



INTERNATIONAL ADVANCED  
SCHOOL IN AGRICULTURAL  
METEOROLOGY

**FIFTH EDITION**

**Ancona, Italy  
9-13 June 2025**



# **AGRICULTURAL METEOROLOGY**

FOR AGRICULTURE  
MANAGEMENT AT MICROSCALE

## **FINAL REPORT**



Associazione  
Italiana  
di Agrometeorologia



WORLD  
METEOROLOGICAL  
ORGANIZATION



**cost**  
EUROPEAN COOPERATION  
IN SCIENCE & TECHNOLOGY



Funded by  
the European Union

*The “School final report” was prepared by:*  
Marina Baldi, CNR-IBE and WMO-RTC, Italy  
*with the contribution of:*  
Marco Simonetti, CNR-IBE, Italy  
*Revised by:*  
Anna Dalla Marta, UniFI-DAGRI, Italy  
Federica Rossi, CNR-IBE, Italy

July, 2025



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## 1. Background

Since its foundation in 1997, AIAM (<http://www.agrometeorologia.it>) has been involved in enhancing and promoting agrometeorological research through conferences, seminars, and training courses. It also acts as a link between the services and research activities. This connection has the result of promoting research on relevant agrometeorological themes, which are internationally disseminated through the Italian Journal of Agrometeorology.

In March 2025, as part of its mission, AIAM proudly launched the Fifth Edition of the International Advanced School in Agricultural Meteorology, aiming to build up knowledge about the use of integrated tools and advanced technologies for a sustainable management of agroecosystems, through the AIAM and WMO-RTC websites, and in the social media. At a later stage, when the final program was consolidated, the WMO-RTC listed the event in the WMO Global Campus - WMO Learn Events Calendar.

The 2025 edition, “AGRICULTURAL METEOROLOGY FOR AGRICULTURE MANAGEMENT AT MICROSCALE”, was co-organized with CNR-IBE, designated as WMO Regional Training Center in Italy, WMO-RTC (<https://training.climateservices.it/>), and with the Università Politecnica delle Marche Dip. Scienze Agrarie, Alimentari ed Ambientali (UNIVPM-D3A), and its main aim was *to lead professionals in the agroforestry sector towards sustainable management, with a focus on the microscale, using innovative means and tools, including those that can be based on the use of machine learning and AI*.

The School was supported by the COST Action CA20108 - FAIR NETwork of micrometeorological measurements (FAIRNESS), The Foundation for Climate and Sustainability (FCS), UNIVPM-D3A, Ecosearch, and organized in partnership with Council for Agricultural Research and Economics (CREA-PB), Università di Firenze – DAGRI, National Research Council, Institute of Bioeconomy (CNR-IBE), Accademia dei Georgofili, Foundation for Climate and Sustainability (FCS).



The Scientific Committee in charge to design and plan the course, evaluate applications, and appoint the Trainers, was composed by: Filiberto Altobelli (CREA-PB, COST CA20108), Anna Dalla Marta (Università di Firenze-DAGRI), Federica Rossi (CNR-IBE), Francesca Ventura (Università di Bologna-DISTAL and AIAM), Marina Baldi (WMO-RTC, CNR-IBE), Branislava Lalic (COST-CA20108), Pavol Nejedlik (COST-CA20108) and by Professors from Università Politecnica delle Marche: Stefania Cocco, Giuseppe Corti, Luigi Ledda.

**Acknowledgement:** The Scientific Committee is grateful to the colleagues of CNR-IBE Guido Righini and Marco Simonetti for ensuring the management of the Moodle platform used by the WMO-RTC, to Elena Rapisardi (CNR-IBE) for brochure and other material Graphic Design, and to Irene Vercellino and Clementina Falco for taking care of the administrative aspects for AIAM and CNR-IBE, respectively.



## 2. Objectives and Expected Learning Outcomes

The main objective of the School was the improvement of scientific and technical skills to address the challenges posed by climate change in the agricultural and forestry sectors. Ability to lead professionals in the agroforestry sector towards sustainable management, with a focus on the microscale, using innovative means and tools, including those that can be based on the use of machine learning and artificial intelligence.

The school included theoretical activity and practical/demonstration sessions to allow the direct application of theory using advanced tools. The active participation of the trainees contributed facilitating the realization of interdisciplinary networking among experts and attendees.

## 3. Training approach

The training course was implemented in presence, with only one day from remote, from the **9 to the 13 of June 2025**, and it was hosted by the Dip. Scienze Agrarie, Alimentari ed Ambientali - Università Politecnica delle Marche, in Ancona, Italy <https://www.d3a.univpm.it/en>.

For this edition of the school, the organizers decided not to register all the lectures, since the school was in presence, and a large part of it was dedicated to practical exercises and to familiarize with the tools, software and platforms presented during the lectures.

All the educational material has been stored on the platform Moodle used as a learning management system. Moreover, the platform was used to foster discussion and included a forum to discuss the topics covered by the Lecturers (<https://rtc-moodle.ibe.cnr.it/> access limited to enrolled trainees).

