

# Dario Massabo'

Fixed-term assistant professor

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## *Education and training*

2013

### **PhD in Material Science and Technology**

An optical set-up for the multi-wavelength characterization of carbonaceous particulate matter - Excellent

University of Genoa - Genova - IT

2008

### **Master's Degree in Materials Science and Engineering**

Self-organized physical synthesis of metal nanostructures on polymeric substrates - 110/110

University of Genoa - Genova - IT

## *Academic experience*

2017 - ONGOING

### **Researcher**

University of Genoa - Genova - IT

2013 - 2017

### **Post-doctoral fellow**

University of Genoa - Genova - IT

2010 - 2013

### **PhD**

University of Genoa - Genova - IT

## *Work experience*

2012 - 2017

### **CEO**

PMTEN s.r.l. - Genova - IT

Chief Executive Officer

## *Language skills*

### **English**

Proficient

Trinity College

London

### *Teaching activity*

I held degree courses in **Physics** and **Materials Science**. I am currently in charge for the courses of **Biophysics** (Faculty of Medicine and Surgery) and **Archeometry** (Conservation of Cultural Heritage).

Teaching contract for the II level Master's Degree in 'System Engineering for Maritime Technologies - Fortemare' I Ed - Module A2-8 'Environmental Sensors and Platforms and Forecasting Models' - Training Project for Fortemare 297/99, 2014. Teaching contract for the II level Master's Degree in 'System Engineering for Maritime Technologies - Fortemare' II Ed - Module A2-8 'Environmental Sensors and Platforms and Forecasting Models' - Training Project for Fortemare 297/99, 2015.

### *Postgraduate research and teaching activity*

#### **Supervision of PhD students, residents and post-doctoral fellows**

Supervisione di una Assegnista di Ricerca

#### **PhD committees membership**

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#### **Postgraduate (PhD) teaching activity**

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### *Research interests*

I am an experimental Materials Scientist and since 2009 I have joined the **Laboratory for Environmental Physics** (LABFISA - <http://labfisa.ge.infn.it>) focusing my activity research on the study of the **optical properties, composition, origin, and effects of the atmospheric aerosols with particular focus on carbonaceous PM**. I have built the first Italian **Atmospheric Simulation Chamber** (ChAMBRé - Chamber for Aerosol Modelling and Bio-aerosol Research) for the study of the interactions between PM and gases with biological particles in controlled conditions, now installed at Physics Department, University of Genoa. I have built an instrument for the measurement of the optical properties of aerosol-loaded filters (the **Multi-Wavelength Absorbance Analyzer - MWAA**). In 2012, I have founded the **PM\_TEN S.r.l. Company** (<http://www.pm10-ambiente.com>), a start-up society devoted to the technological transfer of the research in environmental physics performed at the Univ. of Genoa.

My current research activity can be divided in 4 main lines:

- Study of the composition of PM coming from all over the world. Starting in 2010, as part of numerous national and international collaborations, I have been responsible for many sampling

campaigns to measure the PM in sites with very different characteristics for type, size and seasonality. I studied the composition of **urban** atmospheric aerosol (e.g.: Genoa, Milan, Marseilles, etc.) and **rural/mountain** (Ligurian Apennines, Aosta, Gressoney valley, etc.), PM collected on **glaciers** (such as the cryoconites collected on the Morteratsch glacier, Switzerland), desert particulate (Sahel, Sahara, Gobi, etc.) sampled **in field** and resuspended in **simulation chambers**, primary carbon particulate matter (from **terrestrial and naval diesel engines**) and secondary (reprocessed **biomass combustion** in Paul Scherrer's simulation chamber, Institute of Zurich), particulate from remote sites (Lampedusa, Amazon rainforest) and others.

For the characterization and chemical-physical speciation I have used numerous measurement techniques, mainly **ED-XRF, PIXE/PIGE, Thermo-Optical Transmittance Analysis, Liquid Chromatography (HPLC), Amperometric Chromatography (HPLC-PAD), Optical Spectrometry, ICP-MS, SEM** and **TEM**.

