

Curriculum Vitae

Francesco Barbano

PERSONAL INFORMATION

Work address: Department of Physics and Astronomy, University of Bologna, Via Irnerio 46, 40126 Bologna (BO), Italy

Email: francesco.barbano3@unibo.it

Networks:     

Phone: 051 209 5188 (work), (+39) 320 6717928

Birthplace and date: Casale Monferrato (AL), Italy; 07th March 1991

Citizenship: Italian

Mother tongue: Italian

Driver's license: Italian driver's license B

Main scientific interests: Francesco research delves into the characterization of the planetary boundary layer, with focus on the turbulent processes on morphologically complex terrains. Main research lines include ventilation and air pollution removal in urban canopies with vegetation, multiscale dynamics of the urban heat island, stationary and non-stationary dynamics on sloping terrain, turbulent processes within a saturated environment. Francesco developed expertise in measurements techniques and data analysis, recently approaching simplified computational fluid dynamics modelling. He has been involved within the UNIBO team in the iSCAPE H2020 funded project, where he supported the in-field experimental activities of Bologna Living Lab aiming at assessing the link between air quality, urban heat island and climate change, and develop innovative methods for the assessment of the impacts of green infrastructures (passive control systems) on air quality and canopy ventilation

Keywords: Exchange Processes, Turbulence, Urban Meteorology, Mountain Meteorology, Environmental Data Analysis, Environmental Fluid Dynamics

EDUCATION

Nov 2016 – Mar 2020: **Ph.D. in Geophysics**, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Research topic: “Interaction between vegetation and atmosphere in the urban environment and its links with climate change”. Thesis title: “Characterization of turbulent exchange processes in real urban street canyons with and without vegetation”. Supervisor: Prof. S. Di Sabatino. See details in Sect. [Work Experience](#)



Oct 2013 – Mar 2016: **Master's Degree in Physics of the Earth System**, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Thesis title: "Analysis of evening and morning transitions over complex terrain: MATERHORN campaign 2013", full marks and honour (110/110 cum laude). Supervisor: Prof. S. Di Sabatino
Conference Talk/Poster: [C6](#), [C8](#)

Oct 2010 – Nov 2013: **Bachelor's Degree in Atmospheric Physics and Meteorology**, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Thesis title: "Struttura elettrica delle nubi temporalesche" (Electric structure of thunderstorms), grade 103/110. Supervisor: Prof. V. Levizzani

Sep 2005 – Jun 2010: **High-School Diploma (Liceo Classico)**, Liceo Classico Cesare Balbo, Casale Monferrato, Alessandria, Italy. Grade 90/100

WORK EXPERIENCE

Feb 2022 – ongoing: **Junior assistant professor (fixed-term)**, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Research Topic: Nature-based solutions to mitigate the effect of climate change in urban areas. Research Activity: Evaluate the upscaling and replication potential of NBS both in the temporal and spatial dimension, from local scale monitoring (see Lido di Volano campaign in Sect. [Field Campaigns](#)) to the multi-scale modelling for risk mitigation assessment in climate scenarios. These activities fit into the later-stage evaluation of NBS potential developed within the H2020 project [OPERANDUM](#) and will be tackled within the urban areas during the Horizon-EU projects [I-CHANGE](#) and TRIGGER.

Publication:

Conference Talk/Poster: [C12](#)

Apr 2020 – Feb 2022: **Postdoctoral Researcher**, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Advisor: Prof. S. Di Sabatino. Research Topic: Experimental investigation in urban and mountain meteorology. Research Activity: Atmospheric circulation and turbulent process analysis based on field campaign data collected over complex terrain, aiming at studying the complex interaction between the atmospheric turbulence, flow dynamics and local morphology. The mountain meteorology branch focuses on the characterization of the wave-turbulence interaction within nocturnal low-level jets in mountain valleys; the urban meteorology applied the fundamental thermodynamic knowledge to the pollutant removal and urban heat island mitigation, focusing on the beneficial effects of the urban vegetation and photocatalytic coatings on both phenomena (see Bologna campaign and Lazzaretto campaign in Sect. [Field Campaigns](#)).

Publication: [A3](#), [A5](#), [A6](#), [A7](#), [A8](#), [A9](#)

Conference Talk/Poster: [C10](#), [C11](#)

Nov 2019 – Mar 2020: **Postdoctoral Researcher**, Environmental Fluid Dynamics Lab, Mechanical Engineering Department, University of Utah, Salt Lake City, Utah, USA. Advisor: Prof. E. Pardyjak. Project: Coastal Fog (C-FOG) Research Program (See details in Sect. [Research Projects](#)). Research topic: data analysis on coastal fog. Research activity: Evaluation of the turbulence inside a saturated coastal fog environment, determining the heat release in the

environment associated with water vapour phase changes. This activity generated the collaboration in [P4](#)

Feb 2019 – May 2019: **Visiting PhD candidate in Geophysics**, Environmental Fluid Dynamics Lab, Department of Mechanical Engineering, University of Utah, Salt Lake City, Utah, USA. Supervisor: Prof. E. Pardyjak. Project: Improving the Smart Control of Air Pollution in Europe (iSCAPE), H2020-EU project (See details in Sect. [Research Projects](#)). Research topic: Study of the atmospheric circulation and ventilation of real urban street canyons in presence of vegetation using QUIC (Quick Urbano & Industrial Complex dispersion simulation system). Research activity: Use of the simplified computational fluid dynamics model QUIC to evaluate the atmospheric circulation and ventilation of real urban street canyons, corroborated with field measurements collected within iSCAPE. The objective of the study is to determine the role of trees in urban canyon in modifying flow and turbulence fields.
Publication: [A1](#)
Conference Talk/Poster: [C9](#)