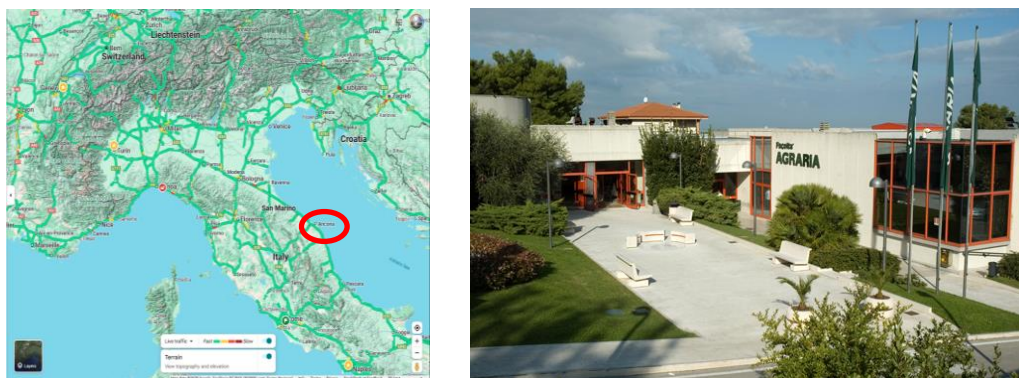


Figure 1 – The city of Ancona in Italy, and the venue

## 4. Delivery of the course

### 4.1 Participants

The school was opened to participants from RA-VI. Attendees were young researchers, scientists and PhD students, engaged and interested in the application of advanced agrometeorological methodologies and techniques, while no professionals from National HydroMeteorological Services or stakeholders participated, most probably due to the very specific theme of the school.



The total number of selected participants was 24, 18 male and 6 female, from 11 Countries, but in the end only 17 were able to participate. Among those who didn't participate are three applicants from Somalia, because they encountered difficulties with VISA application (the proposed appointment at the Visa office arrived too late).

Country	Nr of participants
<b>Croatia</b>	1
<b>Czech Republic</b>	3
<b>Estonia</b>	1
<b>Hungary</b>	1
<b>Italy</b>	5
<b>Romania</b>	1
<b>Serbia</b>	4
<b>Slovakia</b>	1



*Figure 2 - Group photo*

The Participants were all well motivated to take the course.

WMO and the COST Action CA20108 covered the participation of 11 students, while the others had the participation costs covered by their own Institutions and paid a registration fee of 400€.

All the participants had access to the School, Course material, free Wi-Fi connection, Coffee breaks, field activities.

Lunches were served at a small price in the cafeteria of the University, and the daily menu included a varied menu with hot and cold dishes, panini, pizza slices.

A social event (an "apericena", i.e. "happy hour served with a selection of hot and cold local food and snacks") was organized for all students, and trainers.



Figure 3 – Lunch and happy hour time

## 4.2 Trainers

Trainers are experts from different Universities and Research Centres, and experts from CA20108 FAIRNESS COST Action Partners. Marina Baldi, Stefania Cocco, Anna Dalla Marta, Branislava Lalic, Federica Rossi, as members of the Scientific Committee, were always present also chairing the sessions, and facilitating the practical sessions.

The **Opening Session** included welcome address by Prof Davide Neri, Director of the hosting Institution, B. Gen Luca Baione, Permanent Representative of Italy with WMO, Prof Gabriele Cola, the vice-President of AIAM, Prof Branislava Lalic, coordinator of COST Action CA20108, the Director of WMO-RTC in Italy, Dr Marina Baldi.



Figure 4 - Introductory Session

The opening was followed by an introductory lecture given by PhD Andrea Salvucci of with the aim of presenting concepts and novel results on salinization and vertisolization of soils and how the meteorological/climatic conditions can alter the balance and do not fully support the process of vertisolization, despite pedologic properties of the area, finally impacting of the agriculture resilience. The lecture represented a good starting point for the visit to the experimental farm during the week.

Then a full session was dedicated to the outcomes of the COST Action CA20108: *FAIR network of micrometeorological measurements: The COST-ACTION CA20108 Outcomes* with lectures offered by

Branislava Lalic, Ana Firanj Sremac and Joseph Eitzinger. The lectures represented a necessary background for the next sessions on AI, machine learning, and big data.



Figure 5 – COST Action CA20108 Session

Participants remained all captured by the lectures by Alessandro Montagni on “New tools for data interpretation: machine learning and artificial intelligence”, and by Francesco Ferrini on “Urban forestry vs. Urban heat: reclaiming the microclimate for livable cities”.



Figure 6 – Artificial Intelligence, Big Data, Machine learning



Figure 7 – Urban forestry vs. Urban heat: reclaiming the microclimate for livable cities

### 4.3 The Programme

The program of the school (see Appendix 2) was very dense, and covered the following topics:

- Introduction to land-atmosphere interaction
- Micrometeorological flux measurements
- Innovative tools for micrometeorological data
- Micrometeorology, urban environment and urban forestry.

A field trip was included, with a visit to an experimental farm, run by the Università Politecnica delle Marche, dedicated to air-soil interactions and observations and analysis.

The morning before the visit, Professors from the Università presented some of the research and experiments done in the farm.

