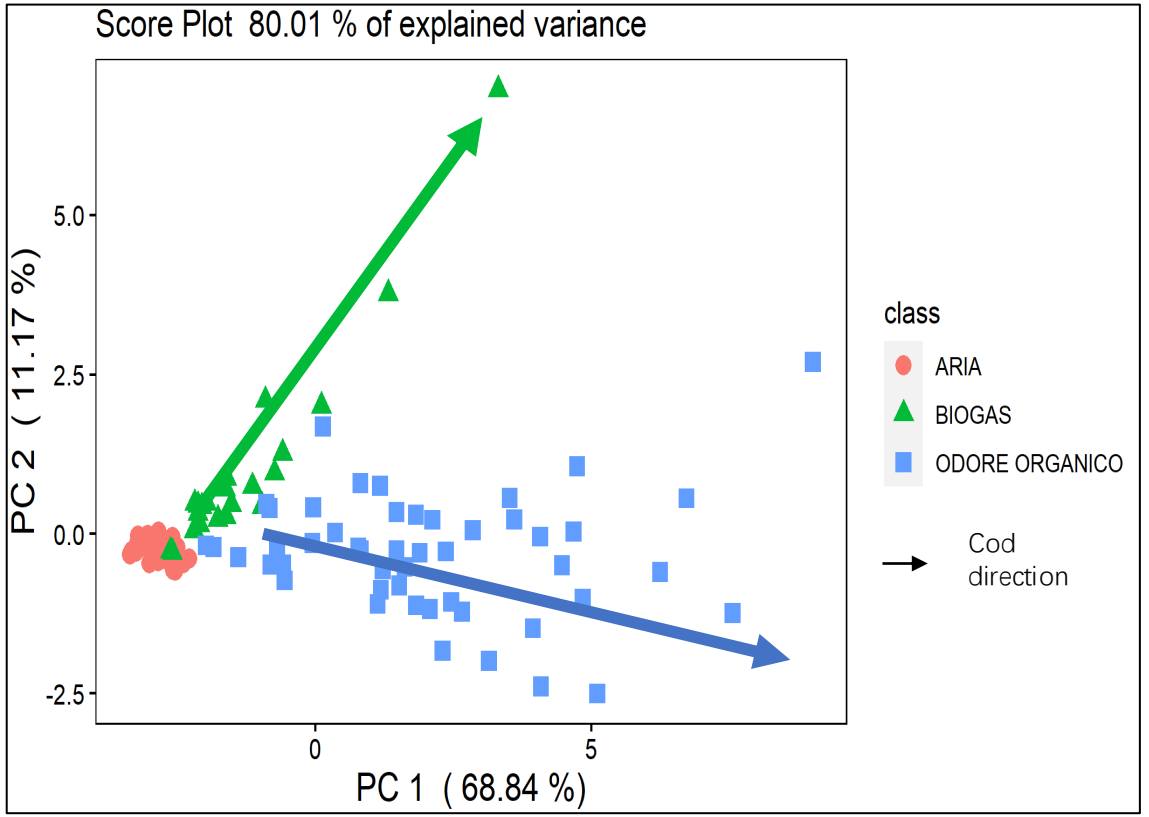


3. IOMS training

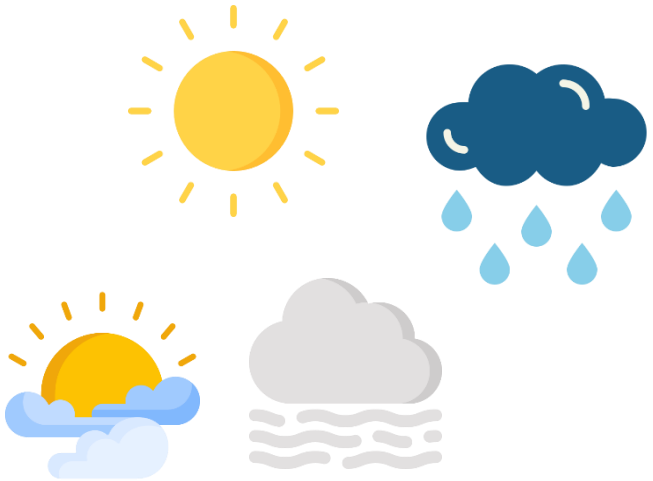
IOMS 1

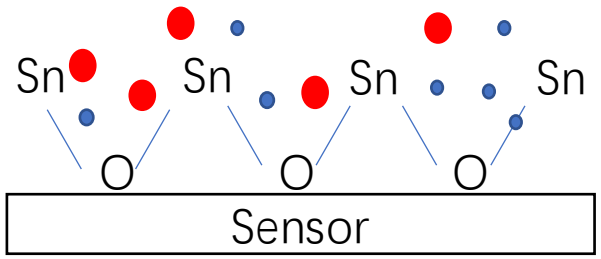


IOMS 2



Management of interferences





! Competitive adsorption of water vapour and and VOCs !

Hardware

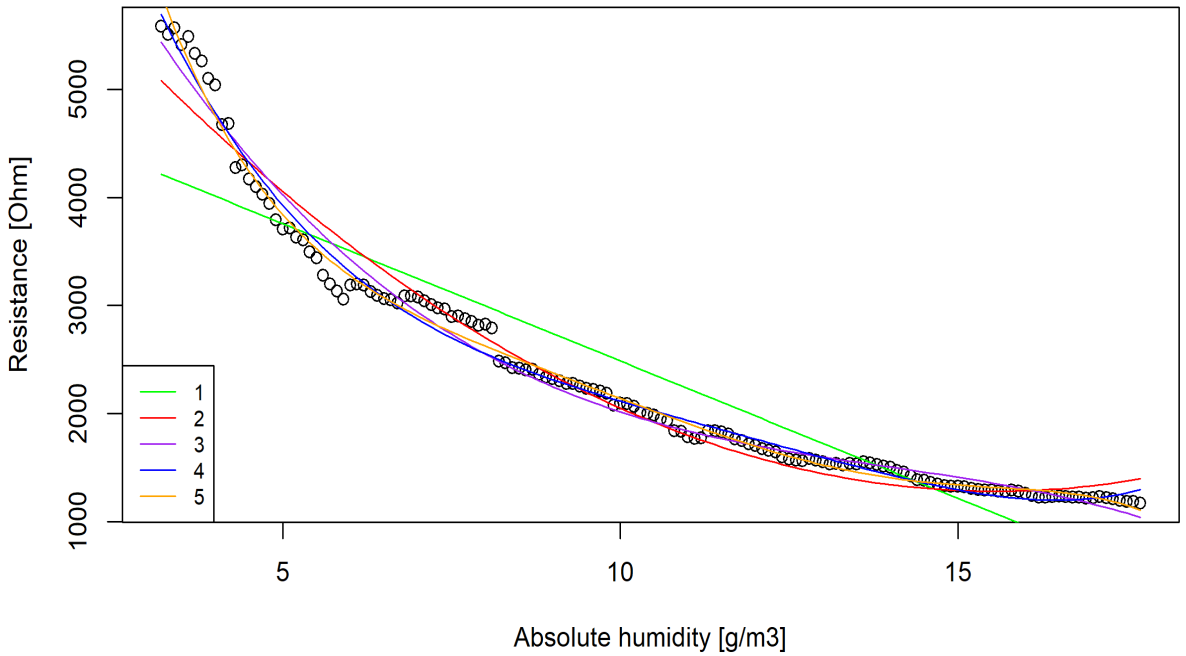
- Physical pre-processing of gaseous samples prior of the analysis to reduce/control its moisture content
- Need for complex and expensive additional device for sampling

Software

- Development of compensation models based on samples moisture content

Management of interferences

Sensor signals VS Absolute humidity



Dynamic baseline compensation based on polynomial regression:

$$R = a_1 + a_2 * AH + a_3 * AH^2 + \cdots + a_n * AH^n$$

Classification accuracy

95%
($CI_{95\%}$: 80 – 100%)

Compensation applied

80.5%
($CI_{95\%}$: 73 – 93.5%)

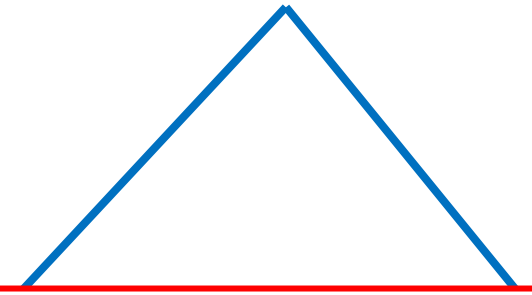
Compensation not applied

Ratti et al., 2024. Real-time monitoring of odour emissions at the fenceline of a waste treatment plant by instrumental odour monitoring systems: focus on training methods. Sensors 24, 3506.

