

MARCELLO IOTTI

CONTACT INFO

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CURRENT POSITION

Postdoc **Sept. 2025-
present**
*Institute for Climate Resilience - REMHI Division
CMCC Foundation (Euro-Mediterranean Center on Climate Change)
Via Thomas Alva Edison, 81100 Caserta (CE), Italy*

PROFILE

I am an atmospheric physicist with a strong background in physics and meteorology. During my PhD, I expanded my expertise to computer science and machine learning, focusing on their applications in atmospheric modeling. My recent research has centered on deep learning techniques for precipitation downscaling, emulating or enhancing physical parameterization schemes, and detecting or classifying extreme precipitation events. More broadly, I am interested in applying machine learning methods to analyze and interpret outputs from Earth System Models. Over the past months, I contributed to the development of the software infrastructure of the Italian National Centre for HPC, Big Data, and Quantum Computing. This work included designing a managed version control service to support multiple research groups, deepening my understanding of research-oriented software development and enhancing my proficiency with Git, GitHub, and GitLab. Since September 2025, I have been a postdoctoral researcher at CMCC, focusing on AI-based downscaling of climate model outputs and developing deep learning emulators for physical parameterizations in climate models. I strongly value multidisciplinary collaboration and am committed to applying my skills across a wide range of scientific and technical domains. I continue to invest significant effort in advancing my scientific and technical proficiency, with the aim of achieving the highest level of expertise and full autonomy in designing and developing software for my research, seamlessly interacting with the necessary hardware infrastructure for their successful operation.

PROFESSIONAL EXPERIENCE

Research Scientist

Feb 2024-
Ago 2025

*Institute for Applied Mathematics and Information Technologies (IMATI)
National Research Council (CNR)*

Via de Marini, 6 (Torre di Francia) - 16149 Genova, Italy

- Contributed to the digital infrastructure of the ICSC National Center for HPC, Big Data, and Quantum Computing.
- Designed and deployed managed version control services for multiple research groups.
- Contributed to the Data Management Plan.

EDUCATION

PhD in "Data Science and Computation"

Jun 2024

Department of Computer Science and Engineering (DISI)

Alma Mater Studiorum - University of Bologna

- **Dissertation:** Exploring deep learning-based approaches for precipitation downscaling
- **Main theoretical subjects:** Python programming, Machine Learning, Deep Learning, Infrastructures for Big Data processing (Computer networks, Datacenters, Cloud computing e Cloud Storage, Infrastructures for parallel computing, Containers, Job scheduling and data distribution, Edge Computing, IoT, Authentication and Authorisation), Quantum Computing.

Master degree in Physics of the Earth System

Mar 2019

Department of Physics and Astronomy "Augusto Righi" (DIFA)

Alma Mater Studiorum - University of Bologna

- **Thesis:** Urban boundary layer modeling with WRF: assessment of different urban parameterizations over the city of Bologna
- **Final grade:** 110/110 cum laude
- **Main theoretical subjects:** Dynamic meteorology, Planetary Boundary Layer and Turbulent diffusion, Physical Climatology, Cloud Physics, Radiative Transfer and Remote Sensing, Atmospheric Physical Chemistry, Fluid Dynamics, Physical and Coastal Oceanography, Seismology.

Bachelor degree in Physics

Apr 2015

Department of Physics, Informatics and Mathematics

University of Modena and Reggio Emilia

- **Thesis:** Effetto stagionale di strategie di mitigazione dell'isola di calore urbana (Seasonal Effects of Urban Heat Island Mitigation Strategies)

Conservatory Diploma in Trombone

Jun 2009

Music Conservatory "Lucio Campiani"

Mantova

POSTGRADUATE TRAINING

Training course: High Performance Computing - Atos
ECMWF | Reading

02-05 May 2023

- <https://events.ecmwf.int/event/336/>

Training Event "Machine Learning and the Physics of Climate" and Workshop "Extreme Events in Weather and Climate" 25-29 Apr 2022

Critical Earth Training Event

(EU Horizon 2020 project. Grant Agreement No.956170)

- https://www.criticalearth.eu/event/ew2-workshop/?instance_id=2

Programming paradigms for GPU devices

29 Nov 2021-
01 Dec 2021

CINECA

- <https://eventi.cineca.it/it/node/679>

Fundamentals of Accelerated Computing with CUDA Python

16 Nov 2021

NVIDIA Deep Learning Institute

- <https://www.nvidia.com/en-us/training/instructor-led-workshops/fundamentals-of-accelerated-computing-with-cuda-python/>