### 4.4 Practical sessions

The practice in all disciplines is crucial to better understand the theory and to acquire knowledge on how the theory can be implemented in specific services, however the limited amount of time available can represent a big obstacle, however, some hands-on sessions were delivered by the Trainers, so students were able to follow step-by-step the demonstration of the tools presented.

Participants very well appreciated the presence of the trainers in the class, and there were interesting discussions on the topics covered both during and after the lectures.

Following the comments of trainees from past editions of the school, and based on the positive past experiences, in this edition we reduced the number of topics presented, one per day, to explore them in more detail. However, even more practical sessions, and group work might be planned in future editions of the school, as it emerges from some comments.

### 4.5 The field trip

A field trip was planned for Thursday afternoon. Participants visited an experimental farm located in Agugliano and Gallignano, managed by the D3A Department of the University: Azienda Agraria

Didattico Sperimentale “Pasquale Rosati” (<https://www.azienda.agraria.univpm.it/presentazione> - in italian). The visit was preceded by introductory lectures in class.



*Figure 8 – Experimental farm of the UNIVPM in Agugliano and Gallignano (Ancona)*

The visit included a general introduction to the facility and then a long discussion, led by Prof Luigi Ledda and his collaborators, the hands-on on some of the instruments used to monitor the wetness of the soil, and a practical session showing the deployment of a drone to monitor the fields. The following time was spent to inspect the fields and the instruments installed there.



*Figure 9 – From the class to the field – In preparation for the visit to “Pasquale Rosati” Experimental Educational Farm – UNIVPM-D3A*

### "Pasquale Rosati" Experimental Educational Farm – Università Politecnica delle Marche

The Pasquale Rosati Educational-Experimental Farm Research and Services Center was founded in 1993 as a special facility of the Università Politecnica delle Marche to serve the faculties in teaching and research. Over the years, it has expanded its activities by collaborating with external companies and, as an educational farm, hosting visits from schools of all levels.

The farm covers a total area of approximately 140 hectares (in Agugliano and Gallignano, in the province of Ancona) planted with:

- Tree crops: vines, olives, apples, pears, peaches, plums, apricots, cherries, almonds, figs, walnuts, strawberries, and poplars.
- Field crops: durum and common wheat, barley, spelt, sunflowers, corn, sorghum, fava beans, chickpeas, beans, alfalfa, and clover.
- Research and experimentation projects (40-50 per year);
- Center for the Conservation and Evaluation of Local Marche Germplasm.

The company also oversees the design and management of the University's ornamental greenery.

In Agugliano, the main focus is integrated agriculture with a "New Experimental High-Density Olive Grove."

The olive grove has a density of 1,250 trees per hectare, suitable for full mechanization (Agugliano Borgo Ruffini).

Experiments underway include (since 2012):

- Comparison of varieties.
- Comparison of planting materials.
- Soil management techniques and control of aerial and root growth.

In Gallignano, interest is focused on organic farming with two important projects:

- The CORE Organic "DOMINO" project
- The MIPAAFT "BIOPAC" project





Figure 10 - Visit to "Pasquale Rosati" Experimental Educational Farm - UNIVPM-D3A

## 5 Course Evaluation

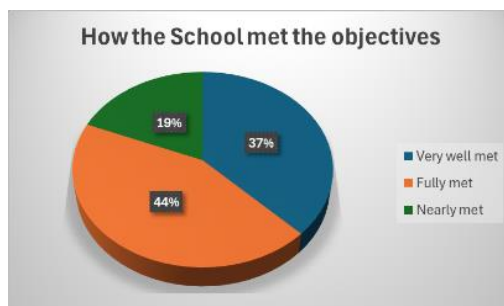
As a final task to complete the course the participants were invited to respond to the evaluation questionnaire on the Moodle platform, and we received answers from 15 trainees out of 17. Only one of the trainers was very critic about the school: the school was too theoretical, and on some topics too advanced for the participants' current level of knowledge; the organizers were not enough engaged with participants throughout the program; there was little to no group interaction (see appendix 5 for the detailed comments).

### Overall evaluation of the course

The general participants' perception of the course is positive with 81% evaluating the initiative very successful or excellent, and about 88% of the participants evaluated the duration (1 week) right, and 6% a little short, but there is no clear indication about a suitable duration.

In terms of meeting the objectives, about 44% of the participants evaluated the course to fully meet them, and 37% very well, while 19% evaluated the course to nearly meet the objectives.





**Main difficulties**

About 44% of trainees had to suspend their everyday duties to attend the school, while the others didn't.

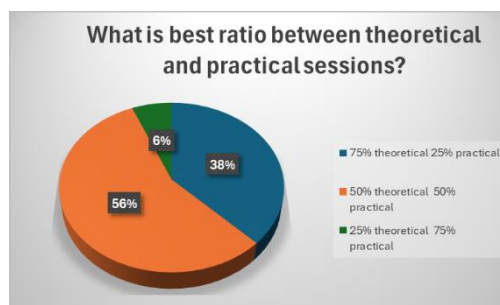
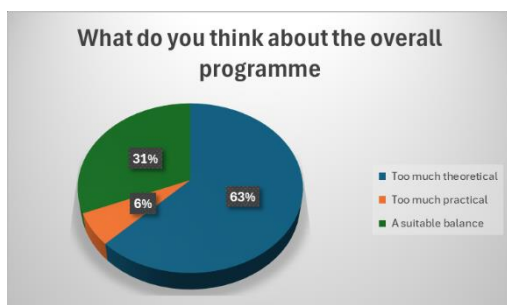
In any case participants didn't face any major difficulty to attend the school.

