Action title:

FAIR NEtwork of micrometeorological measurements

Action No.: **CA20108**

Acronym: **FAIRNESS**

Action chair: Branislava Lalić

WP No: **4**

WP leader: Tamas Weidinger

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Deliverable contributors: All authors of the book (see below)

Deliverable: **D4.2 – Guideline for future good practices in micrometeorological measurement methods, data assimilation and indices (M33)**

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D4.2 – Guideline for future good practices in micrometeorological measurement methods, data assimilation and indices

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Contents

D4.2 – Guideline for future good practices in micrometeorological measurement methods, data assimilation and indices

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Executive Summary

Deliverable D4.2 – Guideline for Future Good Practices in Micrometeorological Measurement Methods, Data Assimilation and Indices presents one of the key scientific and educational outputs of the FAIRNESS COST Action (CA20108 – FAIR Network of Micrometeorological Measurements). It results from the work carried out under Working Group 4 (Beyond FAIRNESS Strategies) and reflects collaborative contributions from experts across Europe with decades of experience in micrometeorology, agrometeorology, and environmental instrumentation.

The deliverable is materialised as a comprehensive, beginner-oriented textbook:

Lalic, B., Eitzinger, J., Foken, T., Weidinger, T. (eds) 2025. Micrometeorological Measurements – An Introduction for Beginners. Springer, Open Access.

This book serves as a pedagogical and practical guideline for individuals who need to design and conduct micrometeorological measurements but lack extensive prior training. It provides a structured introduction to the principles, instrumentation, and data management practices required for reliable small-scale meteorological observations. The content is designed for early-career researchers, students, and professionals in environmental and agricultural sciences who require clear and concise guidance on measurement planning, data quality, and processing.

The book comprises four chapters, each addressing a crucial aspect of micrometeorological research:

1. Introduction to Micrometeorological Measurements – foundational physical principles and the relevance of atmosphere–biosphere interactions.
2. Methodical Recommendations for Micrometeorological Applications – design of representative measurement setups, sensor selection, and data collection methods.
3. Good Practices for Single Parameters – detailed descriptions of instruments and measurement approaches for specific meteorological variables.
4. Quality Control and Recovery of Meteorological Data – data management, validation, and gap-filling methods to ensure FAIRness and usability.

Together, these chapters form a coherent guide linking measurement design, instrumentation, and data-processing workflows in alignment with FAIR data principles. The book also bridges theoretical knowledge and operational practice by presenting concrete examples, standard operating procedures, and recommendations derived from the collective experience of the FAIRNESS network.
This deliverable represents a key component of the FAIRNESS legacy, transforming the Action's collective expertise into a lasting educational and methodological reference that will support training, research, and open-science implementation across Europe and beyond.

Citation of the book:
Lalic, B., Eitzinger, J., Foken, T., Weidinger, T. (eds) 2025. Micrometeorological Measurements – An Introduction for Beginners. Springer, Open Access.

Summary and book content

This book (see Figure 1, Table 1)) is designed and written as a guideline for individuals who need to organize and conduct micrometeorological measurements but lack the necessary knowledge and skills, and don't have the time to acquire them through regular training. It caters to beginners who have a basic understanding of physical processes and are at the start of their professional careers, as well as to professionals who are familiar with meteorological elements but not deeply versed in physical processes and meteorological instrumentation.

The first chapter provides a brief physical introduction to governing processes and their effects. Understanding the causes and consequences of atmosphere-biosphere interaction is essential for organizing reliable experiments. The second chapter helps make your measurements more representative and guides you on sensor selection (type, inertia, principle of work) and data collection and transfer methodology. The third chapter describes the measuring devices for all meteorological elements mentioned, whereby the specific device selection is based on the application objective. The fourth chaper is dedicated to micrometeorological data management and quality assurance, control and data correction aspects.