Management of interferences

Sensor signals VS Absolute humidity

Classification accuracy

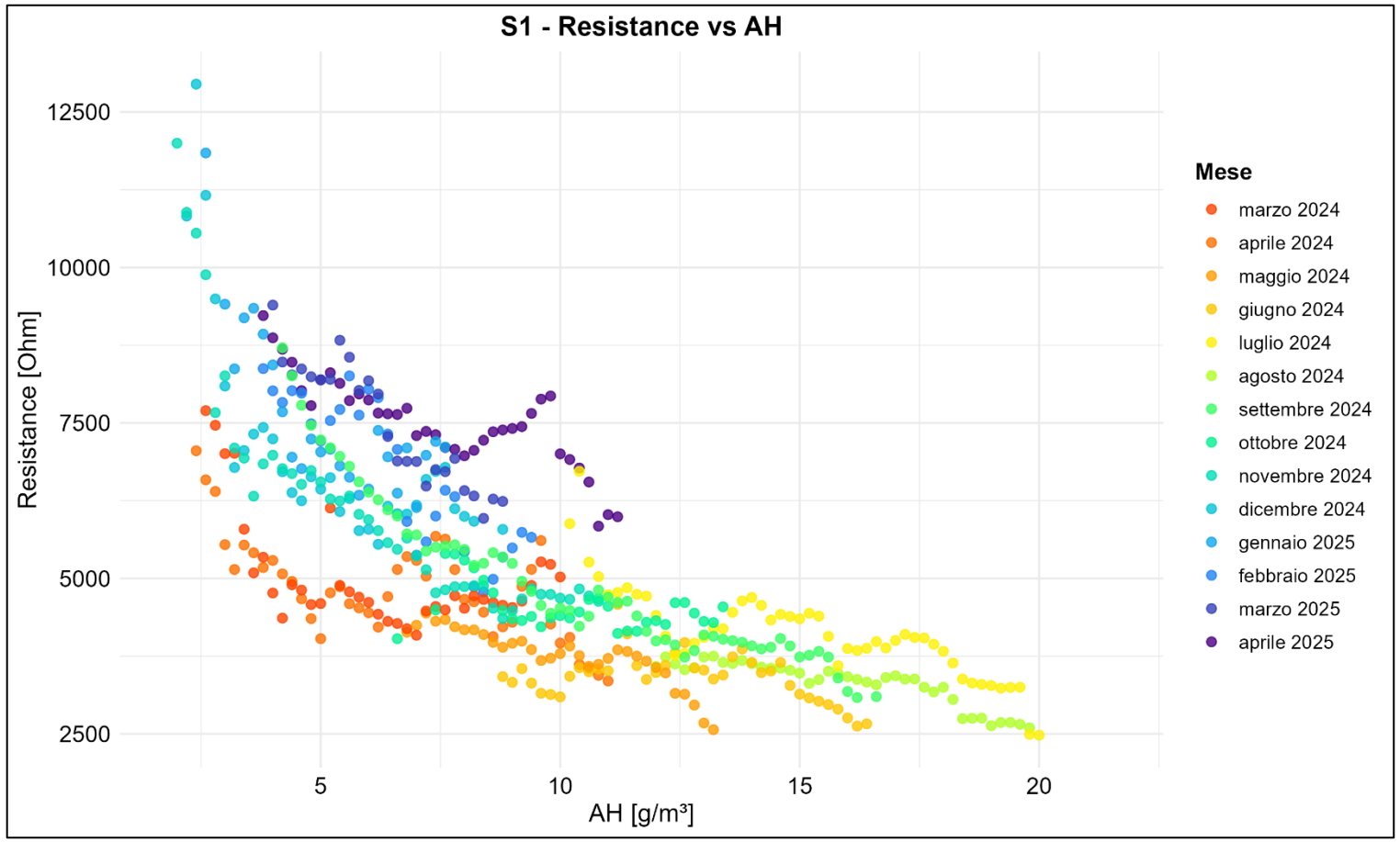


Main limitations:

- Application of regression model month by month -> need to continuously update the model parameters
- No physical meaning behind polynomial regression and risk of overfitting

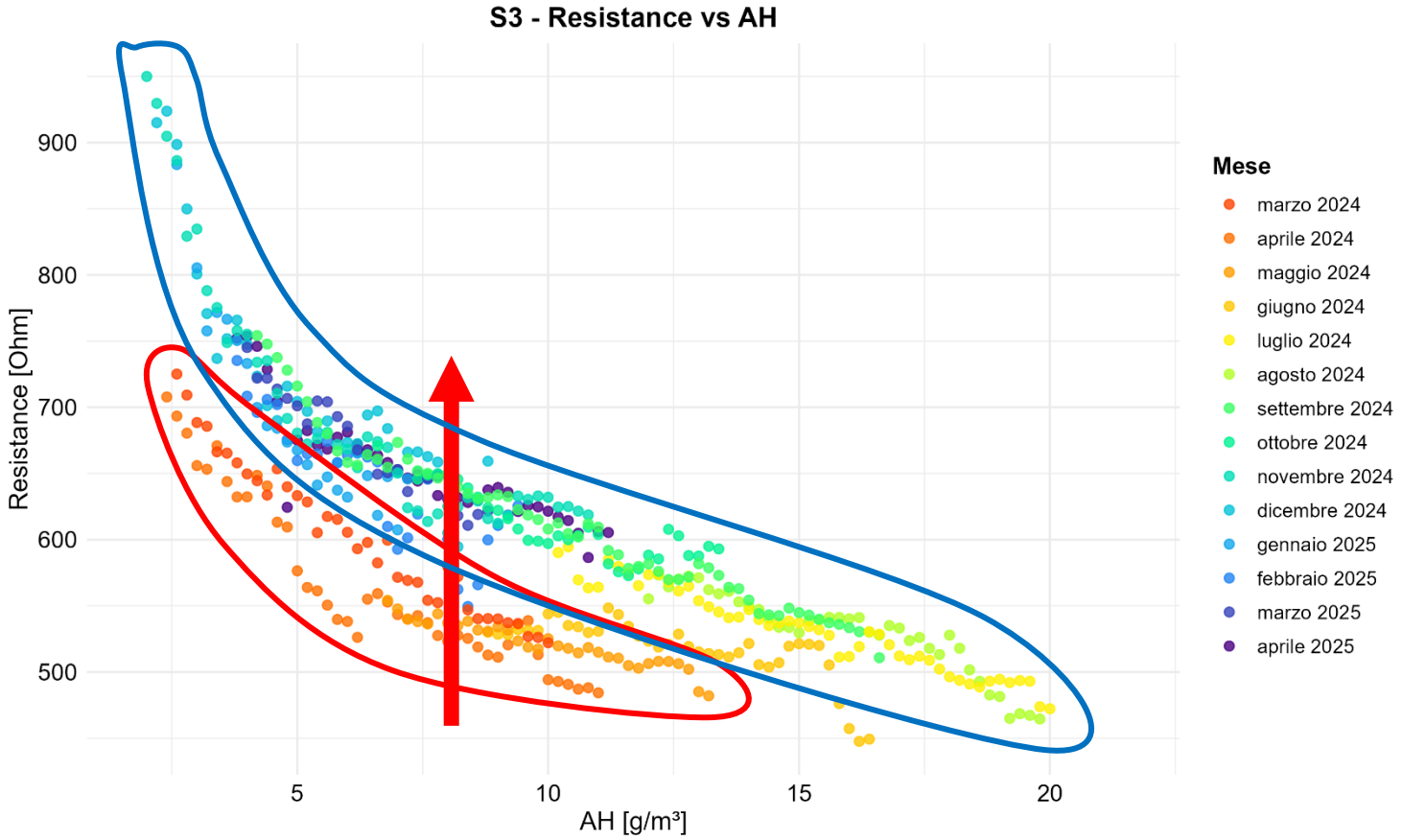
Ratti et al., 2024. Real-time monitoring of odour emissions at the fenceline of a waste treatment plant by instrumental odour monitoring systems: focus on training methods. Sensors 24, 3506.