The options were:

- Home job activities
- Language difficulties
- Course length
- Lack of basic knowledge about some topics of the course
- Other

**Theoretical and practical sessions**

A good percentage (31%) of participants considered the course well balanced between theory and practice, however a large part of them (63%) considered the course too theoretical and suggest more practical parts to be included in the future. This is a comment often received during classroom courses (even more true when the school is fully online), and new solutions must be considered in future both for in presence and online courses.



**Topics**

Concerning the topics covered and the knowledge acquired during the course, all the respondents believe the acquired knowledge will help during their everyday job activities.

Participants are aware the course offered the opportunity to know tools and methods to be applied in their daily job, and they expressed the intention to contact the trainers in the future when more questions will arise on the use of the tools.

The topics that stimulated most interest are listed in order of interest:



- Day 3 - New tools for data interpretation: machine learning and artificial intelligence; The use of AI in plant protection
- Day 5 - Urban forestry, urban micrometeorology, urban heat
- Day 1 - Fair control of micrometeorological measurements: The COST Action CA20108 outcomes
- Day 1 - Soil salinization and vertisolization
- Day 4 - Soil measures and sensors; Field visit
- Day 2 - Micrometeorological flux measurements (mainly because it was a full day online)

### Field visit

The field visit on day 4 was well appreciated, and preceded by a session on Soil Measures and sensors, offered by experts from UNIVPM-D3A which also aroused a certain interest:

- Data Analysis and Experimental Designs in the Field: Methods and Applications
- Agronomic Results and DSSAT Model Calibration: From Field Trials to Simulation
- Introduction to Programming for Forecasting in Agronomic Trials

### Trainers and training material

All the lectures, except those during day 2, were in person. Unfortunately, trainers on day 2 could not join the School in Ancona.

Participants evaluated positively the Trainers in terms of preparation, their ability to motivate/stimulate the class, and to respond and interact with learners. About 90% of the trainees felt that the trainers were able to stimulate/motivate interest in the subject presented, and available and comprehensive when asked for clarification.

The material distributed by the trainers was considered comprehensive for the theoretical lectures, and the practical sessions for 94% of respondents, but the quality of training materials could be improved by distributing additional case studies, video lessons, selected readings.

## 6. Certificate of participation

This course included the release of a certificate of participation.

On the certificate the logo of all the Institutions which contributed to the realization of the Course are reported: AIAM, and WMO-RTC, and COST Action CA20108, and the respective representatives signed it.

On the back of the certificate is a note describing the related WMO Competencies Framework, as shown in the following figure.



### *Figure 11 – Sample certificate of participation*

As for the previous edition of the school, no final test was planned, and the certificate of participation was issued to those participants who actively attended all the sessions.



*Figure 12 - Group photo with Certificate.*

## **7. Conclusions and recommendations**

The survey distributed via the Moodle allowed to collect participants' opinions and impressions on the course. The surveys' questions were designed to get information on the efficacy of the course, on the tools used and the subject matters, as well as on the duration and structure of the course. The purpose of the survey was also to get suggestions for future courses of distance learning. Asking to complete the questionnaire before distributing the certificate was a winning solution, and only 2 out of 17 didn't fill it. Our feeling is that participants were generally satisfied by the course. Also, from our point of view, it was a positive experience and surely a valuable experience for the future.

The group, composed by young scientists with similar background, was homogeneous and responded positively. The constant presence of the school organizers in the classroom helped create a relaxed and positive atmosphere and allowed them to assess the participants' attention, intervening, where necessary, to interrupt sessions to allow participants to reflect on the more difficult points and concepts in order to promote learning.

Some consideration not in order of importance, reflecting the comments on possible improvements for future courses (see Appendix 4), can be summarized as follows:

- The topic: as for the previous editions of the school, Agricultural Meteorology and Micrometeorology is a niche topic and was chosen primarily because it was of specific interest to the school co-organizers involved in the COST action. The inclusion of some appealing topics like microclimatology in urban areas and the use of Artificial Intelligence was certainly of interest for trainees. The participants' suggestions for future training initiatives underline the desire for more in-depth study of some topics, but also the need for more practice.



- Engagement: the selection process followed two different paths. On one hand the coordinators of the COST Action selected a number of participants from Countries participating to the Action, on the other hand a call permitted to RTC and AIAM to select some more participants. In any case, the whole group of participants was very homogeneous, and a good working environment has been created.
- Technical issues: enlarging the practical part is the leit motiv common also in this school. However, it is difficult to adjust the theory/practice percentage, or to plan some hands-on workshop in a short-term school (5 days). Certainly, if the school has more practical sessions, probably a final test can be introduced, and the certificate can be issued for completion (not only participation). For short-term courses not too much can be done, but some ideas have been proposed by the trainees, which will be taken into consideration for future events. Some other ideas might come possibly from a discussion with WMO-ETR.
- Lectures from remote: The lesson learned is to completely avoid lectures from remote, except for a very brief welcome words during the opening
- Human interaction: Another suggestion is related to communication among participants and with trainers. Having participants and trainers at hand in a classroom, to discuss and interact is still considered an added value that can positively impact on a course. During this edition of the school the interaction was facilitated by the field trip and the social event organized. The long coffee breaks (30 min) represented moments of socializing in a very pleasant environment.