Nov 2016 – Mar 2020: **Ph.D. in Geophysics**, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Supervisor: Prof. S. Di Sabatino. Project: Improving the Smart Control of Air Pollution in Europe (iSCAPE), H2020-EU project (See details in Sect. [Research Projects](#)). Research topic: Interaction between vegetation and atmosphere in the urban environment and its links with climate change. Research activity: Evaluation of the impact of trees in real urban street canyons by means of in-field measurements (see Bologna campaign and Lazzaretto campaign in Sect. [Field Campaigns](#)) and simplified computational fluid dynamics modelling (QUIC). Thesis title: Characterization of turbulent exchange processes in real urban street canyons with and without vegetation.
Publication: [T](#), [A2](#), [A4](#)
Conference Talk/Poster: [C2](#), [C4](#), [C5](#), [C6](#), [C7](#),

Apr 2016 – Oct 2016: **Private lesson and tutoring** in mathematics and physics to high school and university students for the FormaMentis group, Bologna, Italy

ACADEMIC TEACHING ACTIVITY

Oct 2018 – Dec 2018: **Tutor (teaching assistant)** in the course “Laboratory of Atmospheric Physics” (Responsible Prof. F. Porcù) of the master’s degree in Physics of the Earth System, Academic Year 2018-2019, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Contribution: Design and teaching of a laboratory experience on the use of sonic anemometers to capture and study indoor convective motions (12 hours).

Dec 2018: **Tutor (teaching assistant for laboratory activities)** in the course “Atmospheric Physics and Meteorology (module 2)” (Responsible Prof. S. Di Sabatino) of the master’s degree in Physics of the Earth System, Academic Year 2018-2019, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Contribution: Lecture and practice on the

interpretation of atmospheric rawinsonde records for the detection of atmospheric instabilities and precipitation events (4 hours).

Oct 2017 – Dec 2017: **Tutor (teaching assistant)** in the course “Laboratory of Atmospheric Physics” (Responsible Prof. F. Porcù) of the master’s degree in Physics of the Earth System, Academic Year 2017-2018, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Contribution: Design and teaching of a laboratory experience on the use of sonic anemometers to capture and study indoor convective motions (12 hours).

Dec 2017: **Tutor (teaching assistant for laboratory activities)** in the course “Atmospheric Physics and Meteorology (module 2)” (Responsible Prof. S. Di Sabatino) of the master’s degree in Physics of the Earth System, Academic Year 2017-2018, Department of Physics and Astronomy, University of Bologna, Bologna, Italy. Contribution: Lecture and practice on the interpretation of atmospheric rawinsonde records for the detection of atmospheric instabilities and precipitation events (4 hours). Lecture and practice on the interpretation of meteorological charts for the recognition and detection of synoptic systems (4 hours).

THESES CO-SUPERVISION

- [M6] Master Thesis, Student: G. M. Bellucci. Supervisor: Prof. S. Di Sabatino, F. Barbano. Title: Analysis and characterization of the morning and the evening transition over a west-facing slope: case-studies from the MATERHORN Program. Academic Year 2021/2022.
- [M5] Master Thesis, Student: A. Coppola. Supervisor: Prof. S. Di Sabatino, D. Zardi, F. Barbano, M. Marchio. Title: Analysis of airborne measurements from paragliders to detect thermal structures in the mountain atmospheric boundary layer. Academic Year 2019/2020. Defended.
- [M4] Master Thesis, Student: L. Trudu. Supervisor: Prof. S. Di Sabatino, F. Barbano, C. Cintolesi. Title: Forest canopy flows: an experimental and numerical investigation based on “Bosco Fontana” case study. Academic Year 2019/2020. Defended.
- [M3] Master Thesis, Student: S. Farina. Supervisor: Prof. S. Di Sabatino, D. Zardi, F. Barbano, M. Marchio. Title: The morning transition from katabatic to anabatic slope flows: analysis, characterization and modeling. Academic Year 2019/2020. Defended.
- [M2] Master Thesis, Student: L. Brogno. Supervisor: Prof. S. Di Sabatino, L. S. Leo, F. Barbano. Title: Nocturnal Low-Level Jets over Complex terrain: Driving Mechanisms and Analytical Modeling. Academic Year 2019/2020. Defended.
- [M1] Master Thesis, Student: M. Polito. Supervisor: Prof. S. Di Sabatino, F. Barbano. Title: Mean flow and turbulent exchange characteristics in real urban street canyons: the Lazzaretto case study. Academic Year 2017/2018. Defended.

RESEARCH PROJECTS

Nov 2021 – Nov 2025: **I-CHANGE** (Individual Change of Habits Needed for Green European transition) HORIZON-EU Programme, as part of the Department of Physics and Astronomy, University of Bologna. Research topic: Raise awareness on climate issues through the direct collection of environmental and socio-economic data with novel and user-friendly tools, such as low-cost sensors, monitoring devices, simplified models, and data resources. Research role in the project: contribute to the citizen science activities supporting the environmental observation and monitoring actions

Jul 2018 – Dec 2022 (engaged from Nov 2021): **OPERANDUM** (OPEn-air laboRAtoRies for Nature baseD solUtions to Manage hydro-meteo risks) H2020-EU Programme, as part of the Department of Physics and Astronomy, University of Bologna. Research topic: Deliver the tools and methods for the validation of Nature-Based Solutions to enhance resilience in European rural and natural territories by reducing hydro-meteorological risks. Research role in the project: contribute to the experimental activities and coordination of the Italian Open-air laboratory (OAL-Italy). Secretariat of the Executive Board, evaluating the exploitation potential of the project outcomes and products