- Study of the **PM optical absorption properties with the MWAA**. This instrument has been used in different projects, such as in the European **MED-APICE** project (Common Mediterranean strategy and local practical Actions for the mitigation of Port, Industries and Cities Emissions) for the quantification of Black Carbon, or in the case of the **ATTO** project (Amazonian Tall Tower Observatory), for the multi-wavelength study of the light absorption of the PM in the Amazonian rainforest. I have also developed **an algorithm for the quantification of the carbonaceous sources of PM (Fossil Fuel and Biomass Burning)**, based on the optical data retrieved with the MWAA (the MWAA model – carbonaceous source apportionment). The MWAA model has been validated through the comparison with <sup>14</sup>C and Levoglucosan measurements. So far, the work on the MWAA brought important collaborations at National Level (University of Milan, University of Florence, ISAC-CNR, and University of Milano Bicocca) and International (**Max Plank Institute of Chemistry**, Mainz; **National Research Council**, Ottawa, Canada; **LISA** (Laboratoire Interuniversitaire des Systèmes Atmosphériques), Parigi; **Juelich Research Center**, Germany). On this topic, in 2016 I won a University competition for a period of research abroad: I have spent about two months at the Julich Research Center (**JRC**) in Germany under the supervision of Dr. Andreas Petzold.
- Study of the **carbonaceous aerosol quantification issues** with thermo-optical transmittance methods, linked also to artefacts issues, using modified instrumentation. The possibility to better separate EC and OC as well as to quantify **Brown Carbon** is still investigated through a custom 2-lambda version of a Sunset EC/OC analyzer unit. So far, my research on Brown Carbon and the results obtained have allowed establishing valuable partnerships with the **Desert Research Institute**, Nevada in the US and the **Paul Scherrer**

**Institute** in Switzerland.

- In 2017 I have built the first **Italian Atmospheric Simulation Chamber** (ChAMBRé - Chamber for Aerosol Modelling and Bio-aerosol Research) for the study of the interactions between PM and gases with biological particles in controlled conditions. This research has been funded by the recently approved 4-year H2020 project **EUROCHAMP2020** (European Simulation Chambers for Investigating Atmospheric Processes; Call: INFRAIA 2016-2017) and by the INFN. On this topic, we actively collaborate with our colleagues of the consortium as well as with scientists of the Paul Scherrer Institute (PSI). ChAMBRé has recently joined the **ACTRIS** (European Research Infrastructure for the observation of Aerosol, Clouds, and Trace gases) network facilities.

I was involved at different levels in European projects, both in proposal writing and in their realization (**MED-APICE, CAIMANS, ChArMEx, and ATTO**). I have also participated to several national projects and experiments funded by the National Institute of Nuclear Physics (**INFN**): **NUMEN, MANIA, DepotMass** and **TRACCIA**. Since 2017, I am the **local PI of the TRACCIA** experiment of the **Fifth National Committee of INFN**.

## *Grants*

**2018 - ONGOING**

### **TRACCIA - Time Resolved Aerosol Characterization Challenging Improvements and Ambitions**

INFN-CSN5 - IT

Principal investigator

Main focus of the experiment is to design and build a new multi-stage atmospheric particulate sampler that has much better performance in terms of reliability and quality of the deposited material compared to the instruments currently within the Scientific Community. TRACCIA involves the INFN sections of Florence, Milan and Genoa

**2017 - ONGOING**

### **EUROCHAMP2020**

CE - IT

Participant

The project aims to integrate the most advanced European atmospheric simulation chambers into a world-class infrastructure for research and innovation. Within the network there is the ChAMBRé atmospheric simulation chamber (Chamber for Aerosol Modeling and Bio-aerosol Research), recently developed at the Department of Physics of the University of Genoa and currently in the final stages of characterization. ChAMBRé has recently joined the ACTRIS IT network (European Research Infrastructure for the Observation of Aerosol, Clouds, and Trace Gases) in preparation for a European research infrastructure (ERIC). In the EUROCHAMP2020 network there are 18 partners including both universities and European research institutions.