## Appendix 1. List of Participants

The total number of selected participants was 24, 18 male and 6 female, from 11 Countries, but in the end only 17 were able to participate. Among those who didn't participate are three applicants from Somalia, because they encountered difficulties with VISA application (the proposed appointment at the Visa office arrived too late).

Country	Nr of participants
Croatia	1
Czech Republic	3
Estonia	1
Hungary	1
Italy	5
Romania	1
Serbia	4
Slovakia	1



## Appendix 2. Programme

### DATE

From Monday 9 June 2025  
h 8.30

To Friday 13 June 2025  
h 17.00

### VENUE

Università Politecnica delle Marche  
Dip. Scienze Agrarie, Alimentari ed Ambientali (D3A)  
Via delle Breccie Bianche 10, 60131 Ancona, Italy  
<https://www.univpm.it/>

# THE PROGRAMME

### WORKING HOURS

Morning 09:00-12:30  
Afternoon 14:00-17:30



# 9 JUNE Monday

8.30 - 9.30

**WELCOME****Welcome**

9.30 - 10.00

**OPENING SESSION**

Welcome address by the organizers

- UNIVPM
- WMO
- COST Action
- RTC-Italy
- WMO-PR

10.00 - 10.30

**COFFEE BREAK**

10.00 - 10.30

**INTRODUCTORY SESSION**

The Advanced School will begin with an introductory session including speeches by distinguished experts from Organizing and Partner Institutions, followed by a plenary discussion, with the aim of setting the stage for the topics to be covered throughout the program.

Session Chair: Anna Dalla Marta (UniFi)

12.30 - 14.00

**LUNCH****SESSION****FAIR NETWORK OF MICROMETEOROLOGICAL MEASUREMENTS: THE COST-ACTION CA20108 OUTCOMES**

The session is dedicated to the latest results from the **COST-Action CA20108 FAIR Network of micrometeorological measurements**.

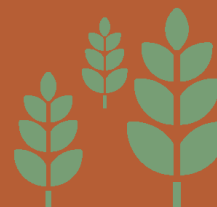
The FAIRNESS Action intended to improve standardization and integration between databases/sets of micrometeorological measurements that are part of research projects or local/regional observational networks established for special purposes (agrometeorology, urban microclimate monitoring).

Objectives of the session is to introduce methods and tools for organization of agrometeorological measurements, quality control and gap filling of data, and the use of AI in plant protection.

<https://www.fairness-ca20108.eu/>

**FURTHER INFORMATION**

- School Secretariat [AgroMetSchool@gmail.com](mailto:AgroMetSchool@gmail.com)
- WMO-RTC contact: [wmortc.italy@gmail.com](mailto:wmortc.italy@gmail.com)



14.00 - 15.30

**FAIR DATA AND TRANSFERRABLE SKILLS**

Branislava Lalic

**ORGANISATION OF AGROMETEOROLOGICAL MEASUREMENTS**

Joseph Eitzinger (CA20108 COST Action)

15.30 - 16.00

**COFFEE BREAK**

16.00 - 17.30

**QUALITY CONTROL (QC) AND GAP FILLING (GF) OF AGROMETEOROLOGICAL DATA WITH PRACTICAL EXAMPLES**

Ana Firanj Sremac (CA20108 COST Action)

# 10

JUNE

## Tuesday

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**SESSION****MICROMETEOROLOGICAL FLUX MEASUREMENTS**

Adaptation and mitigation issues have to be addressed as a priority, and agriculture is deeply concerned on this. This session will be dedicated to comprehend and assess short and long-term energy and gas exchanges ( $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{NO}_{\text{xs}}$ ,  $\text{NH}_3$ ,  $\text{O}_3$ ) between vegetation and the atmosphere, focusing on emissions and deposition processes. Eddy covariance technique will be illustrated from basic micrometeorological assumption up to methodology, including links with with fluorescence and remotely-assessed parameters for fluxes upscaling. A particular focus will be on hands-on data elaboration, data quality and interpretation.

Session Chair: Anna Dalla Marta (UniFi)

9.00 - 12.30

**MICROMETEOROLOGICAL FLUX MEASUREMENTS: THEORY AND PRACTICE**

F. Carotenuto, D. Famulari, M. Nardino (CNR-IBE)

12.30 - 14.00

**LUNCH**

14.00 - 15.30

**MICROMETEOROLOGICAL FLUX MEASUREMENTS: THEORY AND PRACTICE**

F. Carotenuto, D. Famulari, M. Nardino (CNR-IBE)

15.30 - 16.00

**COFFEE BREAK**

16.00 - 17.30

**MICROMETEOROLOGICAL FLUX MEASUREMENTS:  
THEORY AND PRACTICE**

F. Carotenuto, D. Famulari, M. Nardino (CNR-IBE)

# 11

 JUNE Wednesday**SESSION****NEW TOOLS FOR DATA INTERPRETATION: MACHINE LEARNING AND  
ARTIFICIAL INTELLIGENCE**

The session will explore the application of artificial intelligence and machine learning for data analysis to enhance the understanding and interpretation of complex environmental datasets.

