# Andrea Zonato

## Curriculum Vitae - European Format

## General Information

Nationality **Italy**

Researchgate `https://www.researchgate.net/profile/Andrea-Zonato`

Google Scholar `https://scholar.google.com/citations?user=xZgbakQAAAAJ&hl=it`

## Education

2017–2021 **Ph.D. cum laude**, *Department of Civil, Environmental and Mechanical Engineering*, University of Trento, Trento
The Ph.D. regards the development of parameterizations for urban and complex terrain boundary layer processes

2013–2016 **Master of Science**, *Fisica del Sistema Terra - Physics of the Earth System [108/110]*, Alma Mater Studiorum - Università di Bologna, Bologna
Advanced Mathematical and Physical knowledge, with focus on Boundary Layer Dynamics and Urban Meteorology.

2009–2012 **Bachelor of Science**, *Fisica Generale - General Physics [96/110]*, Università degli Studi di Padova, Padova
Basic and advanced Mathematical and Physical knowledge, Laboratory and Data managment

## Ph.D. Thesis

Title *Modeling the Urban Boundary Layer in Complex Terrains*

Supervisors Prof. Lorenzo Giovannini, Prof Dino Zardi, Dr. Alberto Martilli

Description The Ph.D. Thesis is centered on the development of novel parameterizations regarding input datasets, land-surface-atmosphere and planetary boundary layer parameterizations for non-homogeneous terrains. In particular, the focus is set on the urban boundary layer, and in complex terrains.

## Master Thesis

Title *Evaluating the Urban Heat Island for cities of Emilia-Romagna region through numerical simulations*

Supervisors Prof. Silvana Di Sabatino, Dr. Alberto Martilli

Description This thesis deals with the study of the Urban Heat Island Effect for cities of Emilia-Romagna Region. The Weather Research and Forecasting (WRF) model (coupled with multilayer urban parametrizations and satellite data to represent the urban morphology) have been used to reproduce the Urban Boundary Layer dynamics.

## Bachelor Thesis

Title *Planetesimal formation within Circumstellar Disks*

Supervisor Prof. Francesco Marzari

Description This thesis concerns the study of the fluid-dynamical instabilities which leads to the formation of planetesimal within circumstellar disks.

## Work Experience

### Academic

January 2023- Present **Post-Doc**, KNMI - Koninklijk Nederlands Meteorologisch Instituut, De Bilt, NL
As part of ACCORD (A Consortium for COnvective-scale modeling Research and Development), I'm working on the implementation of a multi-layer urban canopy model within the Harmonie-Arome NWP model.

January 2022- January 2023 **Post-Doc**, University of Trento, Trento, IT
Position funded by the Atmospheric boundary-layer modeling over complex terrain (ASTER) project. The topic is the development of idealized simulations for reproducing valley and slope winds for idealized orographies with the WRF model.

March - September 2019 **Internship**, NCAR - National Center fo Atmospheric Research, Boulder, Colorado, US
Development of a new tubulence closure for mesoscale models.

September 2015 - April 2016 **Internship**, CIEMAT - Research Centre for Energy, Environment and Technology, Madrid
Development of a model used for the study of the Urban Boundary Layer for the city of Bologna - Programming languages used: *BASH*, *Fortran*, *Matlab*, *SAGA.GIS*.

September - December 2016 **Research Assistant**, University College of Dublin, Dublin
Development of parametrizations to take into account of the effect of green roofs, irrigated green roofs and cool roofs on urban climate (in addition to the photovoltaic panel technologies parametrization developed at CIEMAT). The software used is WRF version 3.8.1.

### Teaching Activities

25-29 Septemper 2022 **Lecturer**, University of Bochum, Bochum
Lecturer with focus on WRF/WRF-Urban at the Bochum Urban Summer School

February - Septemper 2018 **Teaching Assistant**, University of Trento, Trento
Assistant of Prof. Zardi at the course of General Physics for the viticulture and enology degree programme.

January 2017-June 2018 **Physics Teacher**, ITIS Alessandro Volta, Modena
Full time physics teacher at the secondary school.

## Visitor researcher

November 2017 **Collaboration with Doc. Alberto Martilli**, CIEMAT - Research Centre for Energy, Environment and Technology, Madrid
Development of a new turbulence model for building-induced turbulence.