Sep 2016 – Nov 2019: **iSCAPE** (Improving the Smart Control of Air Pollution in European Cities) H2020-EU Programme, as part of the Department of Physics and Astronomy, University of Bologna. Research topic: Interaction between vegetation and atmosphere in the urban environment and its links with climate change. Research role in the project: Implementation and supervision of the experimental field campaigns foreseen in Bologna (see Bologna campaign and Lazzaretto campaign in Sect. [Field Campaigns](#)). Data collection and analysis on the role of urban vegetation in mitigating air pollution and the urban heat island effect.
Publication: [T](#), [A1](#), [A2](#), [A3](#), [A4](#), [A6](#) [A7](#), [Project reports](#)
Conference Talk/Poster: [C2](#), [C4](#), [C5](#), [C6](#), [C7](#), [C9](#)
Master Thesis: [M1](#)

2018 – 2021: **C-FOG** Coastal Fog Research Program, ONR Grant N00014-18-1-2472 by the Marine Meteorology Division of the Office of Naval Research (Code 322, ONR), as part of the Environmental Fluid Dynamics Lab, Mechanical Engineering Department, University of Utah. Research topic: Improve the knowledge of the life cycle of fog in coastal areas controlled by land, marine, and atmospheric processes. Research role in the project: data analysis on the role of water vapour phase change on turbulence within a fog layer.

PARTICIPATION IN PROPOSAL WRITING

Horizon Europe Project, on the topic “Health impacts of climate change, costs and benefits of action and inaction” (HORIZON-HLTH-2021-ENVHLTH-02); Title: soluTions foR mltiGatinG climate-induced hEath thReats (TRIGGER). UNIBO coordinated. Submitted 21 September 2021.

European Project H2020, on the topic “Enabling citizens to act on climate change, for sustainable development and environmental protection through education, citizen science, observation initiatives, and civic engagement” (LC-GD-10-3-2020); Title: Individual Change of HABits Needed for Green European transition (I-CHANGE). UNIBO co-coordinated. Submitted 26 January 2021. Funded

Italian Project PRIN2020 in the “Physical Sciences and Engineering” ERC field, Title: urbAN heAt iSland, air pollution and Adaptation to climate change using tailored nature-based Solutions for ItaliAn cities (ANASTASIA). UNIBO coordinated. Submitted 26 January 2021

Italian Project PRIN2020 in the “Physical Sciences and Engineering” ERC field, Title: Understanding the Physics of thermally-driven Winds Along slopes thRough moDelling and meaSurements (UPWARDS). Submitted 26 January 2021

PARTNERSHIPS

- [P4] Nov 2019 – ongoing: Environmental Fluid Dynamics Lab, Department of Mechanical Engineering, University of Utah, Salt Lake City, Utah, USA. Collaboration with Prof. E. Pardyjak continuing the research (see details in Sect. [Research Projects](#)) started during the period as a postdoctoral researcher (see details in Sect. [Work Experience](#))
- [P3] Sep 2019 – Dec 2019: Department of Mathematics and Physics, Università Cattolica del Sacro Cuore, Brescia, Italy. Collaboration with Prof. G. Gerosa, Dr. A. Finco and Ph.D. candidate L. Bignotti on the experimental and numerical study of forest ventilation. In this framework, we conducted an experimental field campaign (see Bosco Fontana campaign in Sect. [Field Campaigns](#)) to measure mean flow and turbulence characteristics within and outside a natural forest. Linked to Thesis co-supervision [M4](#)
- [P2] Jun 2019 – ongoing: Atmospheric Physics Group, Department of Civil and Environmental Engineering, University of Trento, Trento, Italy. Collaboration with Prof. D. Zardi and Ph.D. candidate M. Marchio in the realization of an experimental campaign (see Monte Avena campaign in Sect. [Field Campaigns](#)) where the atmospheric variables are collected by instrumented paragliders to study the thermal plumes over sloping terrain (linked to Thesis co-supervision [M5](#)). A parallel collaboration involved the data analysis and modelling of the morning transition over sloping terrain (linked to Thesis co-supervision [M3](#)). Both research activities are proceeding beyond the respective thesis discussions.
- [P1] Jul 2019: Environmental Protection Agency of Emilia-Romagna (ARPAE), Reggio Emilia, Italy. Collaboration with Dr. L. Torreggiani and Dr. C Barbieri for the realization of field experiment (see Reggio Emilia campaign in Sect. [Field Campaigns](#)) to study the mitigating impacts of urban parks on air pollution and microclimate. Linked to the poster presentation [C10](#).