2015 - 2016

**DEPOTMASS (DEtermining Particulate Organic and Total Mass in Aerosol Streaker Samples)**

INFN - CSN5 - IT

Participant

The project aimed at the development and application of physical techniques (Optical Analysis and Total-Ion Beam) for the high resolution temporal study of particulate air pollution. During this project the MWAA has been improved with the installation of 2 additional laser beams and the automation of the filter system in analysis. The project involved the INFN sections of Genoa, Milan and Florence.

2014 - 2015

**EU MED-CAIMANs (Cruise and passenger ship Air quality Impact Mitigation Actions)**

CE - IT

Participant

The project aimed to identify critical pollution situations in the main port cities of the Mediterranean and to define possible strategies to improve air quality with particular reference to passenger traffic. Participating bodies: Arpa Veneto, Air PACA Marseille, Institute of Environmental Assessment and Water Research - Barcelona, University of Genoa and University of Thessaloniki.

2013 - 2016

**ATTO (Amazonian Tall Tower Observatory)**

CE - DE

Participant

The project (still ongoing, coordinated by the Max Plank Institute in Mainz, Germany), which is based on the measurement of weather parameters and pollutants through the use of a 325-meter tower in the middle of the Amazon rainforest, aims at the study and to the prediction of the climatic upheavals of the planet. During this project the MWAA (the optical instrument I made) was used as a reference for measuring the optical absorption properties of atmospheric aerosols.

2012 - 2014

**MANIA (Metodologie Analitiche Nucleari per Indagini Ambientali)**

INFN - CSN5 - IT

Participant

The project mainly focused on improving the sensitivity, traceability and applicability of the methodologies used for the complete compositional and optical characterization of atmospheric aerosol samples. It is at this stage that the first prototype of the MWAA (Multi-Wavelength Absorbance Analyzer) was built, the optical instrument I developed for the determination of the multi-lambda absorption coefficient. Involved the INFN sections of Genoa, Milan and Florence and the National Laboratories

of Legnaro.

2010 - 2013

### **EU MED-APICE (2010-2013) (Common Med. strategy and local Actions for the mitigation of Port Industries and City Emissions**

CE - IT

Participant

The project aimed to assess the impact of the ports on the urban air quality of 5 coastal cities of the Mediterranean (Genoa, Venice, Marseilles, Thessaloniki and Barcelona) and consequently the possible mitigation actions aimed at reducing pollution. During the project I was responsible for the sampling and analysis of about 800 samples of atmospheric particulate collected in three different urban sites. The project coincided with the years of the research doctorate. The project involved the Department of Physics of UNIGE, ARPA Veneto; University of Aristotle and Western Macedonia, University of Provence and the Consejo Superior de Investigaciones Científicas (CSIC) of Barcelona.

### ***Editorial activity***

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### ***Assignments abroad***

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### ***Other professional activities***

In 2012, I have founded, together with some colleagues, the PM\_TEN Company (Physical Methods and Technologies for Environmental Needs) within a Spin-Off technology transfer project of the University of Genoa. The main activities of the Company are related to weather and marine forecast, dispersion of pollutants in fluids, characterization of air pollution sources, study of Eolic potential, determination of different types of pollutants (dust, radioactive isotopes, noise, and non-ionizing radiation) and of their sources in environmental matrices, compositional analysis of materials including non-destructive techniques. The Company is active also in the design and production of filter media for the collection of atmospheric particulate matter.

Within the Company, in addition to my position as CEO (resigned in July, 2017 in order to focus solely on research and teaching activities), I take care of the analytical laboratory that is equipped for the determination of several analytes such as ions, metals, carbonaceous compounds (organic and inorganic carbon) and sugars. I'm currently in charge of a technological transfer project that aims to produce a commercial version of the MWAA. I'm also in charge of the filter media design and production: so far, more than 3000 pieces have been produced for National and International Companies and Research Bodies. Of them, about 2000 filters have been produced for the International Atomic Energy Agency in the frame of an EU-

Middle East project that involved seven Arab countries.