May 2018 **Collaboration with Doc. Alberto Martilli**, CIEMAT - Research Centre for Energy, Environment and Technology, Madrid
Development coherent landuse input datasets for mesoscale simuations

July - august 2019 **Collaboration with Prof. Robert Bornstein and Frank Freeman**, San Jose State University, San Jose, CA, US
Development of a new turbulence model for stable atmpshere

September 2021 **Collaboration with Prof. Gara Villalba**, Universitat Autonoma de Barcelona, Barcelona, Spain
Collaboration for the application of a green roof module for the city of Barcelona and Oslo

June - July 2022 **Collaboration with Doc. Pedro Jimenez & Doc. Jimy Dudhia**, National Center for Atmospheric Research (NCAR), Boulder, CO
Inclusion of a newly developed turbulence scheme in the Weather Research and Forecasting (WRF) Model.

## Computer skills

Operative Systems: Microsoft Windows, Linux distributions, MacOS

Weather Prediction softwares: HARMONIE-AROME, WRF, WRF-Hydro, WRF-Chem. Excellent skills in running simulations, modifying internal modules and developing new physics schemes

Languages: LaTeX, *Matlab*, *python*, *Fortran*,*C++*, *BASH script*, *GIS softwares*,*NCL*

Office: Complete Package knowledge - Microsoft Office Package, Open Office Package

## Communication Skills

Good communication skills with children, developed during a two-month working experience as a science communicator at "Gruppo Pleiadi"

Very good teaching skills, developed during the teaching period at the secondary school and at the university course.

## Languages

Italian: Native Language

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|---|---|---|
| English | Advanced | *Reading (4/5) ; Listening (4/5) ; Writing (4/5) ; Speaking (4/5)* |
| Spanish | Advanced | *Reading (4/5) ; Listening (5/5) ; Writing (3/5) ; Speaking (4/5)* |
| Certifications | English B2 Academic Certificate | |

## Awards

**Advanced Study Program**, Winner of the Graduate Visitor program at NCAR (Colorado, US). Scholarship for spending six months working at the National Atmospheric Center.

## Master Thesis supervison

2022 **Numerical simulations of banded orographic convection over the eastern Italian Alps: influence of atmospheric conditions and local topography**, *Tullio Degiacomi*, Master thesis

2021 **Analysis of the urban heat island effect in Ospitaletto (BS) and of the mitigation potential provided by waste heat recovery measures**, *Gianluca Borghi*, Master thesis

2019 **Verona adapt: la modellazione come strumento di pianificazione: proposta per l'adattamento climatico di Verona Sud. Modeling as a planning instrument: a climate adaptation proposal for Verona South**, *Marika Tomasi*, Master thesis

## Talks and Presentations (as the main presenter)

January 2023 **On the Effects of Urban Areas on Thermally-Driven Circulations in an Idealized Alpine Valley**, *EGU Annual Meeting*, Denver, Colorado, US

January 2023 **A new k − $\varepsilon$ turbulence parameterization for mesoscale meteorological models**, *EGU Annual Meeting*, Denver, Colorado, US

May 2022 **A new k − $\varepsilon$ turbulence parameterization for mesoscale meteorological models**, *EGU Annual Meeting*, Wien, Austria

January 2020 **Comparing Impacts of Different Rooftop Technologies for Mitigating Urban Heat Islands and Reducing Building Energy Consumption in an Alpine City**, *AMS Annual Meeting*, Boston, US

January 2020 **On a New k–$\varepsilon$ Parametrization Closure for Building-Induced Turbulence**, *AMS Annual Meeting*, Boston, US

Septemper 2019 **On the use of High Resolution Land Surface Data Assimilation System (HRLDAS) for the definition of initial soil and land surface conditions within mesoscale models in complex terrain**, *International Converence on Alpine Meteorology (ICAM)*, Riva del Garda, IT

June 2019 **Implementation of a k-$\varepsilon$ closure in the Weather Research and Forecasting model**, *Worshop on "Turbulence Closures parameterizations for mesoscale models*, Trento, IT

Septemper 2018 **Comparing the Impact of Different Rooftop Technologies in Urban Heat Island Mitigation and on Energy Consumption during a Heat Wave Period**, *Primo Convegno Nazionale AISAM*, Bologna, IT

August 2018 **Comparing the Impact of Different Rooftop Technologies in Urban Heat Island Mitigation and on Energy Consumption during a Heat Wave Period**, *International Conference on Urban Environment (ICUC)*, New York, USA

August 2018 **Evaluating the Performance of a Novel WUDAPT Averaging Technique to Define Urban Morphology with Mesoscale Models**, *International Conference on Urban Environment (ICUC)*, New York, USA

## Software developments and Datasets

1 **Weather Research and Forecasting Model - Version 4.3**, *Implementation of novel parameterizations to account for rooftop mitigation strategies within the urban environment in the standard open-source version (`https://github.com/wrf-model/WRF/releases`)*