FIELD CAMPAIGNS

- Lido di Volano campaign (Jan 26th – ongoing, 2022). **Objective:** study the local meteorology and turbulence processes in coastal area, hosting a nature-based sand dune to counteract storm surge, coastal erosion and marine flooding. **Campaign design:** explorative campaign taking place at in the coastal area of Lido di Volano, Ferrara, Italy; a 5-m tower is installed onshore at 100 m from the sea, where 3 monitoring levels were equipped each with a sonic anemometer and a temperature and humidity probe. The set-up is completed by a net radiometer, a disdrometer and a gas analyzer. **Contribution:** design, setup and installation of the instrumentation; data collection and data analysis. **Network/outcomes:** the experimental campaign was coordinated by the University of Bologna under the OPERANDUM project (see details in Sect. [Research Projects](#)).
- Bosco Fontana campaign (Oct 26th – Nov 14th, 2019). **Objective:** study the ventilation of a natural forest, combining experimental and numerical data analysis. **Campaign design:** an intensive experimental field campaign took place within the forest of Bosco Fontana (Marmirolo, Mantova, Italy) a natural reserve composed of deciduous trees and a natural undergrowth. The experimental design consisted of two measurement sites: a forest mast permanently located within the forest and equipped with sonic anemometers, air temperature and relative humidity probes, ozone and PM samplers, and gas analysers distributed among 5 levels within, at the edge and above the forest canopy; a ground mast temporarily installed outside the forest and equipped with sonic anemometers, air temperature and relative humidity probes, net radiometer and gas analyser distributed among two levels. **Contribution:** setup and installation of the UNIBO instrumentation; support to data-collection monitoring and data analysis. **Network/outcomes:** the experimental campaign was performed in collaboration with [P3](#) and is linked to [M4](#).
- Monte Avena campaign (Sep 17th – Sep 30th, 2019). **Objective:** test the potential use of paragliding as a resourceful measurement technique for daytime mountain flow and atmospheric processes. **Campaign design:** the campaign was performed along the east-facing slope of Monte Avena (Belluno, Italy), integrating the upper-air meteorological variables measured by instrumented paragliders with ground-based measurements from permanent meteorological stations. **Contribution:** support to data-collection monitoring and data analysis. **Network/outcomes:** the experimental campaign was performed in collaboration with [P2](#) and is linked to [M5](#).
- Reggio Emilia campaign (Jul 5th – Jul 29th, 2018). **Objective:** study the mitigating impacts of urban parks on air pollution and microclimate through the data analysis of measurements collected within Reggio Emilia city centre. **Campaign design:** setup and installation of two measurement site for collecting air quality and meteorological data, each of them composed of: an equipped van to measure the most common air pollutant in urban environment including gases (nitrogen oxides, carbon oxide, etc.) and particulate matter (PM₁₀, PM_{2.5}), as well as ozone; a sonic anemometer; an air temperature and relative humidity probe; a net radiometer. The first site was located within a pedestrian area (paved with concrete and receiving no shadow by the surroundings) nearby the urban park

(grassland covered by a dense array of trees) where the second site was placed. The experimental design was completed by two permanent stations measuring air pollutants in condition of urban background and urban traffic, respectively. Contribution: setup and installation of the UNIBO instrumentation; data acquisition monitoring, data collection and data analysis. Network/outcomes: the experimental campaign was performed in collaboration with [P1](#) and linked to [C10](#).

Lazzaretto campaign (Aug 4th – Aug 28th, 2018). Objective: evaluate the impact of photocatalytic coatings in reducing the nitrogen oxides concentrations of an urban street canyon. Campaign design: the experimental site is the University Campus within the Lazzaretto neighbourhood (Bologna, Italy), a traffic-restricted area where an array of similarly high buildings forms a series of parallel street canyons. Two of these canyons were similarly instrumented to collect air quality and meteorological variables for the investigation. One of them was also coated with a photocatalytic solution of TiO₂, while the other was used as a reference. Two similar measurement stations were installed in each canyon: the street-level station composed of an equipped van to measure the most common air pollutant in urban environment including gases (nitrogen oxides, carbon oxide, etc.) and particulate matter (PM₁₀, PM_{2.5}), as well as ozone, a sonic anemometer, an air temperature and relative humidity probe; the rooftop station (mounted on the west building rooftop and hanging out towards the canyon centre) composed of a sonic anemometer, an air temperature and relative humidity probe, a net radiometer and a gas analyser. The experimental design was completed by two permanent stations measuring air pollutants in condition of suburban background and urban traffic, and three permanent meteorological stations. Contribution: experimental design; setup and installation of the UNIBO instrumentation; data acquisition monitoring, data collection and data analysis. Network/outcomes: the experimental campaign was coordinated by the University of Bologna under the iSCAPE project (see details in Sect. [Research Projects](#)) and carried out as part of the Ph.D. (see details in Sect. [Work Experience](#)). Linked to publications ([A3](#), [A7](#)), conference talks/posters ([C9](#)), student thesis ([M1](#)), and [Project reports](#).

Bologna campaigns (Summer: Aug 7th – Sep 26th, 2017; Winter: Jan 15th – Feb 15th, 2018): Objective: valuate the role of trees in urban street canyons for the mitigation of air pollution and the urban heat island effect, and for the adaptation to climate change. Campaign design: the experimental site is composed two parallel street canyons within the city centre of Bologna (Italy), representing the historical, densely-built business centre and a residential, vegetated neighbourhood, respectively. Both canyons were similarly instrumented to collect air quality and meteorological variables for the investigation. Three similar measurement stations were installed in each canyon: the street-level station composed of an equipped van to measure the most common air pollutant in urban environment including gases (nitrogen oxides, carbon oxide, etc.) and particulate matter (PM₁₀, PM_{2.5}), as well as ozone, a sonic anemometer, an air temperature and relative humidity probe; the mid-canyon station (mounted on a building balcony and hanging out towards the canyon centre) composed of a sonic anemometer and an air temperature and relative humidity probe; the rooftop station (mounted on the building rooftop without protruding towards the canyon centre) composed of a sonic anemometer, an air

temperature and relative humidity probe, a net radiometer and a gas analyser. The experimental design was completed by two permanent stations measuring air pollutants in condition of suburban background and urban traffic, and two permanent meteorological stations. Two intensive operational periods of 24-hour each were performed once per season to collect the thermal imaging (infrared radiating temperature of a surface) of the building facades every two hours. Contribution: experimental design; setup and installation of the UNIBO instrumentation; data acquisition monitoring, data collection and data analysis. Network/outcomes: the experimental campaign was coordinated by the University of Bologna under the iSCAPE project (see details in Sect. [Research Projects](#)) and carried out as part of the Ph.D. (see details in Sect. [Work Experience](#)). Linked to publications ([A1](#), [A2](#), [A4](#), [A6](#)), Ph.D. thesis ([T](#)), conference talks/posters ([C2](#), [C4](#), [C5](#), [C6](#), [C7](#), [C9](#)), and [Project reports](#).

