

WG Fires



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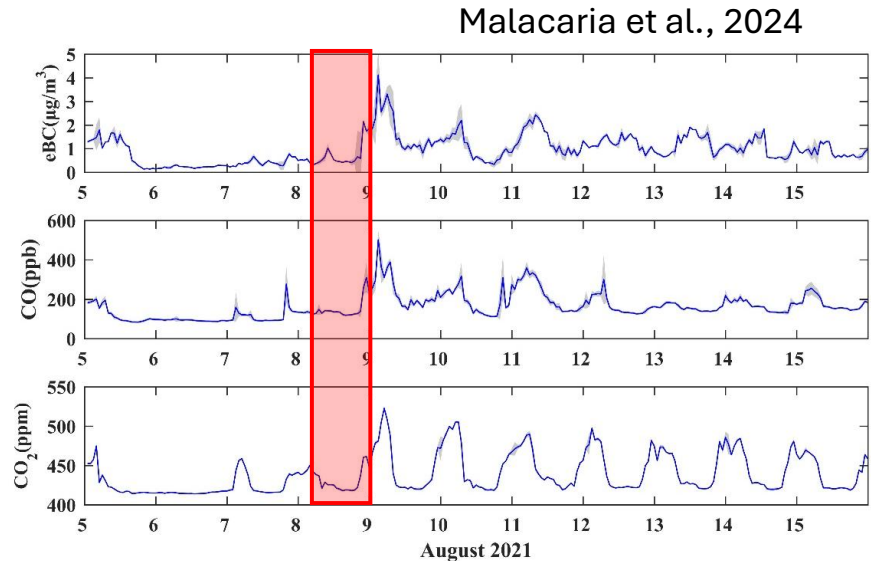
Meeting IMPEACH – Bologna, 2 LUGLIO 2026

Open vegetation fires as a source of climate-altering species and air pollutants

- 19-29% of global fossil fuel CO₂ emissions (2-3 Pg C in 2022).
- 5% of total global anthropogenic CH₄ emissions (Saunois et al., 2025)
- CO: 60-70% of total global anthropogenic CO emissions (265-308 Mt in 2019, Griffin et al., 2024)
- 30-40 % of global atmospheric BC emissions (Bond et al., 2013)

WG Fires

1. Impact of open vegetation fires to atmospheric composition
2. Interactions and feedbacks between fires and plants to predict ecosystem fate in the long term under a changing climate



WG Fires



Seminario CNR ISAC

29 Maggio 2024

A risk assessment tool for the protection of cultural heritage exposed to extreme climate events

Protezione del patrimonio culturale dagli impatti di eventi climatici estremi: uno strumento per la valutazione e la gestione del rischio

Alessandro Sardella

CNR - ISAC Bologna
University of Ferrara
Department of Environmental and Earth Sciences



Impact of open fire emissions to atmospheric composition variability

Rabia Ali Hundal-PhD Student
IUSS Pavia
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Influence of open vegetation fires on BC and O₃ variability in the Southern Himalayas

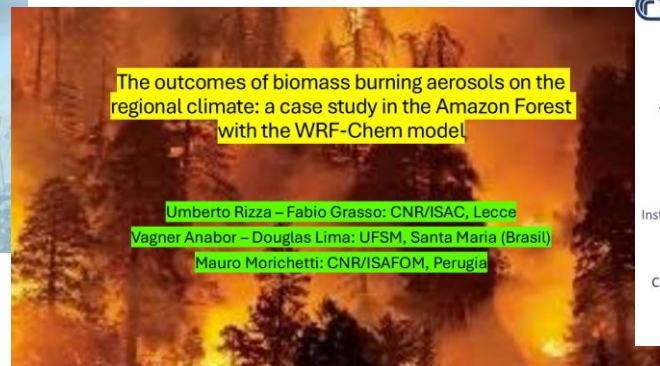
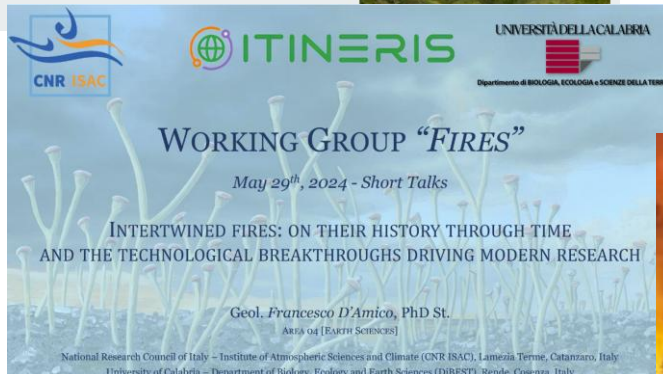
Davide Putero, CNR-ISAC