2 **Weather Research and Forecasting Model - Version 4.5**, *Implementation of a novel turbulence parameterization in the standard open-source version (`https://github.com/wrf-model/WRF/releases`)*

3 **Technical documentation for the hybrid 100-m global land cover dataset with Local Climate Zones for WRF**, *Development of a novel land cover dataset for urban areas (`https://zenodo.org/record/7670792`)*

## Research Projects

September 2016 - December 2016 **iSCAPE (Improving the Smart Control of Air Pollution in Europe)**, *Partecipation as Ph.D. student*

September 2019 - January 2023 **ASTER (Atmospheric boundary-layer modeling over complex terrain)**, *Partecipation as Post Doc*

February 2023 - current **Research Demonstration Project Paris 2024 Olympics**, *Partecipation as Post Doc*

## Publications


[1] O. Brousse, C. H. Simpson, O. Kenway, A. Martilli, S. Krayenhoff, A. Zonato, and C. Heaviside. Bias correction of modelled urban temperatures with crowd-sourced weather data. nov 2022. doi: 10.1002/essoar.10512277.2. URL `https://doi.org/10.1002%2Fessoar.10512277.2`.

[2] M. Demuzere, D. Argüeso, A. Zonato, and J. Kittner. W2w: A python package that injects wudapt's local climate zone information in wrf. *Journal of Open Source Software*, 7(76): 4432, 2022. doi: 10.21105/joss.04432. URL `https://doi.org/10.21105/joss.04432`.

[3] A. Ferrone, E. Vignon, A. Zonato, and A. Berne. Local spatial variability in the occurrence of summer precipitation in the sør rondane mountains, antarctica. *EGUsphere*, 2023:1–38, 2023. doi: 10.5194/egusphere-2023-490. URL https://egusphere.copernicus.org/preprints/2023/egusphere-2023-490/.

[4] I. Ribeiro, A. Martilli, M. Falls, A. Zonato, and G. Villalba. Highly resolved wrf-bep/bem simulations over barcelona urban area with lcz. *Atmospheric Research*, 248:105220, 2021. ISSN 0169-8095. doi: https://doi.org/10.1016/j.atmosres.2020.105220. URL https://www.sciencedirect.com/science/article/pii/S016980952031156X.

[5] M. Tomasi, S. Favargiotti, M. van Lierop, L. Giovannini, and A. Zonato. Verona adapt. modelling as a planning instrument: Applying a climate-responsive approach in verona, italy. *Sustainability*, 13(12), 2021. ISSN 2071-1050. doi: 10.3390/su13126851. URL https://www.mdpi.com/2071-1050/13/12/6851.

[6] A. Zonato, A. Martilli, S. Di Sabatino, D. Zardi, and L. Giovannini. Evaluating the performance of a novel wudapt averaging technique to define urban morphology with mesoscale models. *Urban Climate*, 31:100584, 2020. ISSN 2212-0955. doi: https://doi.org/10.1016/j.uclim.2020.100584. URL https://www.sciencedirect.com/science/article/pii/S221209551930183X.

[7] A. Zonato, A. Martilli, E. Gutierrez, F. Chen, C. He, M. Barlage, D. Zardi, and L. Giovannini. Exploring the effects of rooftop mitigation strategies on urban temperatures and energy consumption. *Journal of Geophysical Research: Atmospheres*, 126 (21):e2021JD035002, 2021. doi: https://doi.org/10.1029/2021JD035002. URL https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2021JD035002.

[8] A. Zonato, A. Martilli, P. A. Jimenez, J. Dudhia, D. Zardi, and L. Giovannini. A new k – $\varepsilon$ turbulence parameterization for mesoscale meteorological models. *Monthly Weather Review*, 2022. doi: 10.1175/MWR-D-21-0299.1. URL https://journals.ametsoc.org/view/journals/mwre/aop/MWR-D-21-0299.1/MWR-D-21-0299.1.xml.

[9] A. Zonato, A.and Martilli, J. L. Santiago, D. Zardi, and L. Giovannini. On a new one-dimensional k-$\varepsilon$ turbulence closure for building-induced drag. *Quarterly Journal of the Royal Meteorological Society*, 1(16), 2023. doi: https://doi.org/10.1002/qj.4476. URL https://rmets.onlinelibrary.wiley.com/doi/abs/10.1002/qj.4476.

## References contacts

- **Dr. Alberto Martilli**: alberto.martilli@ciemat.es ; +34 91 346 6299
- **Dr. Pedro Jimenez**: jimenez@ucar.edu ; +1 303-497-8201
- **Dr. Jimy Dudhia**: dudhia@ucar.edu ; +1-303-497-8950