IFAB Quantum training course

7,9,12,14
Apr 021

IFAB - International Foundation Big Data and Artificial Intelligence for Human Development

- Presentation webinar: <https://www.ifabfoundation.org/2021/02/26/giovedi-11-marzo-ore-16-00-presentazione-del-programma-formativo-quantum-learning-machine/>

Quantum Computing and High Performance Computing 3rd edition

15 Dec 2020

CINECA

- <https://eventi.cineca.it/en/events/quantum-computing-and-high-performance-computing-3rd-edition>

Physical Sensing and Processing Summer School 2^a edizione

20-24 Jul 2020

Dipartimento di Fisica e Astronomia

Alma Mater Studiorum - Università di Bologna

- <https://site.unibo.it/school-physical-sensing-and-processing/en/past-editions/2nd-edition-20-24-july-2020>

COLLABORATIONS

Visiting Scientist

Jun 2023-
Nov 2023

European Centre for Medium-Range Weather Forecasts

ECMWF Headquarters, Shinfield Park, Reading, RG2 9AX, UK

- Development of a deep learning model for the prediction of heavy precipitation events.
- Collaboration on research on urban flood prediction.

Visiting Scientist

**Mar 2023-
Jun 2023**

*European Centre for Medium-Range Weather Forecasts
ECMWF Headquarters, Shinfield Park, Reading, RG2 9AX, UK*

- Collaboration on research on urban flood prediction.

Associate Research Assistant

**May 2022-
Aug 2023**

*Institute of Atmospheric Sciences and Climate (CNR-ISAC)
Bologna Headquarter, Via P. Gobetti, 101 - 40129 Bologna - Italy*

- Development of a generative deep learning model for rainfall downscaling.

PUBLICATIONS

Articles

- [1] **M. Iotti**, P. Davini, J. von Hardenberg, and G. Zappa. *RainScaleGAN: a Conditional Generative Adversarial Network for Rainfall Downscaling*. 2025. DOI: <https://doi.org/10.1175/AIES-D-24-0074.1>.
- [2] C. Iacomino, S. Pascale, G. Zappa, **M. Iotti**, P. Grazzini F. and Ghinassi, and A. Portal. *A classification of high-risk atmospheric circulation patterns for Italian precipitation extremes*. 2025. DOI: <https://doi.org/10.1002/joc.70118>.

Conference proceedings

- [Proc1] **M. Iotti**, P. Davini, J. von Hardenberg, and G. Zappa. "Downscaling of precipitation over the Taiwan region by a conditional Generative Adversarial Network". In: *Proceedings of International Symposium on Grids & Clouds 2022 – PoS(ISGC2022)*. Vol. 415. 2022, p. 004. DOI: [10.22323/1.415.0004](https://doi.org/10.22323/1.415.0004).
- [Proc2] M. Simonazzi, L. Sandrolini, **M. Iotti**, and A. Mariscotti. "Deep-Learning Based Transient Identification in Switched-Mode Power Supplies Conducted Emissions". In: *2022 International Symposium on Electromagnetic Compatibility - EMC Europe*. 2022, pp. 410-414. DOI: [10.1109/EMCEurope51680.2022.9900994](https://doi.org/10.1109/EMCEurope51680.2022.9900994).

