



INTERNATIONAL ADVANCED  
SCHOOL IN AGRICULTURAL  
METEOROLOGY

**FIFTH EDITION**

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



# **AGRICULTURAL METEOROLOGY**

FOR AGRICULTURE  
MANAGEMENT AT MICROSCALE



Associazione  
Italiana  
di Agrometeorologia



WORLD  
METEOROLOGICAL  
ORGANIZATION



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EUROPEAN COOPERATION  
IN SCIENCE & TECHNOLOGY



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The 5th Edition of the International School is co-organized by AIAM, WMO-RTC in Italy, Università Politecnica delle Marche, jointly with the CA20108 FAIRNESS COST Action, and with the Technical Cooperation of FAO.

## **COURSE CONTENT**

Effective agricultural management requires detailed knowledge of microclimatic conditions at the field and sub-field scale. Agricultural Meteorology provides essential tools to monitor and analyse local climate variability, supporting data-driven decisions for resource optimization and sustainable practices. The 5th edition of the School, Agricultural Meteorology for Agriculture Management at Microscale, focuses on high-resolution climate analysis, precision monitoring, and site-specific applications. Participants will learn advanced techniques to assess and manage microclimatic dynamics, improving resilience and efficiency in agricultural systems, under a changing climate.

## **LEARNING OUTCOMES**

Improvement of scientific and technical skills to address the challenges posed by climate change in the agricultural and forestry sector. 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.

## **COURSE FORMAT**

One-week school in presence with lectures, group discussions, and practical training sessions. Students and teachers of the course will benefit from the Moodle platform through which educational material will be shared and evaluation procedures conducted.

## **COURSE LANGUAGE**

The school is delivered in English and translation into other languages is not planned.

## **COURSE TOPICS**

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

*A field trip is planned, dedicated to air-soil interactions and observations and analysis.*

## **CERTIFICATE, EVALUATION**

There is no final learning assessment test. A Certificate proving the attendance to the training course will be awarded to all the trainees at the end of the school, after completing the individual online survey to evaluate the Training Effectiveness and Impact.

## **VENUE**

Università Politecnica delle Marche  
Dip. Scienze Agrarie, Alimentari ed Ambientali  
Via delle Brecce Bianche 10, - 60131 Ancona, Italy



## **ITALIAN ASSOCIATION OF AGROMETEOROLOGY**

The mission of AIAM ([www.agrometeorologia.it/](http://www.agrometeorologia.it/)), the Italian Association of Agrometeorology, is the promotion of agrometeorological research through conferences, seminars, and training. AIAM also acts as a link between the services and research activities, and this connection favours the promotion of research on relevant agrometeorological themes, internationally disseminated through the Italian Journal of Agrometeorology, published by the Association.

## TARGET AUDIENCE

The School is designed primarily for professionals, young researchers and scientists, and PhD students from WMO-Regional Association VI (RA-VI, <https://wmo.int/about-wmo/regions/regional-associations>) engaged and interested in the application of advanced agrometeorological methodologies and techniques.

## PRE-REQUISITIES

Applicants are expected to have an adequate knowledge of Meteorology, Agrometeorology, Agronomy and agro-systems management, data collection and analysis.

## COSTS AND FEE WAIVER

A registration fee of 400€ will be charged to participants to be paid via Internet banking by 30 May, 2025, before the beginning of the school. Further details will be provided at a later stage.

The tuition fee includes access to the school, course material, coffee breaks, field trip, social event.

## WMO COMPETENCIES

The school is planned to address the following competency (WMO-No. 1209, 2019 -

Compendium of WMO Competency Frameworks): Provision of Climate Services with a focus on services for agriculture

The school is also linked to the following objectives of the WMO Strategic Plan 2024-2027:

Objective 4.2 - Develop and sustain core competencies and expertise

Objective 5.4 - Environmental sustainability

## SCIENTIFIC COMMITTEE

The Scientific Committee is composed by members of AIAM, WMO RTC, FAO, CA20108 FAIRNESS COST Action, and the hosting Institution, the Università Politecnica delle Marche:

- Filiberto Altobelli, CREA-PB and AIAM
- Marina Baldi, WMO-RTC and CNR-IBE
- Anna Dalla Marta, University of Florence-DAGRI and AIAM
- Federica Rossi, CNR-IBE and AIAM
- Francesca Ventura, University of Bologna-DISTAL and AIAM
- Federica Matteoli, FAO
- Branislava Lalic, COST Action
- Pavol Nejedlik, COST Action
- Luigi Ledda, Università Politecnica delle Marche
- Giuseppe Corti, Università Politecnica delle Marche
- Stefania Cocco, Università Politecnica delle Marche

## COURSE INSTRUCTORS

Trainers are experts from different Universities and Research Centres, and experts from CA20108 FAIRNESS COST Action Partners.

## PARTNERS

- University of Florence - DAGRI
- National Research Council, Institute of Bioeconomy (CNR-IBE)
- Council for Agricultural Research and Economics (CREA)
- Accademia dei Georgofili
- Foundation for Climate and Sustainability (FCS)

## APPLICATIONS AND SELECTION PROCESS

The School is open to a max of 30 participants: interested applicants are invited to submit their application as soon as possible, because in the selection process, in case of a tie, preference will be given to those who submitted the application first.

Interested Candidates can apply filling this application form and sending copy of their Passport (or Identity Card for EU Citizen) and a brief CV to [wmortc.italy@gmail.com](mailto:wmortc.italy@gmail.com)

The scientific committee will evaluate, for each candidate, the application, the motivation, and profile and prepare a ranked list.

## DEADLINE FOR APPLICATIONS

Deadline for applications is 16 May, 2025.



## DATE

**From** Monday 9 June 2025  
h 8.30  
**To** Friday 13 June 2025  
h 17.00

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## VENUE

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

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# THE PROGRAMME

## WORKING HOURS

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



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.

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

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- 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)

18.00

## ICEBREAKER

# 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 fluorescence and remotely-assessed parameters for fluxes upscaling. A particular focus will be on hands-on data elaboration, data quality and interpretation.

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.

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 Montaghi (CNR-IRET)

16.00 - 17.30

## THE USE OF AI IN PLANT PROTECTION

Branislava Lalic (CA20108 COST Action)

# 12 JUNE 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



## 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

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



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