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DELLE MARCHE

Applicability and tuning of numerical models to evaluate extreme weather and air-pollution events

Prof. Giorgio Passerini

Department of Industrial Engineering and Mathematical Sciences - www.univpm.it

UNIVERSITÀ POLITECNICA DELLE MARCHE

Supervisor: Prof. Giorgio Passerini
Research Group Description

Prof. Giorgio Passerini, MEng, PhD; Professor in Environmental Applied Physics
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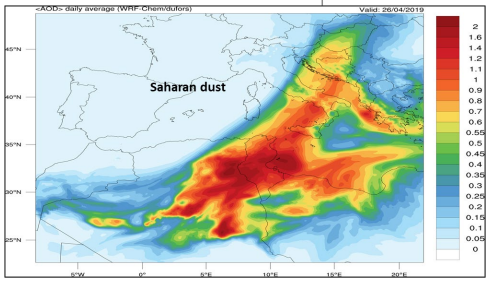
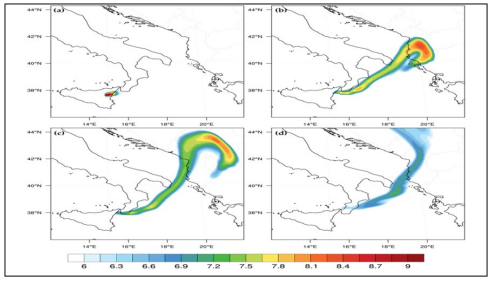
Link to brief CV:
https://www.univpm.it/Entra/Engine/RAServeFile.php/f/P003302/Curriculum/Passerini_Short_CV_EN_20221219.pdf

Link to complete list of publications:
http://prodapps.econ.univpm.it/iris/index.php?docente=GIORGIO+PASSERINI&sb_pagina=1&from=0&to=100&authorID=1989

Head of the Environmental Analysis Laboratory at the
Department of Industrial Engineeringand Mathematical Sciences of the Marche Polytechnic University





The research group was established in the early 1990s to study physics and chemistry of the lower atmosphere. Prof. Passerini has actively contributed to the birth of the research group and the laboratory, being part of it from the beginning and actively collaborating, especially for the aspects related to the analysis and implementation of new generation models.

Main Reasearch areas: Atmospheric thermo-fluid dynamics (also with CNR-ISAC): numerical modelling of airborne pollutants transport and deposition; local and mesoscale meteorology including parameterization of the Atmospheric Boundary Layer; mesoscale analysis and forecast focused on extreme events.

Publications: 4 co-authored Books – 14 co-edited Books; 140+ peer-reviewed international papers

Teaching: 12 PhDs, 350+ Master Degrees, and 200+ Bechelor Degrees supervised within research group

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Other research group activities are focused on the analysis, development, and interfacing of environmental models for the study of air pollution dynamics including diagnostic and prognostic techniques related to atmospheric dynamics of Atmospheric Boundary Layer.
Areas of interest include: Geographic Information Systems for georeferenced data management and post-processing; assessment of health risk posed by anthropogenic emission of airborne pollutants; assessment and estimate of anthropogenic and biogenic emissions.

Main funded projects

- Fondazione Cassa di Risparmio di Jesi (2001/02); 100,000Euro
- General Impianti Srl (2000-2002); 70,000Euro
- Fondazione Cassa di Risparmio di Jesi (2002/03); 35,000Euro
- Ancona Municipality (several in 2003 2006 2007 2009); about 60,000 Euro
- SEA Srl (2006-2008); 75,000 Euro
- Ministry of Environment through Marche Regional Authority (2007/08); 120,000 Euro
- Multiservizi Srl (2010 e 2011); 120,000 Euro
- Fondazione Cariverona (2010-2013). 45,000 Euro
- SIMAM Srl (2016-2018); 27,000 Euro
- Marche Regional Authority (2018-2020) 150,000 Euro
- “ADRIGREEN” https://www.italy-croatia.eu/web/adrigreen 150,000 Euro
- Marche Regional Authority (2021-) 130,000 Euro
- Marche Environmental Agency (2023-) (ARPAM) 70,000 Euro + 55,000 Euro
- ENI/CNR-IRBIM (2023-) 215,000 Euro

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Department description

https://diism.univpm.it/en/

About the **Department of Industrial Engineering and Mathematical Sciences** (**DIISM**):

- 48 Labs
- 61 research staff, 26 technical and administrative staff
- about 100 active researchers
- 6 B.Sc. and M.Sc. degree courses
- Doctoral School in Industrial Engineering
- 78 PhDs awarded and more than 1600 students graduated in the last 5 years
- in 2024: 8 funded international projects with over 1.7 M€ EU funded budget for DIISM
- B+ National Laboratory on rapid prototyping technologies established in 2018, following the successful participation of DIISM in the national call for "**Departments of Excellence**"

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Project Idea:

Applicability and tuning of numerical models to evaluate extreme weather and air-pollution events

Climate Change is altering the state and the evolution of the Earth atmosphere rapidly and profoundly. This poses several challenges and possible stresses to atmospheric modelling. First, the modelling community and the models themselves struggle to keep up with rapidly changing weather patterns. Then, today models often operate in borderline conditions to predict and/or diagnose extreme events that are becoming increasingly frequent and intense. Extreme weather and air pollution events represent a risk both in the short and in long term through direct and indirect effects. The short-term effects are readily visible including flash floods and Medicanes (i.e., tropical–like cyclones that occur over the Mediterranean Sea). Extreme meteorological settings also trigger intense pollution episodes mainly due to the persistence of exceptional environments (e.g. extremely high temperatures and pressures exacerbate photochemical smog episodes) but also due the transport of air masses (e.g. Saharan dust intrusions).

At our laboratory, the analysis of extreme events is routinely performed through regional meteorological models such as the Weather Research and Forecasting model also coupled with chemistry (WRF-Chem), space-borne observations, local monitoring and meteorological reanalysis.

In this framework, the candidate MSCA Postdoc will focus on the performance and the likely tuning of the physical parameterization of the above models to enhance their applicability and robustness in the Mediterranean Basin and other comparable environments.