Management of interferences: new approach



Sensor responses from march 2024 to April 2025 plotted as a function of the absolute humidity

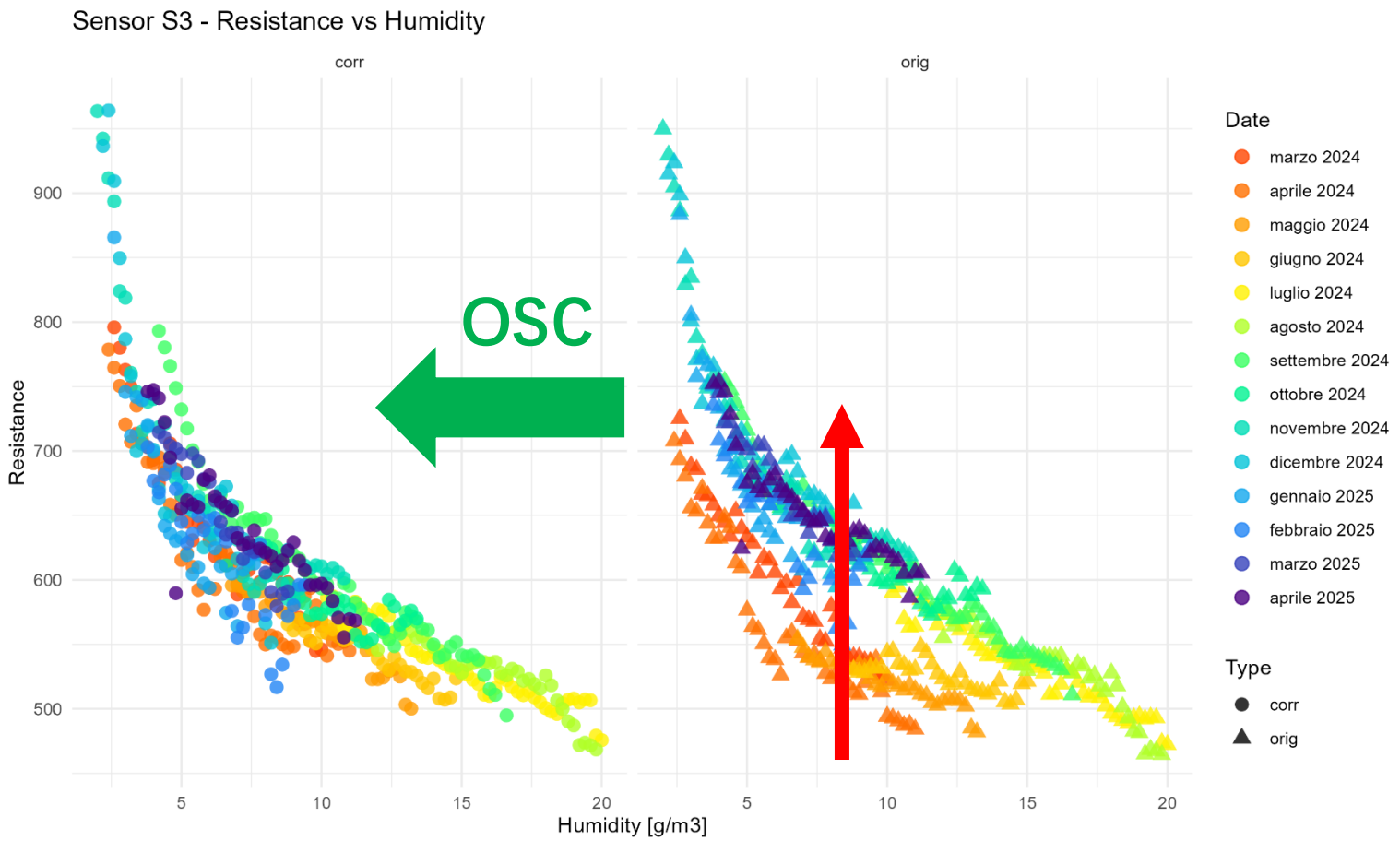
Management of interferences: new approach



PROBLEM:
TIME DRIFT!!

- Variation of resistance values over the months
- Difficult to implement one global model fitting all data

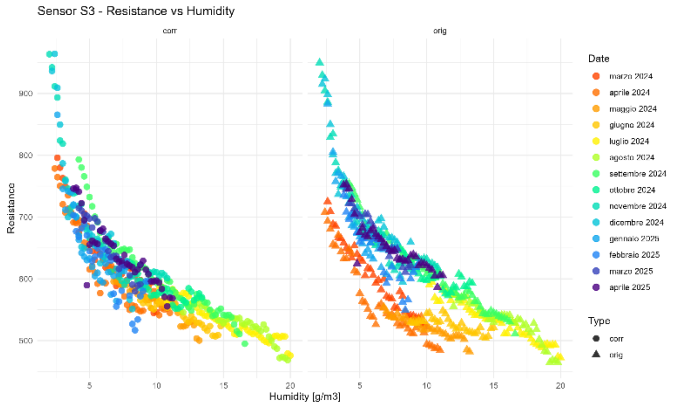
Management of interferences: new approach



OSC correction to remove drift variations

Possibility to implement a single regression model

Management of interferences: new approach



FITTING

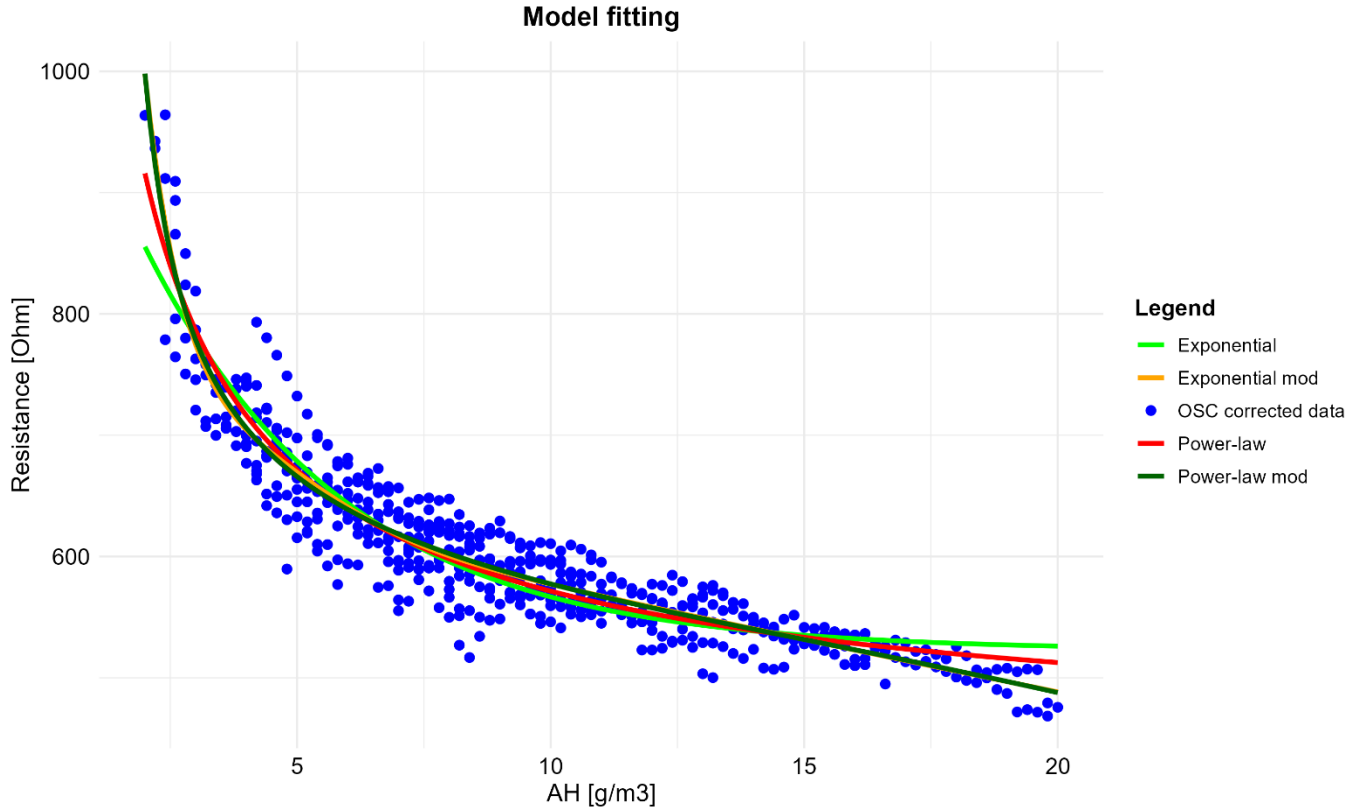
$$f_{exp}^{1} = a_1 * e^{-b_1 * AH} + c_1$$