Technical details of the book

Chapter 1: Introduction to Micrometeorological Measurements
(by Thomas Foken, Tamás Weidinger, Branislava Lalić, Josef Eitzinger)

Chapter 2: Methodical Recommendations for Micrometeorological Applications
(by Josef Eitzinger, Tamás Weidinger, Branislava Lalić, Thomas Foken, Zoltán Istenes, Britta Jänicke, Erich Mursch-Radlgruber)

Chapter 3: Good Practices for Single Parameters
(by Thomas Foken, Branislava Lalic, Josef Eitzinger, Tamás Weidinger)

Chapter 4: Quality control and recovery of meteorological data
(by Mina Petrić, Branislava Lalić, Peter Domonkos, Tamas Weidinger, Thomas Vergauwen, Ivan Koči, Thomas Foken)

Tab.1. Pages and counts of the 4 chapters (of the submitted manuscript to SPRINGER)

Chapters	Pages	Word count	Characters	Char+Spaces
CH 1	40	14369	77983	92122
CH 2	52	18845	107989	126333
CH 3	66	22289	125203	146812
CH 4	41	12334	74557	86598

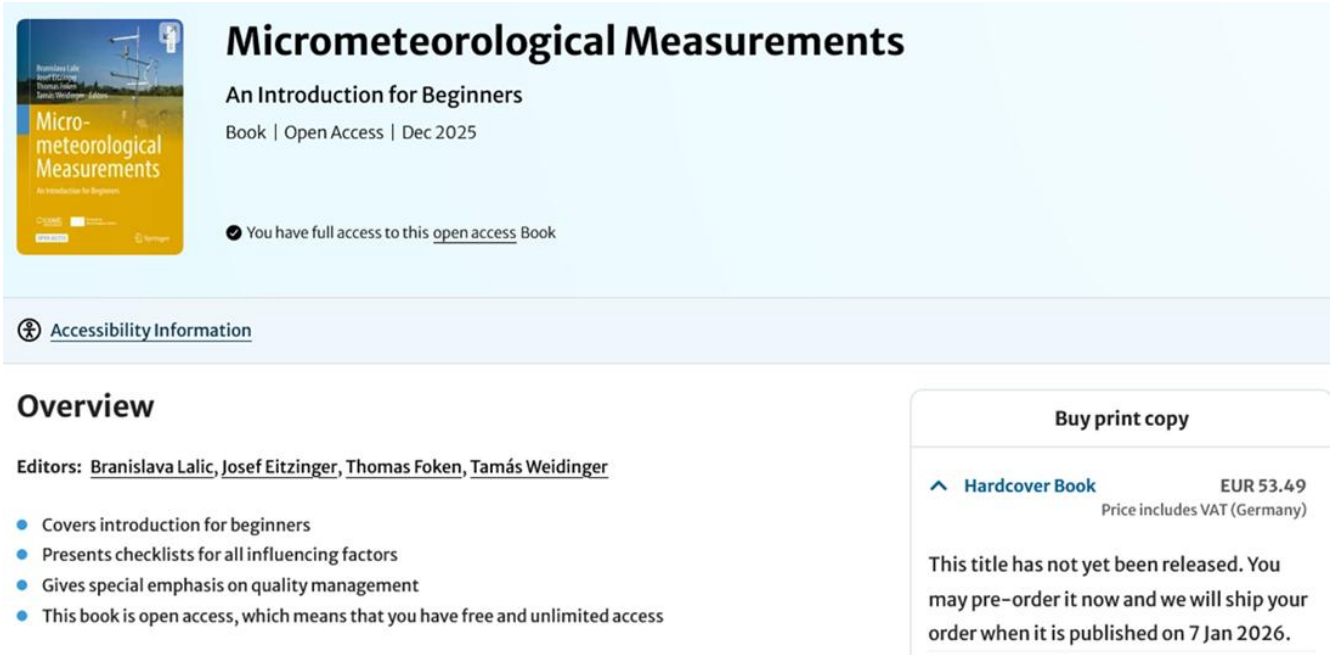

Fig. 1. Frontcover of the book as advertised at Amazon

Authors of the book

Branislava Lalic is a professor of Meteorology and Biophysics at Faculty of Agriculture, UNS, Novi Sad (Serbia). Decades of experience in teaching micrometeorological measurements, instrumentation and data management, particularly to agronomy students and early-career researchers inspired this beginner-oriented guide.