PUBLICATION ON SCIENTIFIC JOURNAL

- [A9] Barbano, F., Brogno, L., Tampieri, F., & Di Sabatino S. (2021). Interaction between Waves and Turbulence within the Nocturnal Boundary-Layer. *Boundary-Layer Meteorology*. <https://doi.org/10.1007/s10546-021-00678-2>
- [A8] Brogno, L., Barbano, F., Leo, L. S., Fernando, H. J. S., & Di Sabatino, S. (2021). Driving Mechanisms of Double-nosed Low-Level Jets during MATERHORN Experiment. *Journal of Atmospheric Science*, 78(12), 4037-4051. <https://doi.org/10.1175/JAS-D-20-0274.1>
- [A7] Brattich, E., Barbano, F., Pulvirenti, B., Pilla, F., Bacchetti, M., & Di Sabatino, S. (2021). The effect of photocatalytic coatings on NO_x concentrations in real-world street canyons. *Building and Environment*, 205, 108312. <https://doi.org/10.1016/j.buildenv.2021.108312>
- [A6] Cintolesi, C., Barbano, F., & Di Sabatino, S. (2021). Large-Eddy Simulation Analyses of Heated Urban Canyon Facades. *Energies*, 14(11), 3078. <https://doi.org/10.3390/en14113078>
- [A5] Cintolesi, C., Di Santo, D., Barbano, F., & Di Sabatino, S. (2021). Anabatic Flow along a Uniformly Heated Slope Studied through Large-Eddy Simulation. *Atmosphere*, 12(7), 850. <https://doi.org/10.3390/atmos12070850>
- [A4] Barbano, F., Brattich, E., & Di Sabatino, S. (2021). Characteristic Scales for Turbulent Exchange Processes in a Real Urban Canopy. *Boundary-Layer Meteorology* 178(1), 119-142, <https://doi.org/10.1007/s10546-020-00554-5>
- [A3] Pulvirenti, B., Baldazzi, S., Barbano, F., Brattich, E., & Di Sabatino, S. (2020). Numerical simulation of air pollution mitigation by means of photocatalytic coatings in real-world street canyons. *Building and Environment*, 186, 107348. <https://doi.org/10.1016/j.buildenv.2020.107348>

[A2] Di Sabatino, S., Barbano, F., Brattich, E., & Pulvirenti, B. (2020). The Multiple-Scale Nature of Urban Heat Island and Its Footprint on Air Quality in Real Urban Environment. *Atmosphere*, 11(11), 1186. <https://doi.org/10.3390/atmos11111186>

[A1] Barbano, F., Di Sabatino, S., Stoll, R., & Pardyjak, E. R. (2020). A numerical study of the impact of vegetation on mean and turbulence fields in a European-city neighborhood. *Building and Environment*, 186, 107293. <https://doi.org/10.1016/j.buildenv.2020.107293>

Ph.D. THESIS

[T] Barbano, F. (2020). Characterization of turbulent exchange processes in real urban street canyons with and without vegetation. Dissertation Thesis, Alma Mater Studiorum Università di Bologna, Dottorato di Ricerca in Geofisica, 32 ciclo. <http://amsdottorato.unibo.it/9452/>

CONFERENCE ATTENDANCE

[C12] 15th – 19th February 2022: 4° Congresso Nazionale AISAM, University of Milan, Italy. Contribution in Keynote Presentation: “Urban heat island and heat waves characteristics and interactions: a review of the state-of-the-art”, S. Di Sabatino, L. Aragao, F. Barbano, E. Brattich, L. S. Leo, M. Possega, P. Ruggieri, M. Santo

[C11] 19th – 30th April 2021: *EGU General Assembly 2021*: Virtual Conference:

- i. 2-min talk: “Reciprocal Interaction between Waves and Turbulence within the Nocturnal Boundary-Layer”, F. Barbano, L. Brogno, F. Tampieri, S. Di Sabatino
- ii. 2-min talk: “Double-Nosed Low-Level Jets over Complex Terrain: Driving Mechanisms and Analytical Modeling”, L. Brogno, F. Barbano, L. S. Leo, H. J. Fernando, S. Di Sabatino
- iii. 2-min talk: “Characterization of the morning transition from downslope to upslope winds and its connection with the nocturnal inversion breakup at the foot of a gentle slope”, S. Farina, D. Zardi, S. Di Sabatino, M. Marchio, F. Barbano

[C10] 14th – 16th October 2020: *IX Convegno Nazionale sul Particolato Atmosferico (PM2020)*, Lecce, Puglia, Italy. Poster Presentation: “Studio sugli effetti dei parchi urbani su microclima e inquinanti”, L. Torreggiani, C. Barbieri, S. Ferrari, F. Barbano. Poster awarded as Best Poster

[C9] 24th – 26th September 2019: 2° Congresso Nazionale AISAM, University of Naples, Italy:

- i. Poster presentation: “Assessing the role of deciduous trees in real urban canopies using QUIC dispersion model: Bologna residential neighbourhood.”, F. Barbano; E. Brattich; S. Di Sabatino; R. Stoll; E. R. Pardyjak