$$f_{pow}^{1} = a_1 * AH^{-b_1} + c_1$$

$$f_{exp}^{mod} = f_{exp}^{1}(1 - w) + f_{exp}^{2} w$$

$$f_{pow}^{mod} = f_{pow}^{1}(1 - w) + f_{pow}^{2} w$$

$$w = \frac{1}{(1 + e^{-k(AH - AH_0)})}$$



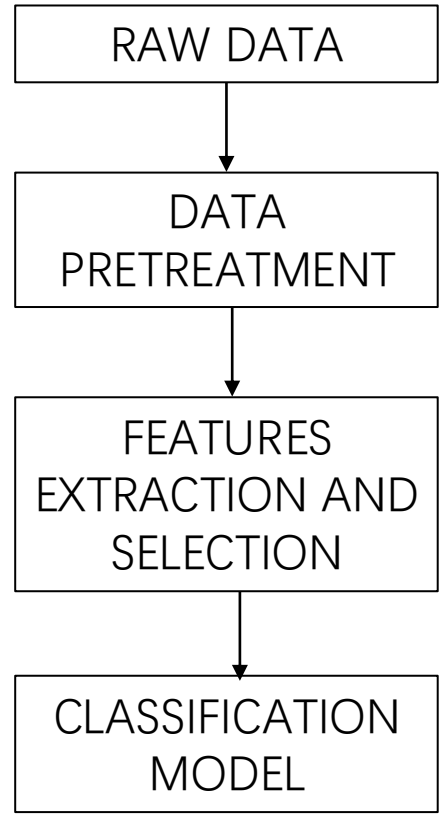
Dynamic baseline compensation

Management of interferences: new approach

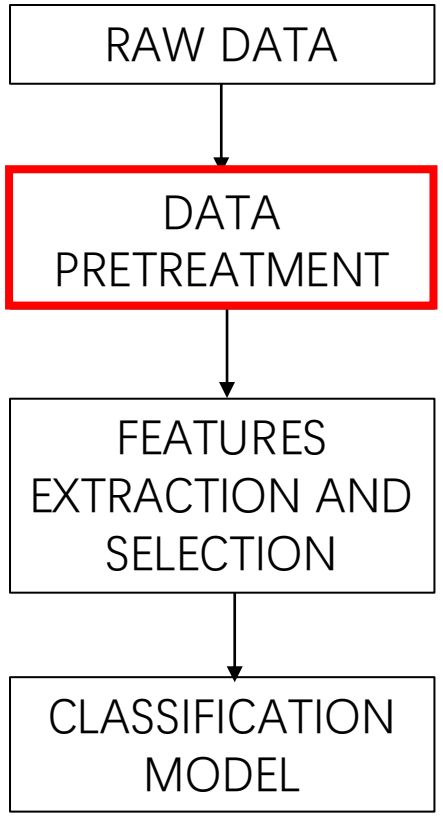
Comparison of the correction models on data registered by one E-Nose installed in the WTP

- Field data from analyses conducted between march 2024 and march 2025
- Comparison on classification model developed to identify the principal odour classes of the plant: ‘Air’, ‘Biogas’ and ‘Organic’
- Performance parameters evaluated on an external test set (63 samples)

Data processing pipeline



Management of interferences: new approach



Old data pretreatment

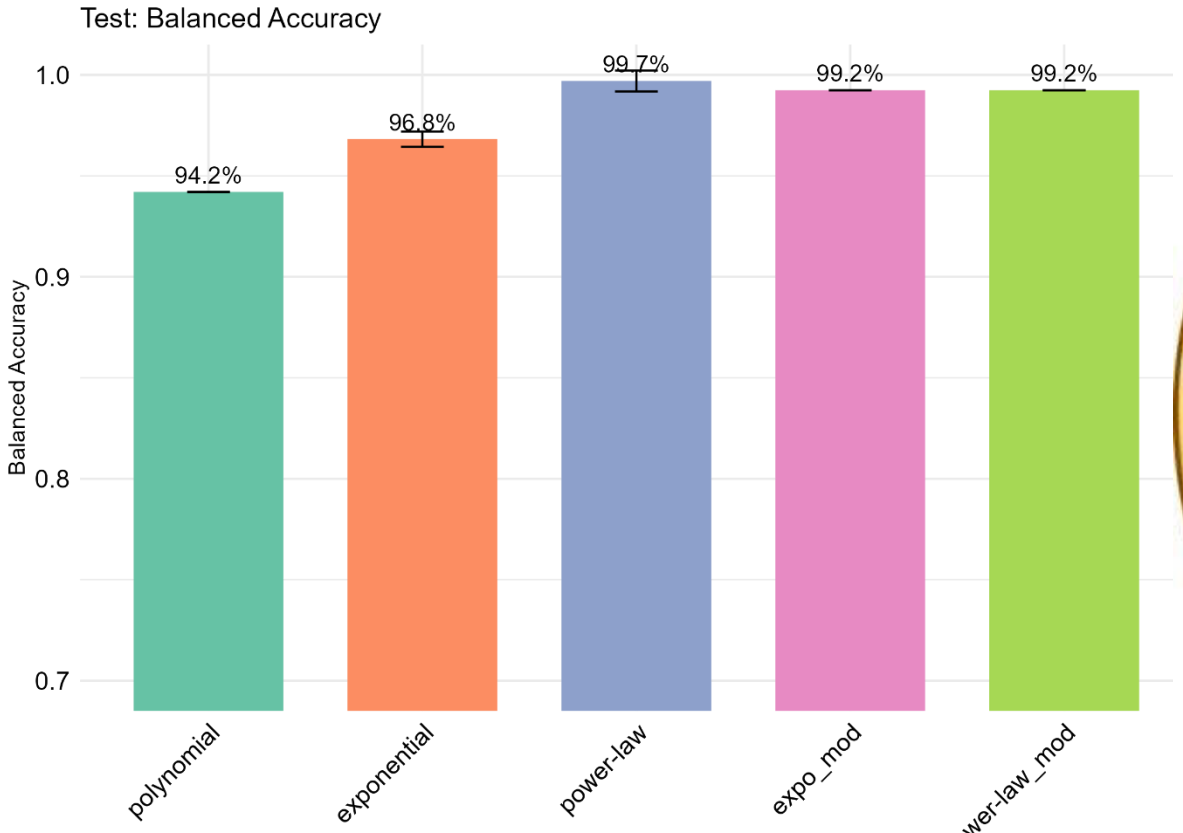
1. Dynamic baseline compensation with polynomial regression models

New data pretreatment

1. Time drift correction with OSC
2. Dynamic baseline compensation with exponential/power-law models

Management of interferences: new approach

Results of testing on dataset of 63 “unseen” samples



4. Field performance testing

Verification of the **IOMS performance** rather than hardware requisites by means of **specific verification tests** in the field after IOMS training for the specific monitoring