CONFERENCES

- Presentations**
- [Talk1] **M. Iotti**, P. Davini, J. von Hardenberg, and G. Zappa. *A Conditional Generative Adversarial Network for Rainfall Downscaling*. *EGU General Assembly 2022, Vienna, Austria, 23-27 May 2022*. EGU22-9877. 2022. DOI: <https://doi.org/10.5194/egusphere-egu22-9877>.
- [Talk2] **M. Iotti**, P. Davini, J. von Hardenberg, and G. Zappa. *A Conditional Generative Adversarial Network for Rainfall Downscaling*. *International Symposium on Grids & Clouds (ISGC) 2022 Virtual Conference, Academia Sinica, 21-25 March 2022*. 2022. URL: <https://indico4.twgrid.org/event/20/contributions/1107/>.
- [Talk3] S. Di Sabatino, E. Brattich, F. Barbano, F. Di Nicola, **M. Iotti**, M. Polito, B. Pulvirenti, F. Prandini, C. Barbieri, L. Torreggiani, E. Minguzzi, M. Nardino, A. Valmassoi, and F. Pilla. *Dynamics of the urban heat island and its effect on local air quality: the Bologna iSCAPE case study*. *1° Congresso Nazionale AISAM, Bologna, 10-13 Sep 2018*. 2018. URL: <https://hdl.handle.net/11585/728097>.
- [Talk4] S. Fiore, P. Nassisi, L. Sacco, G. Padovani, F. Antonio, D. Elia, I. Epicoco, N. G. Marchioro, M. Robol, K. Zefkilis, F. Vella, C. Sopranzetti, A. Alessandri, A. Cherchi, F. Catalano, G. Sannino, G. Scipione, M. Puccini, E. Coppola, I. Giroto, M. Reale, S. Salon, A. Galizia, **M. Iotti**, H. J. Oliver, V. Anantharaj, and S. Gualdi. *Climate Data IT: towards a National Data Hub for Climate Science*. *ITADATA2025: The 4th Italian Conference on Big Data and Data Science, Turin, 9-11 Sep 2025*. 2025. URL: <https://www.itadata.it/>.
- Posters**
- [Poster1] F. Di Nicola, M. A. Santo, **M. Iotti**, P. Testori, F. Barbano, E. Brattich, and S. Di Sabatino. *Predictions of the urban temperature distribution using two different scale model approaches: an analysis of pros and cons for heat mitigation strategy*. *2° Congresso Nazionale AISAM, Napoli, 24-27 Sep 2019*. 2019. URL: <https://hdl.handle.net/11585/728209>.
- [Poster2] C. Iacomino, S. Pascale, G. Zappa, **M. Iotti**, F. Grazzini, P. Ghinassi, and A. Portal. *A classification of high-risk atmospheric circulation patterns for Italian precipitation extremes*. *EMS Annual Meeting 2025, Ljubljana, Slovenia, 7-12 Sep 2025*. EMS2025-259. 2025. DOI: <https://doi.org/10.5194/ems2025-259>.
- [Poster3] C. Iacomino, S. Pascale, G. Zappa, **M. Iotti**, F. Grazzini, A. Portal, and P. Ghinassi. *High-risk atmospheric circulation patterns for Italian precipitation extremes*. *EGU General Assembly 2025, Vienna, Austria, 27 Apr-2 May 2025*. EGU25-15668. 2025. DOI: <https://doi.org/10.5194/egusphere-egu25-15668>.

GRANT PROPOSAL

ENCIRCLE: Evaluating the changing risk of cyclones for Italian precipitation extremes

2023

PRIN: Progetti di Ricerca di Rilevante Interesse Nazionale - Bando 2022, Prot. 202282W35K

- PI G. Zappa, **funded (€ 282k)**.
- Participation in the drafting of the project, included as an expert for the ML-related part.

PROFESSIONAL ACTIVITY

Projects

- **CENTAUR: Copernicus ENhanced Tools for Anticipative response to climate change in the emergency and secU-Rity domain**, HORIZON-CL4-2021-SPACE-01-43, Project ID 101082720, <https://centaur-horizon.eu>. Collaboration on research on urban floods, as part of the visit(s) to the ECMWF.
- **ICSC - National Centre for HPC, Big Data and Quantum Computing**, Project Type: PNRR - National Centre, Project identification code CN000013, <https://www.supercomputing-icsc.it/en/icsc-home/>. Contribution to the software infrastructure supporting the activities of Spoke 4 - Earth & Climate; involvement in research activities related to machine learning.

Other

- Serving as a **reviewer** for *Climate Dynamics* and *International Journal of Climatology*.

SKILLS

Languages

- Italian: mother tongue.
- English: professional proficiency.
- French: basic proficiency.

OS e hardware

- Advanced: GNU/Linux (Ubuntu, Debian, RHEL), Windows, Mac OS
- Proficient: Bash shell and bash scripting, Slurm Workload Manager.
- Familiar with: virtualisation software (Oracle VM Virtual-Box, VMware), cloud computing services (AWS).

Programming languages

- Advanced: Python, namely scientific (Numpy, Scipy, Matplotlib, Pandas, Seaborn), Machine Learning (Scikit-learn) and Deep Learning (Tensorflow, Keras) packages.
- Proficient: NCL (NCAR Command Language).
- Familiar with: Julia, MATLAB, R, Fortran.

Software

- Advanced: Project Jupyter (Jupyter Notebook, Jupyter-Lab), Google Colab, Kaggle.
- Advanced: \LaTeX , Markdown.
- Proficient: Git, GitHub, CDO.
- Familiar with: Docker.