The session will include:

- Short introduction to Python as a standard language in Machine Learning, and Artificial Intelligence. Python Warm-up with self-assessment exercises
  - Data exploration using Pandas library.
- Data preparation using the scikit-learn library
  - Example of unsupervised learning (e.g., clustering with k-means and outlier detection with isolation forest) and supervised learning (eg. Random Forest) using the scikit-learn library.
- The importance of hyperparameter optimization: a practical example with xgboost and scikit-learn library.
  - A first MLP (Multilayer perceptron) with Pytorch.

Session Chair: Anna Dalla Marta (UniFi)

8.30 - 12.30

**NEW TOOLS FOR DATA INTERPRETATION: MACHINE LEARNING  
AND ARTIFICIAL INTELLIGENCE**

Alessandro Montaghi (CNR-IRET)

12.30 - 14.00

**LUNCH****IMPORTANT DATES**

- Application deadline 16 May 2025
- Fee payment 30 May 2025
- School 9-13 June 2025



14.00 - 16.00 **NEW TOOLS FOR DATA INTERPRETATION: MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE**

Alessandro Montagni (CNR-IRET)

16.00 - 17.30 **THE USE OF AI IN PLANT PROTECTION**

Branislava Lalic (CA20108 COST Action)

# 12<sup>JUNE</sup> Thursday

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**FIELD TRIP** **SOIL MOISTURE MEASURES AND SENSORS**

The day is organized by Università Politecnica delle Marche in collaboration with AIAM, WMO-RTC, COST-Action CA20108 FAIRNESS  
A detailed programme of the day will be distributed later on.

8.30 - 12.30 **SOIL MOISTURE MEASURES AND SENSORS – AN INTRODUCTION**

Università Politecnica delle Marche

12.30 - 14.00 **LUNCH**

14.00 - 17.30 **FIELD TRIP**

19.30 **SOCIAL DINNER**



Photo by Nadine Redlich on Unsplash

# 13 JUNE Friday

## SESSION

### URBAN FORESTRY VS. URBAN HEAT: RECLAIMING THE MICROCLIMATE FOR LIVABLE CITIES

Urban Forestry plays a crucial role in regulating urban climate and adapting and mitigating to climate changes and the extreme related events, while also contributing to the preservation of urban biodiversity. Trees and green infrastructure help reduce the urban heat island effect through shading and transpiration, lowering summer temperatures and decreasing energy consumption for cooling buildings. Additionally, they improve air quality by absorbing and adsorbing pollutants and sequestering CO<sub>2</sub>, and they support sustainable stormwater management, reducing the risk of flooding.

Biodiversity is a key factor for urban resilience: diverse urban forests are less vulnerable to pests and diseases, ensuring more stable and efficient ecosystems that provide essential ecosystem services. Increasing the variety of tree and plant species in cities not only strengthens their ability to adapt to climate change but also supports local wildlife, enhancing urban quality of life

Session Chair: Anna Dalla Marta (UniFi)

8.30 - 11.00

### URBAN FORESTRY VS. URBAN HEAT: RECLAIMING THE MICROCLIMATE FOR LIVABLE CITIES

Francesco Ferrini (University of Florence)

11.00 - 11.30

### COFFEE BREAK

11.30 - 12.30

### FAIR URBAN AND RURAL MICROMETEOROLOGICAL NETWORKS

Josef Eitzinger (CA20108 COST Action)

### SEASONALITY OF URBAN AND RURAL MICROMETEOROLOGICAL ENVIRONMENTS

Ana Firanj Sremac (CA20108 COST Action)

### MODELING IMPACT OF URBAN FORESTRY ON UHI

Branislava Lalic (CA20108 COST Action)

12.30 - 13.00

### DISCUSSION AND FINAL REMARKS

13.00 - 14.00

### LUNCH

14.00 - 15.00

### FINAL SURVEY (MANDATORY) AND CERTIFICATES

15.00 - 16.00

### WRAP-UP SESSION AND CLOSING REMARKS



### Appendix 3. Trainee course evaluation – Questionnaire

Trainee Course Evaluation | RTC - IBE

<https://rtc-moodle.ibe.cnr.it/mod/questionnaire/print.php?qid=133&r...>

**Trainee Course Evaluation**

Your opinion is important for us, please answer the questions as accurately as possible.

You can save your progress and then log back on to the questionnaire.

Once completed the questionnaire can not be changed.