- ii. Oral Presentation: “Evaluation of different mitigation strategies of air pollution in European cities in present and climate change scenarios”, Erika Brattich; Di Nicola Francesca; Francesco Barbano; Muhammad Adnan; Shiraz Ahmed; Kirsti Jylhä; Kimmo Ruosteenoja; Marco Deserti; Chiara Agostini; Carla Barbieri; Luca Torreggiani; Francesco Pilla; Di Sabatino Silvana
- iii. Oral Presentation: “Modelling the effect of trees using operational dispersion models”, Di Nicola Francesca; Francesco Barbano; Beatrice Pulvirenti; Erika Brattich; Chiara Agostini; Luca Torreggiani; Carla Barbieri; Marco Deserti; Di Sabatino Silvana
- iv. Oral Presentation: “On the influence of green infrastructure characteristics on pollutant concentration within real street canyons”, Di Sabatino S.; Beatrice Pulvirenti; Sara Baldazzi; Erika Brattich; Francesco Barbano
- v. Poster Presentation: “The use and performance of low-cost sensors for monitoring of various PM size fractions”, Erika Brattich; Di Nicola Francesca; Francesco Barbano; Guillem Camprodom; Francesco Pilla; Laura Tositti; Federico Porcù; Simone Cangiamila; Di Sabatino Silvana
- vi. Poster Presentation: “Predictions of the urban temperature distribution using two different scale model approaches: an analysis of pros and cons for heat mitigation strategy”, Di Nicola F.; Marco A. Santo; Marcello Iotti; Paolo Testori; Francesco Barbano; Erika Brattich; Di Sabatino S.
- vii. Poster Presentation: “Air quality forecasts using an off-line WRF-ADMS coupling: a verification study for the city of Bologna (IT)”, Di Nicola Francesca; Marco A. Santo; Erika Brattich; Francesco Barbano; Di Sabatino Silvana

[C8] 2nd – 6th September 2019: *35th International Conference on Alpine Meteorology*. Oral Presentation: “Characteristics of low-level jets in the nocturnal boundary layer over complex terrain in presence of turbulent burst”, Di Sabatino S., Barbano F., Brogno L., Leo L.S., Fernando H.J.S.

[C7] 10th – 11th September 2018: *1° Congresso Nazionale AISAM*, Bologna, Italy:

- i. Poster presentation: “Impact of vegetation on ventilation mechanisms in real urban street canyons: the Bologna iSCAPE case study”, Barbano F.; C. Barbieri; E. Brattich; A. F. Brunetti; S. Di Sabatino; A. Drebs; P. Kumar; E. Minguzzi; M. Nardino; F. Pilla; B. Pulvirenti; L. Torreggiani
- ii. Poster presentation: “Sul ruolo degli urban street canyon: studio della qualità dell’aria nella città metropolitana di Bologna”, Luca Torreggiani; Francesco Barbano; Carla Barbieri; Erika Brattich; Marco Deserti; Di Nicola Francesca; Enrico Minguzzi; Federico Prandini; Beatrice Pulvirenti; Di Sabatino Silvana
- iii. Poster presentation: “CFD analysis of scalar transport phenomena within two real street canyons in the city of Bologna”, Federico Prandini; Beatrice Pulvirenti; Francesco Barbano; Erika Brattich; Prashant Kumar; Silvana Di Sabatino
- iv. Oral presentation: “Dynamics of the urban heat island and its effect on local air quality: the Bologna iSCAPE case study”, Di Sabatino Silvana; Erika Brattich; Francesco Barbano; Di Nicola Francesca; Marcello Iotti; Martina Polito; Beatrice

- Pulvirenti; Federico Prandini; Carla Barbieri; Luca Torreggiani; Enrico Minguzzi; Marianna Nardino; Arianna Valmassoi; Francesco Pilla
- v. Poster presentation: “Influence of synoptic meteorological conditions on particle size distributions collected in two urban street canyons in the city of Bologna”, Erika Brattich; Laura Tositti; Federico Porcù; Francesco Barbano; Carla Barbieri; Enrico Minguzzi; Luca Torreggiani; Silvana Di Sabatino
 - vi. Poster presentation: “On the use of low-cost sensors to monitor urban air quality and assessment of their performance”, F. Di Nicola; F. Barbano; E. Brattich; G. Camprodon; F. Pilla; S. Di Sabatino

[C6] 4th – 7th June 2018: *8th International Symposium on Environmental Hydraulics (ISEH2018)*, University of Notre Dame, South Bend, Indiana, USA.

- i. Oral presentation: “Interaction between turbulence bursts and low-level jet in a nocturnal boundary layer flow over complex terrain”, F. Barbano; L. S. Leo; A. Brandi; H. J. S. Fernando; S. Di Sabatino
- ii. Oral presentation: “Mechanisms of ventilation in real street canyons in presence of vegetation”, Silvana Di Sabatino, Francesco Barbano, Luca Torreggiani, Carla Barbieri, Enrico Minguzzi, Marco Deserti, Marianna Nardino, Beatrice Pulvirenti

[C5] 23rd – 25th May 2018: *VIII Convegno Nazionale sul Particolato Atmosferico (PM2018)*, Matera, Basilicata, Italy. Poster Presentation: “Turbolenza atmosferica e qualità dell’aria in due street canyon nella città metropolitana di Bologna”, Torreggiani L.; Barbano F.; Barbieri C.; Brattich E.; Deserti M.; Di Nicola F.; Di Sabatino S.; Minguzzi E.; Nardino M.; Prandini F.; Pulvirenti B.; Valmassoi A. Poster awarded as Best Poster

[C4] 11th May 2018 (attendee and staff): *Qualità dell’aria urbana: pianificazione e coinvolgimento dei cittadini*, Bologna, Emilia-Romagna, Italy. Oral presentation: “Studio micrometeorologico di due canyon urbani”. Barbano F., Prandini F.