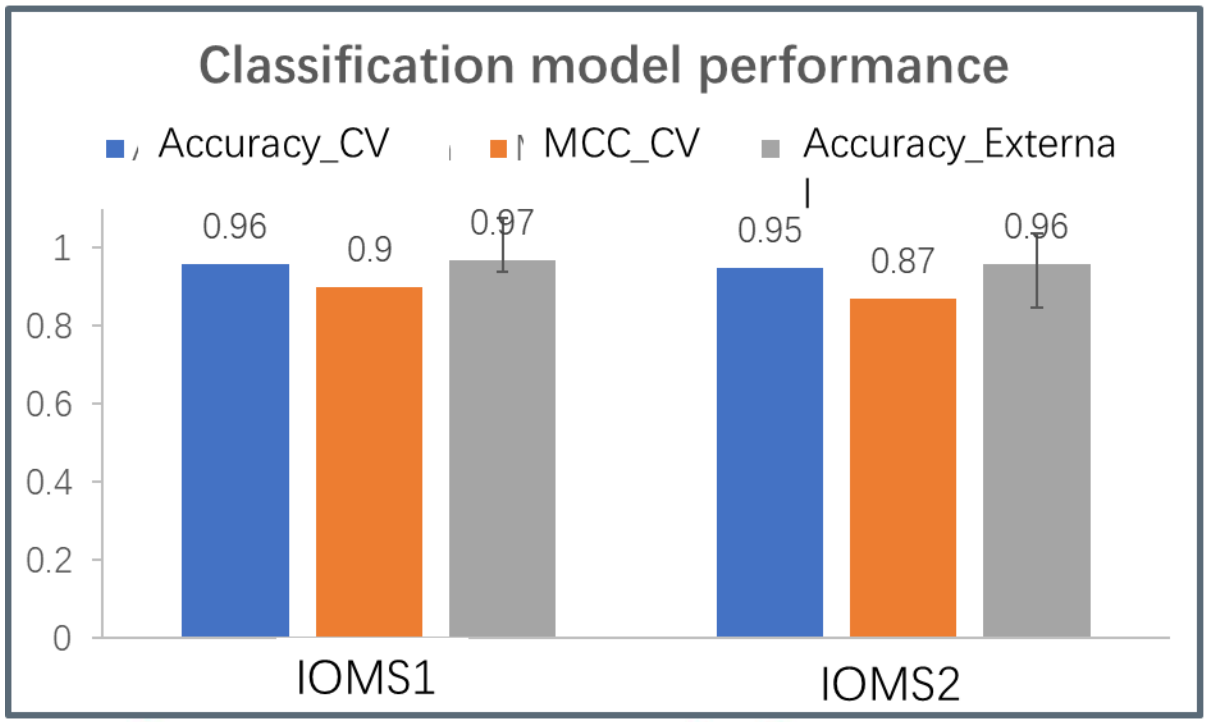
- Odour detection
- Odour classification
- Odour quantification

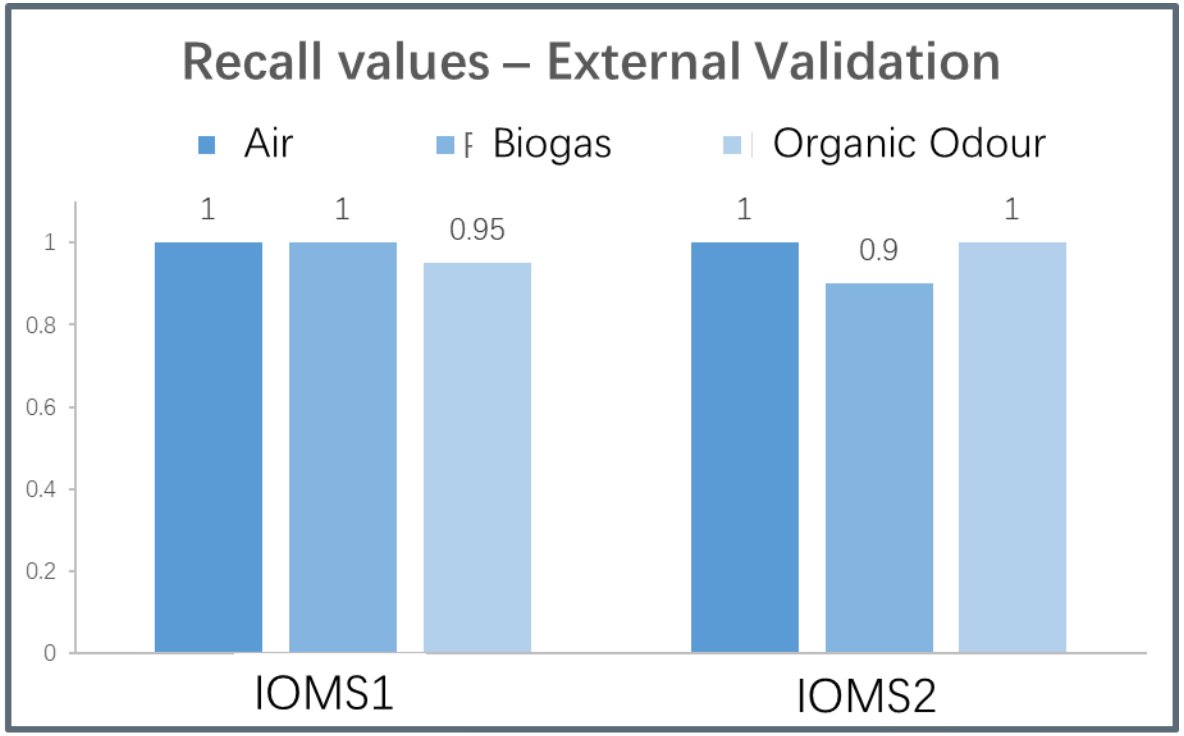
4. Field performance testing

1. AMPLING AND OLFACTROMETRIC CHARACTERIZATION OF SAMPLES INDEPENDENT FROM THE TRAINING SET
2. PREPARATION OF SAMPLES AT DIFFERENT CONCENTRATION LEVELS
3. IOMS ANALYSIS UNDER MONITORING OPERATING CONDITIONS
4. COMPARISON OF ODOR CONCENTRATIONS ESTIMATED BY E-NOSE WITH THE ONES DETERMINED BY DYNAMIC OLFACTOMETRY
5. DETERMINATION OF MODEL INDICES ACCURACY

E-NOSE 1		REFERENCE		
		AIR	BIOGAS	ORGANIC ODOUR
PREDICTION	AIR	4	0	0
	BIOGAS	0	9	0
	ORGANIC ODOUR	0	1	15

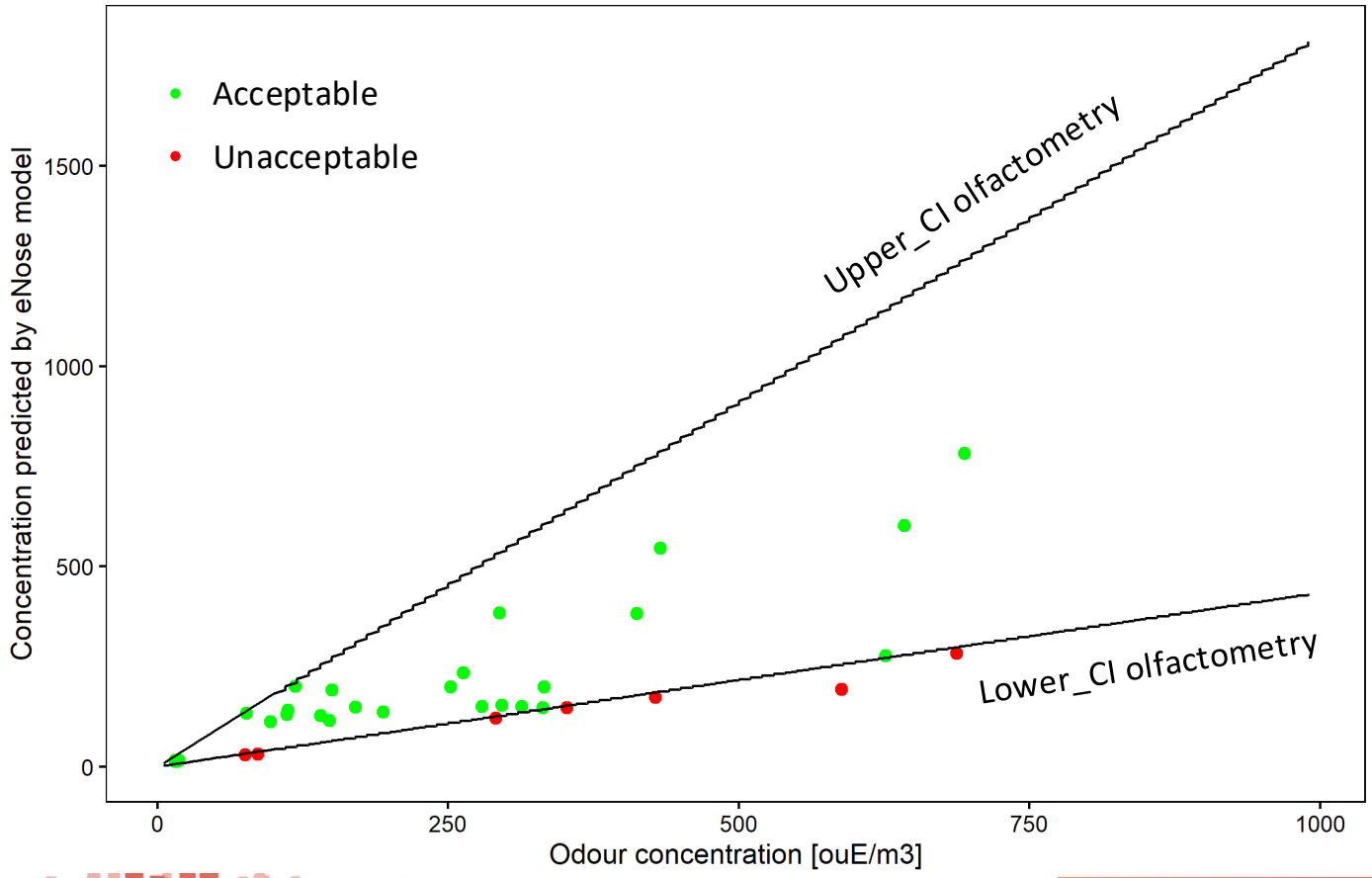
E-NOSE 2		REFERENCE		
		AIR	BIOGAS	ORGANIC ODOUR
PREDICTION	AIR	4	0	0
	BIOGAS	0	10	1
	ORGANIC ODOUR	0	0	19