---

Page 1

**1** How did you know about the AgroMetSchool?  
(AIAM web site, RTC web site, WMO web site, colleagues, list of experts [please, specify which list], .....)  
- Max 100 characters

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Page 2

**2** Did you have any problem with the participation at the Course?

Yes  No

---

Page 3

**3** If you had difficulties with the participation at the course, please indicate which is the major problem you had

Home job activities  
 Language difficulties  
 Course length  
 Lack of basic knowledge about some topics of the course  
 Other:

---

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**4** To what extent the program met the objectives?

very well met  
 fully met  
 nearly met  
 not met

**5** Do you think the acquired knowledge will help you during the everyday job activities?

Yes  No

---

Page 5

**6** If yes, explain. (max 300 character)

---

Page 6

**7** If no, explain. (max 300 character)

---

Page 7



**8** How was the length of the Course?

too short

little short

just right

a little long

---

Page 8

**9** Did you suspend your daily work activity to attend the course? Please select the answer that best applies to your situation (max 1)

I had to suspend all the everyday duties

I had to manage to attend the course while doing my everyday duties

I can easily manage my everyday duties while I'm attending the course

---

Page 9

**10** In your opinion, the course format, is it effective?

Yes  No

---

Page 10

**11** If you think that the course format was effective, please select the answer that better explain why (max 3 answers/options)

clear course content

the course is very demanding

the course is basic

good documentation very effective practical exercises

field visits

appropriate length

---

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**12** If you think that the course format was not effective, please select the answer that better explain why (max 3 answers/options)

problems with course content

the course is too demanding

the course is too basic

some more documentation material would help

more practical exercises

more field visits

too short

too long

---

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**13** When did you feel most engaged with the course content topics?



**14** Please rate how well the Course met your expectations in the following areas.

(1=Below expectation, 3=Met expectation, 5=Exceeded expectation)

	1	2	3	4	5
Relevant content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effectiveness of learning activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of facilitator support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Level of engagement possible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effective learning resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flexible learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Course structure and format	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Course website (Moodle site)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**15** If you rated any of the above items 1 or 2, please give a brief explanation to help us improve.

**16** Rate the overall quality of each session of the Course

(1=Not effective, 3=Moderately effective, 5=Very effective)

	1	2	3	4	5
Day 1 - Introductory lecture - Dr Salvucci	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 1 - Fair data and transferrable skills - Prof Laic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 1 - Organisation of agrometeorological measurements - Prof Eitzinger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 1 - Quality control (QC) and gap filling (GF) of agrometeorological data with practical examples - Dr Firanj Sremac	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 2 - Micrometeorological flux measurements - Lecture 1 - Dr Famulari	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 2 - Micrometeorological flux measurements - Lecture 2 - Dr Carotenuto	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 2 - Micrometeorological flux measurements - Lecture 3 - Dr Nardino	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 3 - New todata interpretation: machine learning and artificial intelligence - Dr Montaghi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 3 - The use of AI in plant protection - Prof Laic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 4 - Soil Measures and sensors - Data Analysis and Experimental Designs in the Field: Methods and Applications - UNIVPM	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 4 - Soil Measures and sensors - Agronomic Results and DSSAT Model Calibration: From Field Trials to Simulation - UNIVPM	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 4 - Soil Measures and sensors - Introduction to Programming for Forecasting in Agronomic Trials - UNIVPM	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 4 - Visit to the eperimental farm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 5 - Urban forestry vs urban heat: reclaiming the microclimate for livable cities - Prof Ferrini	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 5 - Fair urban and rural micrometeorological networks - Prof Eitzinger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 5 - Seasonality of urban and rural micrometeorological environments - Dr Firanj Sremac	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Day 5 - Modeling impact of urban forestry on UHI - Prof Laic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**17** If you rated any of the above items 1 or 2, please give a brief explanation to help us improve.



Rich text editor toolbar: Bold, Italic, Underline, Bulleted list, Numbered list, Link, Unlink, Image, Help.

18 What do you think about the overall programme, was it too theoretical, or too practical or the right balance?

Choose...

---

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19 According to your educational background and experience, how was the level of the training?

Choose...

---

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20 If you think that the level of the training activity was "Too High" tick the answers that best describe why (max 2 answers)

- the level was too academic
- the course duration was too short
- more time needed to do practice with software
- Other:

---

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21 If too low, explain.

---

Page 16

22 In your opinion, what do you suggest is the best ratio between the theoretical and practical components of the programme?

- 100% theoretical
- 75% theoretical 25% practical
- 50% theoretical 50% practical
- 25% theoretical 75% practical

23 Do you think the duration of the course was adequate to the objective?

Yes  No

---

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24 If you think the duration of the course was not adequate to the objective, which should be a suitable duration?

- 3 days
- 2 weeks
- 1 months
- Other:

---

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25 Do you consider comprehensive the training material for the theoretical lectures and the practical sessions?