[C3] 10th May 2018 (attendee and staff): *Urban air quality: designing and implementing effective control strategies* (iSCAPE Mid-Term Event), Bologna, Emilia-Romagna, Italy.

[C2] 7th – 11th January 2018: *20th Joint Conference on the Applications of Air Pollution Meteorology with the A&WMA, 98th Annual Meeting, American Meteorology Society (AMS)*, Austin, Texas, USA.

- i. Oral presentation: “Mechanisms of Ventilation in real Street Canyon: The Bologna iSCAPE case study”, Barbano F.; C. Barbieri; E. Brattich; A. F. Brunetti; S. Di Sabatino; A. Drebs; P. Kumar; E. Minguzzi; M. Nardino; F. Pilla; B. Pulvirenti; L. Torreggiani. Presentation awarded with the Student Travel Award
- ii. Oral presentation: “The effect of trees in temperature hotspots within a urban heat island: CFD analysis of the Bologna case study”, Federico Prandini, Beatrice Pulvirenti, Francesco Barbano, Silvana Di Sabatino, Erika Brattich, Achim Drebs, Prashant Kumar, Kirsti Jylhä, Enrico Minguzzi, Marianna Nardino, Francesco Pilla, Luca Torreggiani, Carla Barbieri

- iii. Oral presentation: “Urban heat island, air pollution and climate change: the Bologna (IT) iSCAPE case study”, Silvana Di Sabatino, Francesco Barbano, Carla Barbieri, Erika Brattich, Alessio Francesco Brunetti, Achim Drebs, Prashant Kumar, Kirsti Jylhä, Enrico Minguzzi, Marianna Nardino, Francesco Pilla, Beatrice Pulvirenti, Luca Torreggiani, Arianna Valmassoi
- iv. Oral presentation: “Assessing Environmental Impacts and Socioeconomic Benefits of Green Infrastructure: The Vantaa iSCAPE Case Study”, Kirsti Jylhä, Achim Drebs, Antti Mäkelä, Carl Fortelius, Väinö Nurmi, Athanasios Votsis, Leena Maidell-Münster, Santa Stibe, Anja Maerz, Lucy Barrett, Silvana Di Sabatino, Francesco Barbano, Alessio Francesco Brunetti, Beatrice Pulvirenti, Prashant Kumar, Francesco Pilla

[C1] 9th – 12th October 2017 (attendee and staff): *18th International Conference on Harmonization within Atmospheric Dispersion Modelling for Regulatory Purposes (HARMO18)*, Bologna, Emilia-Romagna, Italy.

SEMINAR AND WORKSHOP ATTENDANCE

27th February 2019: Presentation of the PhD work, *Department of Mechanical Engineering, University of Utah*. Title: “On the mechanisms of ventilation and exchange processes in real urban street canyons.”. Author: F. Barbano.

26th October 2018: Presentation of the Ph.D. work, *Department of Physics and Astronomy, University of Bologna*. Title: “On the mechanisms of ventilation and exchange processes in real urban street canyons.”. Author: F. Barbano.

16th April 2018: Attendee at the seminary given at the Department of Physics and Astronomy, University of Bologna. Title: “An interdisciplinary approach for modeling and impact assessment of urban climates”; Author: Prof. A. Sharma, Research Assistant Professor all’Università di Notre Dame, USA

18th – 19th September 2017: Attendee at iSCAPE Future City Catapult Training School on citizen engaging activities and living lab experience, London, UK

PUBLICATION ON SCIENCE MAGAZINE

Brattich E., Barbano F., Cintolesi C., Pilla F., Pulvirenti B., Di Sabatino S., 2021: “NBS, la natura ci insegna come affrontare le sfide legate all’urbanizzazione” in Monografia RETICULA n. 28/2021 Nature-Based Solutions e territorio: prendersi cura della natura con la natura, ISSN 2283-9232

Barbano F., Brattich E., Di Sabatino S., 2020: “Characteristic scales for turbulent exchange processes in a real urban canopy”, Urban Climate News, Quarterly newsletter of the International Association for Urban Climate, Issue 77

Di Sabatino S., Barbano F., Bazzani A., 2017: “Misure e dati per comprendere i fenomeni”, Sostenibilità e controllo ambientale, *Ecoscienza*, Rivista di Arpa, N°3, ISSN 2039-0432

Di Sabatino S. and Barbano F., 2016: “Convezione atmosferica”, *Ithaca Viaggio nella Scienza*, Rivista di Dipartimento di Matematica e Fisica Ennio De Giorgi dell’Università del Salento, N°8, ISSN 2282-8079

PROJECT REPORTS

Gharbia S., Brattich E., Barbano F., Anand M., Gallagher J., Middleton S., McNabola A., McManus B., Broderick B., Baldazzi S., Di Nicola F., Deserti M., Torreggiani L., Barbieri C., Poluzzi V., Trentini A., Bacco D., Pulvirenti B., Di Sabatino S., Pilla F., 2019: “Report on deployment of neighborhood level interventions”, D3.8, iSCAPE;

Di Sabatino S., Brattich E., Barbano F., Gharbia S., Pilla F., Abhijith K., Kumar P., Drebs A., Jyhlä K., Mäkelä A., Torreggiani L., Barbieri C., 2019: “Air pollution and meteorology monitoring report (Update)”, D5.2u, iSCAPE;

Di Sabatino S.; Erika Brattich; Di Nicola F.; Francesco Barbano; Muhammad Adnan; Shiraz Ahmed; Kirsti Jyhlä; Kimmo Ruosteenoja; Marco Deserti; Chiara Agostini; Vanes Poluzzi, 2019: “Report on policy options for AQ and CC”, D4.5, iSCAPE