4. Field performance testing

$$C_{od_{Olfactometry,inf}} < C_{od_{IOMS}} < C_{od_{Olfactometry,sup}}$$

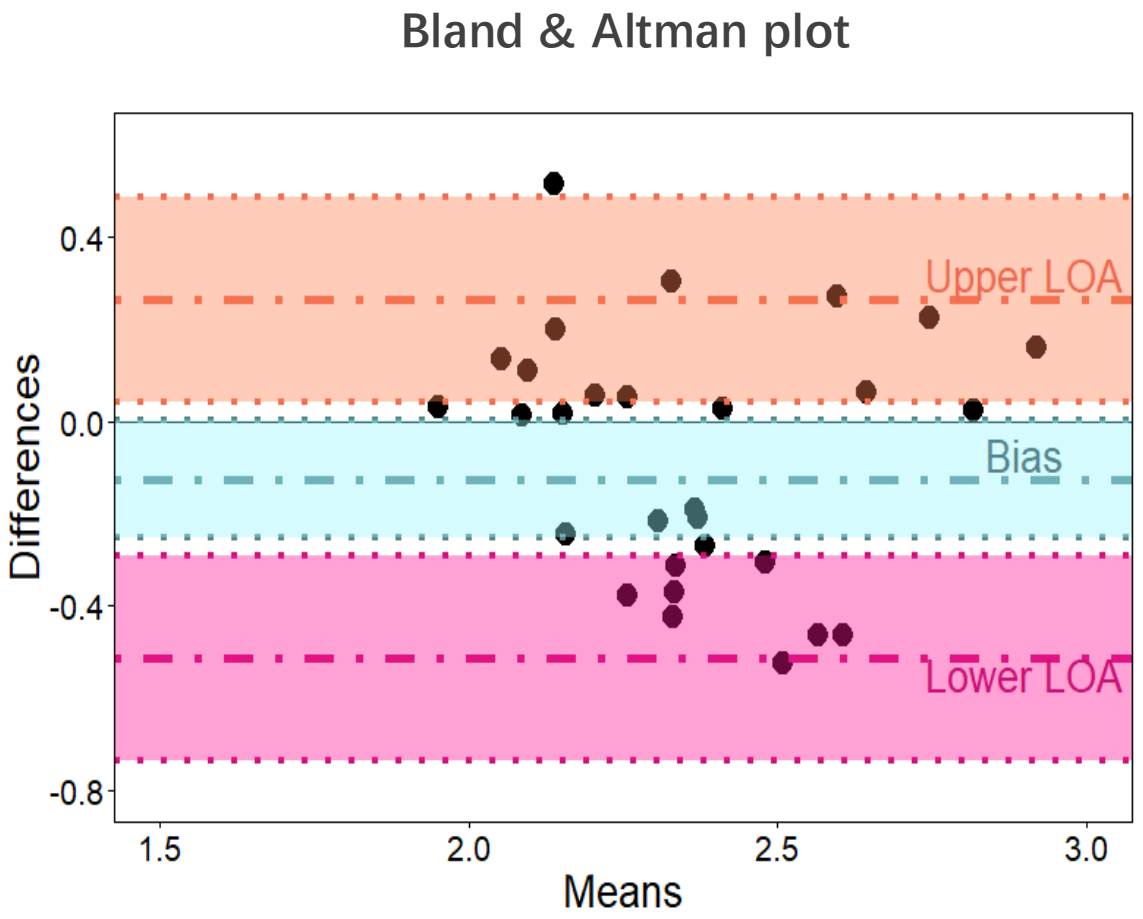


4. Field performance testing

Parameter	Value log10	Value real
Bias	-0.0356	**1.08**
LoA upper	0.565	3.60
LoA lower	-0.637	0.235
Sigma	0.302	
Precision	**3.92**	

Evaluation Criteria (EN13725:2022)

Bias	Precision
$10^{abs(Bias)} < 1.64$	$2\ sigma < 3$



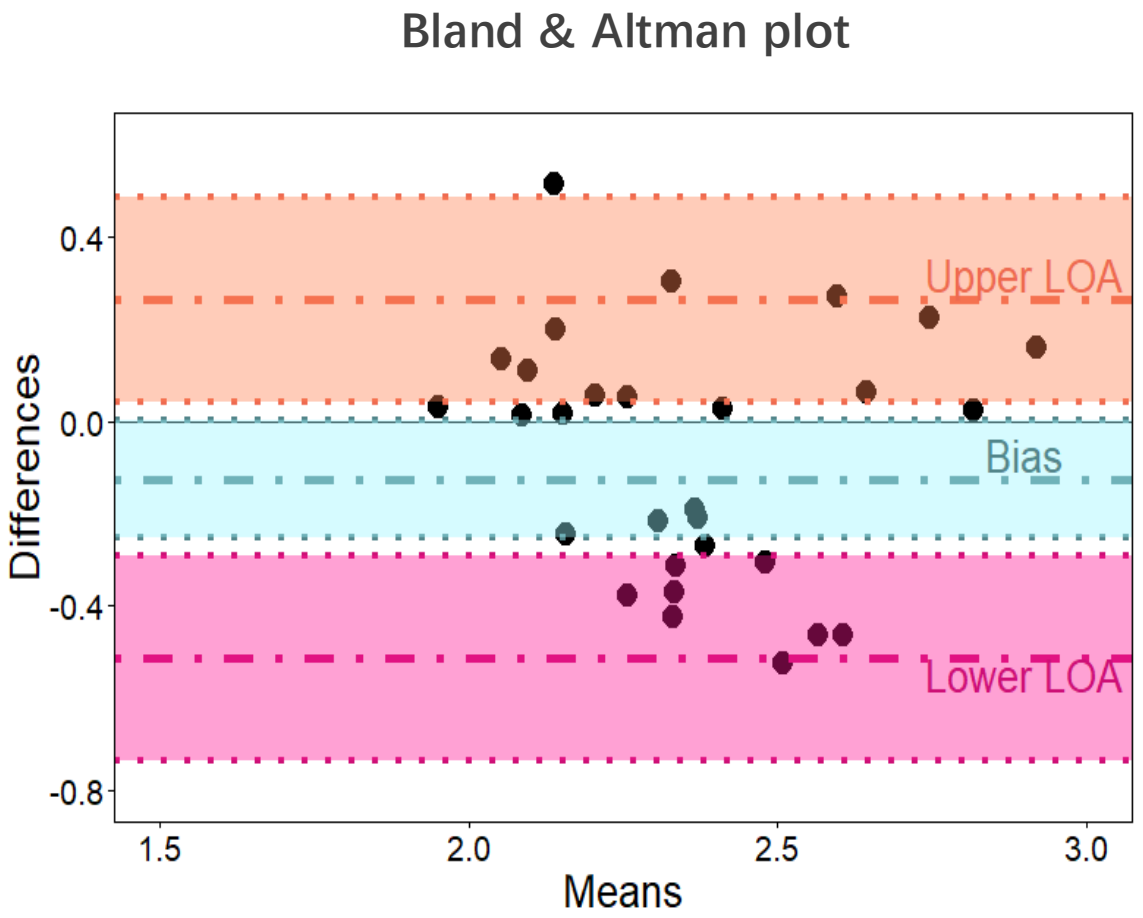
4. Field performance testing

Parameter	Value log10	Value real
Bias	-0.0356	**1.08**
Precision	**3.92**	

- IOMS estimates of odour concentration are comparable with results of dynamic olfactometry