Yes  No

26 How you would improve the quality of training materials (max 2 answers/options)

more selected readings

more support after the training

more case studies

video lessons

more exercises

Other:

---

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27 The teachers were well prepared for the class

Almost always

Frequently

Sometimes

Rarely

Almost never

28 The teachers stimulate / motivate interest in the subject presented.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

29 The teachers were available and exhaustive when asking for clarification in the Q&A Sessions.

Almost always

Frequently

Sometimes

Rarely

Almost never

---

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30 If you have any suggestion to improve the program for future training activities, please write it here

Rich text editor toolbar:



31 How would you rate the overall event?

excellent

very successful

successful

fair

Close this window



#### Appendix 4. Do you think the acquired knowledge will help you during the everyday job activities?

It will help me to develop ideas for my future scientific work and connect me with other scientist in my field. Also, it will improve some of my teaching skills.
The course framework introduced advanced techniques from the basics, thus made them much easier to implement for my research objectives. The direct connection with experts helped me to also advance in very specific areas of my research.
I work at the Institute of lowland Forestry and Environment, and micrometeorological measurement will help me in the future research. Also, lecturing about urban forestry it was very helpful, because I am dealing with urban physiological measurements.
It's hard to say, but at least it connected me with another great scientists and some presentations (like about meteorological stations, Python etc.) really helped me a lot.
I have gained a lot of new knowledge from the summer school and I would like to use all of these information during my PhD, especially machine learning.
I work with remote sensing data to analyse environmental hazards. It is always useful to calculate soil moisture and surface temperature parameters for detection of agricultural analysis and environmental impacts. In addition, python and r programming are really important to deal with huge dataset.
Yes, it will help me especially with information on practical measurements and how to make our own measurements. Also, amazing lecture on AI by Prof Lalic
I think that this experience has allowed me to gain a deeper understanding of key theoretical concepts and learn practical skills vital for the collection, processing and interpretation of micrometeorological data and environmental monitoring.
The information acquired during the course will be crucial for better planning experiments that require meteorological data. Important information for finding data online.
As I work with micrometeorology studies, the summer school was important in acquiring knowledge especially on UAV measurements in Agriculture and also it was good to revise on the basics of Python programming language and Eddy covariance measurements
Lectures on micrometeorological measurements and the application of machine learning in agro-meteorology met my research interests. I believe that these courses have improved my skills by helping me to be more efficient in data management and analysis



## Appendix 5. When did you feel most engaged with the course content topics?

I felt most engaged with the course content on the first day during the lecture on soil science, as well as during the lectures given by Prof. Lalić and Prof. Ana. Additionally, the final day and the presentation by Prof. Francesco were particularly useful and inspiring for me.
When I had to opportunity for discussion about the key objectives of my research I am not very confident with. I could ask the senior experts from the field of research about very specific problems I would spend weeks researching and learning by my own.
I felt most engaged with urban forestry lecturing.
During the part dealing with programming (Python, R) and during Friday's lecture on urban greenery
I think on Friday - when there was a presentation about Urban Green Spaces and Meteorological stations.
New tools for data interpretation: machine learning and artificial intelligence
Francesco Ferrini's presentation, as well as when installing Python.
I was aware I will learn about soil moisture, meteorological data and programming skills. But I was totally engaged with topics of remote sensing.
When talking about proxy variables for determining seasons.
<b>NEW TOOLS FOR DATA INTERPRETATION: MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE</b>
I felt most engaged with the course content during the section on machine learning and AI. The topics were both intellectually stimulating and highly relevant, and I appreciated the practical examples that helped illustrate complex concepts in an accessible way.
Session: <b>NEW TOOLS FOR DATA INTERPRETATION: MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE.</b>
During the Eddy covariance, remote sensing lectures and the field trip where we witnessed the UAV and data collection.
During lectures about micrometeorological measurements and machine learning in agrometeorology



## Appendix 6. Additional suggestions to improve the program for future training activities.

<p>Include more practical exercises to reinforce the theoretical concepts and enhance hands-on learning.</p>
<p>I did not like the lessons, where the lecturer was talking through MS Teams. It was very hard to focus on the topic and also process the communication noise due to online presentation.</p>
<p>I would include at least 2 or more field exercises. I think it makes a sense because of choosing a Summer school location.</p>
<p>I believe this summer school had excellent objectives, with the idea of combining diverse approaches and knowledge. However, the overall delivery fell short of its potential. Many of the sessions were heavily theoretical, so I would suggest focusing more on practical activities in the future. In particular, it would be beneficial to create group-based tasks that promote engagement, collaboration, and networking. Each group could then present their results at the end of the week, which would not only enhance learning but also provide a way to assess what participants gained from the program. Additionally, having lunch together in a cafeteria, even if participants need to contribute a small fee, would be a great opportunity for informal interaction and networking. I want to emphasize that not everything was negative. The organizers were approachable, the schedule was well-managed and on time, and both the venue and the participants were excellent. One suggestion, however, would be for the organizers to engage more with participants throughout the program. At times, it felt as though they were somewhat detached from the project and the attendees.</p>
<p>Everything was nice and useful. Exactly the course contributed to my academic future.</p>
<p>We would like the program to adopt an integrated learning and application methodology, with an increased emphasis on in-situ demonstrations, with sessions for processing, validation and transformation into concrete solutions or models applicable in the office.</p>
<p>In-person lessons without distance learning for better understanding of topics. More practical activities, theoretical and practical operation of the sensors for comprehensive information for direct use in experiments.</p>
<p>It would be good to have more practical sessions as playing with the data and analysing different conditions/scenarios would be really helpful in understanding the concepts in a very deep level.</p>
<p>The duration of theoretical lessons could be better planned in order to have more time for practical ones</p>