Josef Eitzinger is professor for Agrometeorology at the University of Natural Resources and Life Sciences, BOKU, Vienna (Austria). His long-time expertise and research focus includes the processes of soil-crop-atmosphere interactions, crop modelling, crop-water balance, drought and cropping risks monitoring, agrometeorological measurements and climate change impact assessments on crop production.

Thomas Foken is a retired professor of micrometeorology at the University of Bayreuth (Germany) with many years of experience in research and teaching on the interaction between the Earth's surface and the atmosphere. He previously headed departments at the meteorological observatories in Potsdam and Lindenberg. His work on experimental meteorology has been honoured internationally.
Tamás Weidinger is a retired Associate Professor at Eötvös Loránd University (ELTE, Budapest, Hungary), with a PhD in meteorology. His main research topic is surface-biosphere-atmosphere exchange processes including both measurements and modelling. He is an editor of Theoretical and Applied Climatology and Editorial Board member of Időjárás (Quarterly Journal of the HungaroMet).
Peter Domonkos is a Hungarian climatologist living in Spain. PhD (Kossuth Lajos University, Debrecen, Hungary, 1999), expert on statistical climatology, analysis of extreme climatic events, data quality control and time series homogenization. Software developer and author of a large number of scientific papers.
Zoltán Istenes is an Associate Professor at Eötvös Loránd University (ELTE, Budapest, Hungary), specialized in robotics, intelligent systems, and sensor technologies. His research includes the development of advanced meteorological data acquisition platforms, ranging from ground-based weather stations to unmanned aerial vehicles (UAVs) equipped with environmental and atmospheric sensors for real-time, in-situ observations.
Mina Petrić is a researcher at Avia-GIS, Belgium, since 2016. She is a physicist specialised in meteorology with a focus on mathematical vector population dynamics modelling and how population seasonality and abundance is affected by weather patterns, changing climatic conditions and extreme events.
Britta Jänicke is professor of Environmental Meteorology at the University of Kassel. Her research focuses on urban climate and human biometeorology, with expertise in multi-scale observations and simulations. With a background in Urban Ecology and Landscape Planning, she has experience linking urban climatology and planning to support climate-resilient cities.
Erich Mursch-Radlgruber is retired professor for boundary layer meteorology at the University of Natural Resources and Life Sciences, BOKU, Vienna, Austria. His expertise and research focus includes micro- and mesoscale meteorological analysis, including related measurement and modelling techniques.
Thomas Vergauwen is specialized in high-resolution numerical weather forecasting and non-traditional observations. His primary focus is on verification techniques using crowdsourced observations and maintaining the MetObs-toolkit. With a background in physics and meteorology, he is affiliated with the Royal Meteorological Institute of Belgium (RMI) and Ghent University.
Ivan Koči is MS Certified professional, responsible for PIS agrometeorological network (Serbia) and its data assimilation and analysis.

Acknowledgement in the book

This book is based upon work from COST* Action CA20108 FAIRNESS (FAIR Network of Micrometeorological Measurements), supported by COST (European Cooperation in Science and Technology). We gratefully acknowledge the collaborative environment, shared expertise, and

voluntary contributions of participants throughout the FAIRNESS Action, which made this book possible.
*COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.

Outlook (next steps): The book will be published as open access by end of 2025. Further steps include that part of contents of the book considering data gap filling procedures (calculation sheets and examples) will be made available via GitHub to strengthen and support the use of the book content for users.