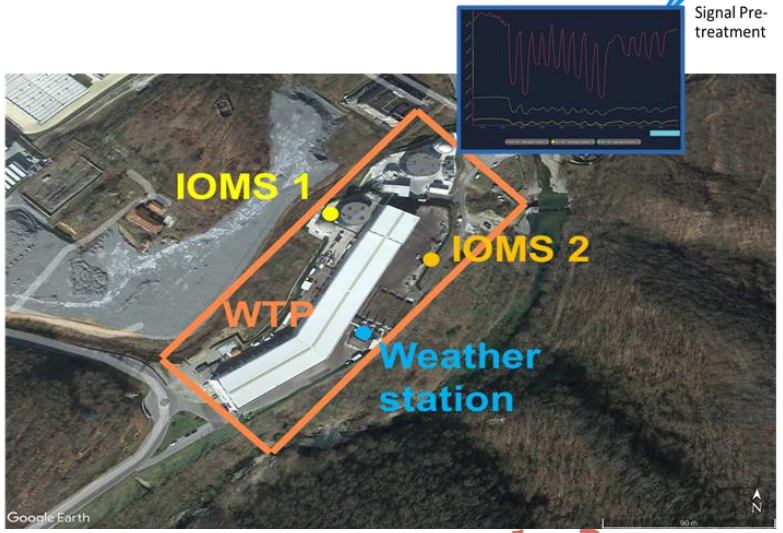
Evaluation Criteria (EN13725:2022)

Bias	Precision
$10^{abs(Bias)} < 1.64$	$2\ sigma < 3$

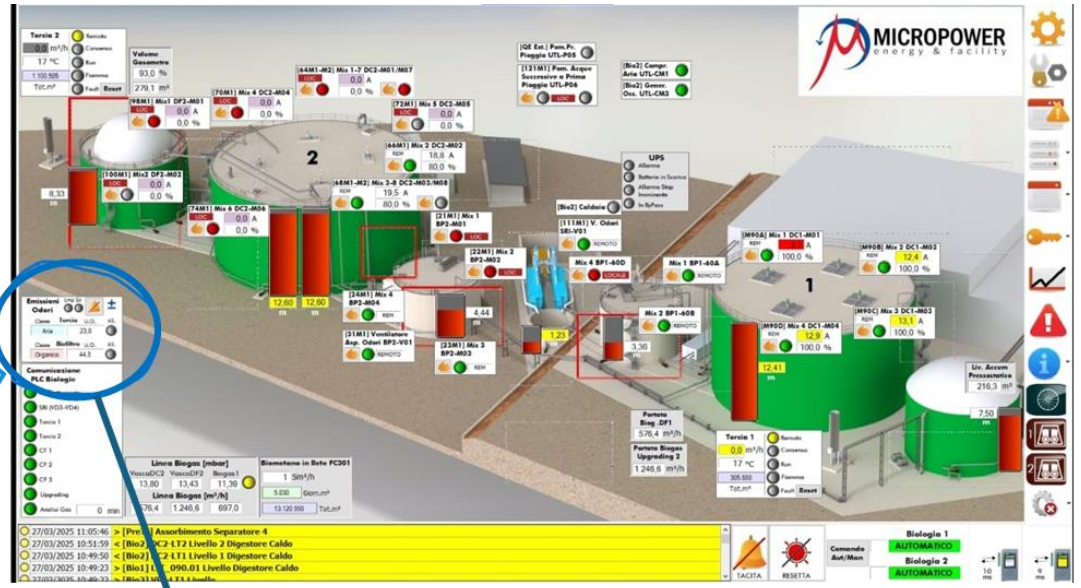


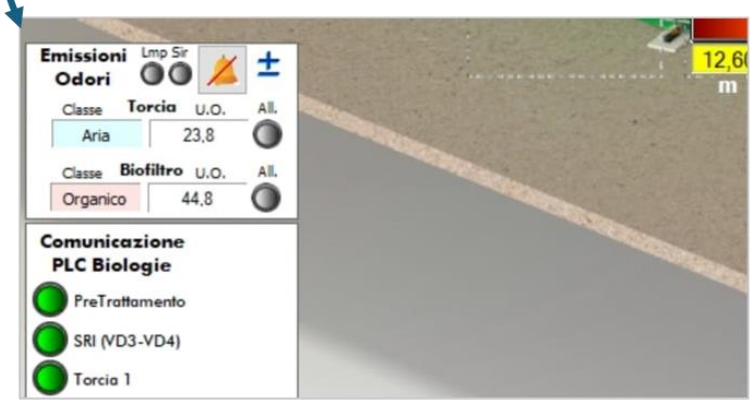
4. Monitoring phase

- Real time output visible on plant management SW:
  - Odour class (air, biogas or organic waste)
  - Odour concentration
- Telegram message everytime fixed odour threshod is exceeded with attached IOMS outputs of last 24 h



Signal Pre-treatment
Feature extraction
Classification
Quantification



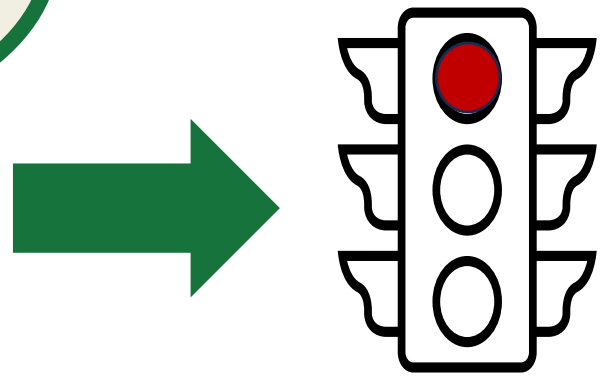


4. Monitoring phase

IOMS monitoring data

Meteo

Citizens' complaints



Alarm threshold

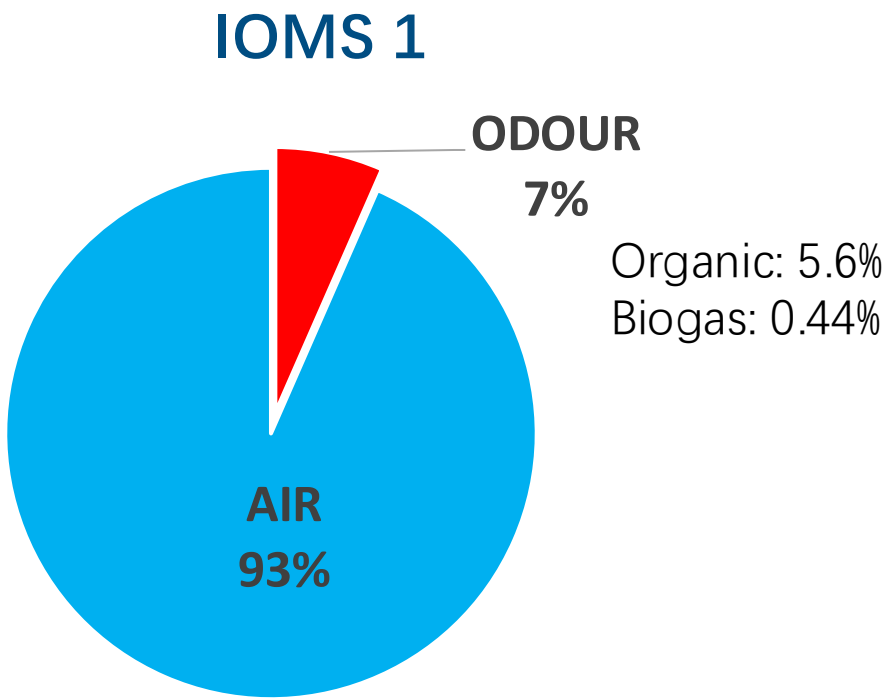
IOMS output
ODORE
(Organic_Waste or Biogas)