Thor-Bjørn Ottosen; Abhijith Kooloth Valappil; Arvind Tiwari; Hamid Omidvarborna; Prashant Kumar; Maria Carmela Marinelli; Francesco Pilla; Salem Gharbia; Di Sabatino S.; Beatrice Pulvirenti; Francesco Barbano; Sara Baldazzi; Erika Brattich; Lisa Faulenbach; Marisa Fuchs; Väinö Nurmi, 2019: “Strategic portfolio choice”, D5.4, iSCAPE

Abhijith Kooloth Valappil; Hamid Omidvarborna; Thor-Bjørn Ottosen; Sachit Mahajan; Prashant Kumar; John Gallagher; Bidroha Basu; Francesco Pilla; Aonghus McNabola; Brian Broderick; Beatrice Pulvirenti; Silvana Di Sabatino; Federico Prandini; Sara Baldazzi; Erika Brattich; Francesco Barbano; Achim Drebs, 2019: “Microscale CFD Evaluation of PCS Impacts on Air Quality”, D6.2 iSCAPE

Gharbia S., Abhijith K.V., Skouloudis A.N., Brattich E., Votsis A., Ottosen T., Makela A., Nurmi V., Fortelius C., Jyhlä K., Drebs A., Papini G., Maticchiera F., Valmassoi A., Brunetti A.F., Barbano F., Pilla F., Di Sabatino S., Pulvirenti B., Kumar P., Camprodon G., 2018: “Report on Footprint of Passive Control Systems”, D3.3, iSCAPE;

Di Sabatino S., Brattich E., Barbano F., Gharbia S., Pilla F., Abhijith K.V., Kumar P., Drebs A., Jyhlä K., Mäkelä A., Torreggiani L., Barbieri C., 2018: “Air pollution and meteorology monitoring report”, D5.2, iSCAPE;

Di Sabatino S., Barbano F., Brunetti A.F., Valmassoi A., Pulvirenti B., 2017: “Assessment of air quality and microclimate in EU selected cities pre-infrastructure solutions”, D6.1, iSCAPE;

Di Sabatino S., Jylhä K., Barbano F., Brunetti A.F., Drebs A., Fortelius C., Nurmi V., Minguzzi E., Pulvirenti B., Votsis A., 2017: “Report on climate change and air quality interactions”, D1.4, iSCAPE;

MEMBERSHIP AND REVIEW ACTIVITY

Membership: Associazione Italiana di Scienze dell’Atmosfera e Meteorologia (AISAM), 2018 – 2021.

Reviewer: Boundary-Layer Meteorology (2), Building and Environment (1), Environmental Fluid Mechanics (2), MDPI journals (Atmosphere, Sustainability, Remote Sensing, International Journal of Environmental Research and Public Health, International Journal of Geo-Information - 7), Advances in Science and Research (1)

COMPUTER SKILLS

Programming languages: C++, Matlab, OpenMP (beginner level), ROOT (beginner level), Bash (beginner level), CRBasic

Operating systems: MS Windows, Mac, Linux

Software: MS Office (Word, Excel, Powerpoint), OpenOffice, Latex, BL-view (Vaisala), Loggernet (Campbell Scientific), Wind (Gill), EddyPro (Licor)

Model: QUIC (Quick Urbano & Industrial Complex dispersion simulation system)

FOREIGN LANGUAGE

English (fluent): B2 level granted from University of Bologna (2015)

OTHER ON TOPIC ACTIVITIES AND PARTECIPATIONS

23rd September 2017: Invited speaker at the event *Incontro fra arte e scienza*, Treville, Alessandria, Italy. Oral presentation: “Presente e futuro del nostro clima”

18th – 19th September 2017: Attendee at *iSCAPE Future City Catapult Training School on citizen engaging activities and living lab experience*, London, UK

7th – 8th November 2015: Invited speaker at the event *L'influenza del clima nella produzione del tartufo*, 24th Sagra del Tartufo Bianco in Valle Ghenza, Cella Monte, Alessandria, Italy. Oral presentation: "Il cambiamento climatico"

OTHER SKILLS

25th July 2018: Certificato di abilitazione per *Lavori in Quota e Utilizzo dei DPI Anticaduta* (validità quinquennale), Ente di Formazione, Prait ricerca e progettazione, Corciano, Perugia, Italia

10th July 2017: Certificate of participation and accomplishment at the online course on *Working in Multidisciplinary Teams*, University of Bologna, Bologna, Italy

ADDITIONAL PROFESSIONAL REFERENCES

[Prof E. Pardyjak](#), Department of Mechanical Engineering, University of Utah, 1495E 100S Salt Lake City, Utah, USA. Email: pardyjak@mech.utah.edu

[Prof. F. Porcù](#), Department of Physics and Astronomy, University of Bologna, via Irnerio 46, Bologna, Italy. Email: federico.porcu@unibo.it

[Prof D. Zardi](#), Department of Civil and Environmental Engineering, University of Trento, Trento, Italy. Email: dino.zardi@ing.unitn.it

[Prof. B. Pulvirenti](#), Department of Industrial Engineering, University of Bologna, Bologna, Italy. Email: beatrice.pulvirenti@unibo.it

[Prof. F. Pilla](#), School of Architecture, Planning and Environmental Policy, College of Engineering and Architecture, University College Dublin, Richview, Clonskeagh, Dublin, Ireland. Email: francesco.pilla@ucd.ie

[Dr. F. Tampieri](#), CNR ISAC, via Gobetti 101, Bologna, Italy. Email: f.tampieri@isac.cnr.it