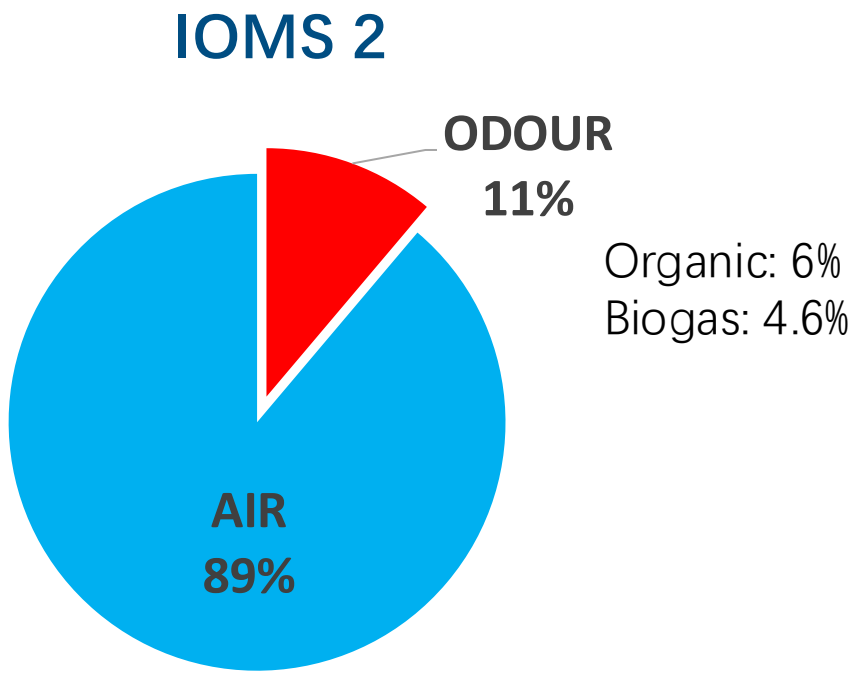
Estimated odour concentration
> 100 U.O.

Activation of plant odour management procedures

5. Interpretation of monitoring results

- Evaluation of frequency of occurence of odour events at the plant fenceline (measurements types A and B) over 1 year



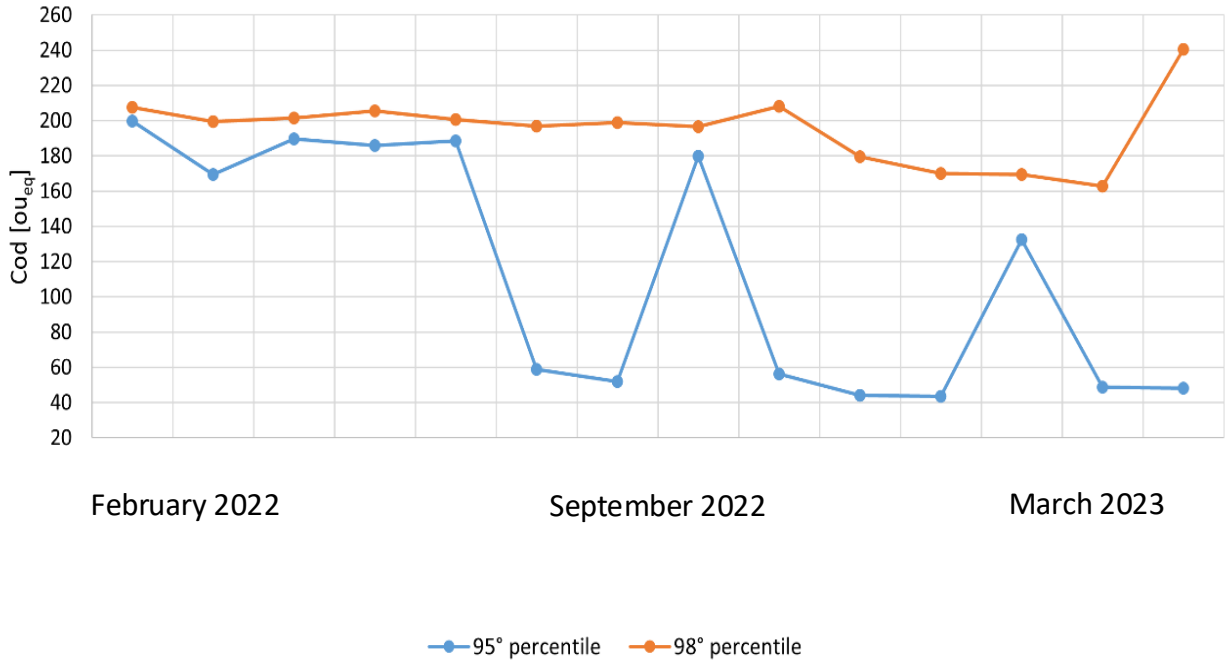


5. Interpretation of monitoring results

- Evaluation of frequency of exceedance of odour concentration levels (percentiles)

IOMS 1

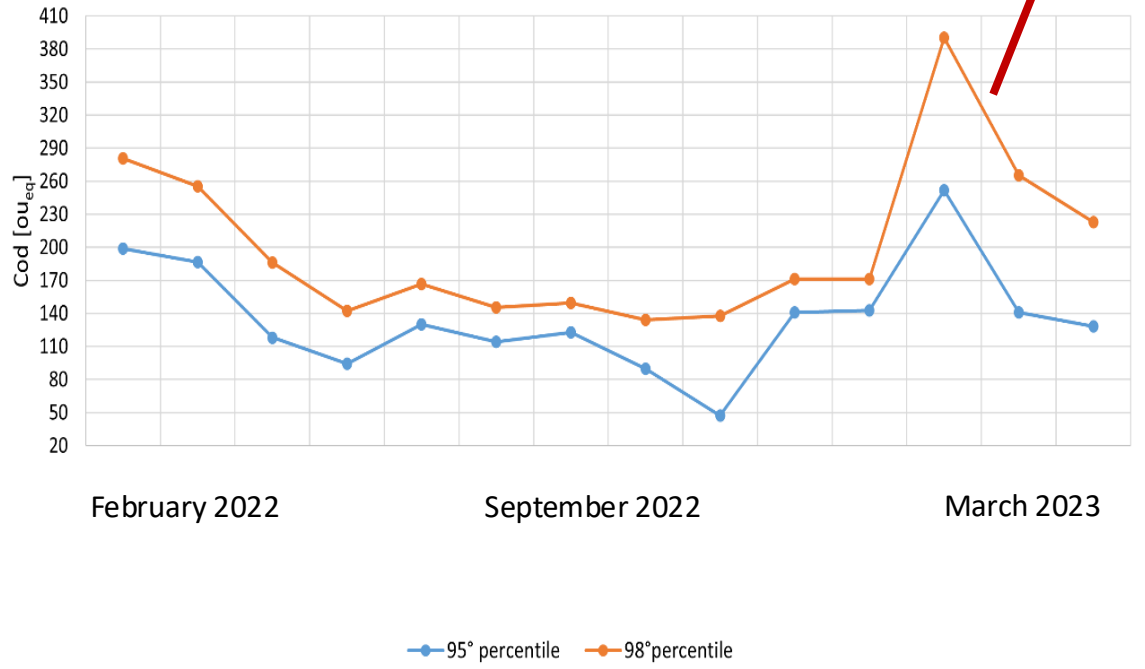
Odour concentration estimates = 40 – 240 OU_eq



IOMS 2

Odour concentration estimates = 50 – 380 OU_eq

Frequent odour events



5. Interpretation of monitoring results

Comparison with citizens odour reports

Odour event	IOMS 1		IOMS 2	
Date & Hour	Classification	Quantification [ou_E_eq]	Classification	Quantification [ou_E_eq]
22/06/2023 07:40	Organic	167	Air	-
22/06/2023 07:50	Organic	170	Air	-
22/06/2023 08:00	Organic	173	Air	-
22/06/2023 08:10	Organic	176	Organic	158
22/06/2023 08:20	Organic	160	Organic	170
22/06/2023 08:30	Organic	168	Organic	200

IOMS for odour monitoring: What's next?

- **Integration of new compensation algorithms** into new sensor modules including possibility of **temperature modulation** and **impedance readout**
- **Accuracy of predictions, reliability, stability over time** are still critical aspects, especially in view of use within environmental permitting for emission monitoring
- **High costs associated with training** could be addressed by implementing **calibration transfer strategies**
- **Standardisation and quality protocols** are needed for their use as air quality monitoring tools
- There is still a **lot of space for improvement …**

Take home messages

IOMS are effective tools for continuous odour monitoring,

… but environmental deployment is not straightforward

- Regulation is evolving, leading to an **attractive market expansion**
- Be careful with overoptimistic results obtained in the lab: in the field you have **uncontrollable, dirty** and **continuously changing conditions**
- Work in **teams with odour experts** to ensure **representative training** (often expensive!) and **make your technology USEFUL**
- **Multidisciplinary, multidisciplinary, multidisciplinary…**
- Don’t give up: **if you are realistic, you can be successful!**

Thank you for your attention!