WG-FIRES Meeting, 26/09/2024

Examining Climate Drivers and Land Cover for Italian Burned Area Prediction

Gabriele Vissio, Alice Baronetti, Mara Baudena,
Paolo Fiorucci, Antonello Provenzale, Marco Turco



The outcomes of biomass burning aerosols on the regional climate: a case study in the Amazon Forest with the WRF-Chem model

Umberto Rizza - Fabio Grasso: CNR/ISAC, Lecce
Vagner Anabor - Douglas Lima: UFSM, Santa Maria (Brasil)
Mauro Morichetti: CNR/ISAFOM, Perugia



An integrated approach for detection of summer open fire emissions at GAW Regional Observatory of Lamezia Terme : case study

Luana Malacaria,

Institute of Atmospheric Sciences and Climate of National Research Council, Lamezia Terme (CZ)- Italy

Contributors: Luana Malacaria, Teresa Lo Feudo, Giorgia De Benedetto, Salvatore Sinopoli, Ivano Ammoscato, Francesco D'Amico, Daniel Gulli, Elenio Avolio, Mariafrancesca De Pino, Paolo Cristofanelli, Claudia Roberta Calidonna

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WG Fires – Riunione dedicate

28-10-2024: Marco Turco (University of Murcia)

Discussion about the fire variables to be used to link fire occurrence and emissions (e.g. fire number vs burned areas), source of data to derive burned areas.



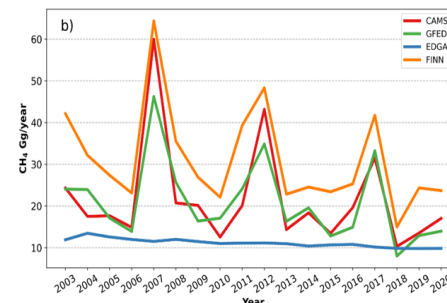
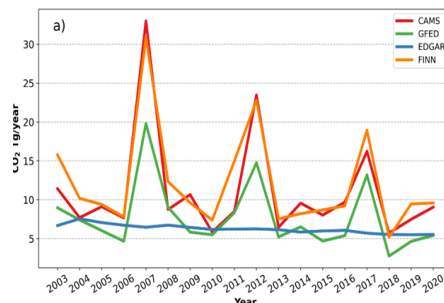
IUSS
Scuola Universitaria Superiore Pavia



PhD SDC
SUSTAINABLE DEVELOPMENT
AND CLIMATE CHANGE

In the Curriculum
CU1 EARTH SYSTEM AND ENVIRONMENT

Rabia Ali Hundal



15-05-2025: Umberto Rizza, Mauro Morichetti

Presentation of the modeling system WRF-Chem (fire tracers and impact to the radiative budget). Discussion on possible application to the Mediterranean region and collaboration with ISAC measurements.

6-10-2025: Claudia Roberta Calidonna

Introduction to the experiment carried out in Calabria within the ITINERIS “Fire” pilot to investigate the impact of vegetation fires to atmospheric composition. The goal was to investigate possible collaborations with WG participants not strictly related with CAFCA.

4-6-2026: Paolo Cristofanelli

Proposition of the EGU2026 talk about summer 2025 wildfires from Canada

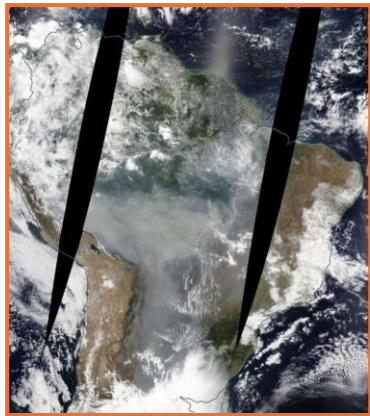
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Modeling and simulations of BB aerosols in climatic hot-spots (Mediterranean Basin; Amazon Forest)

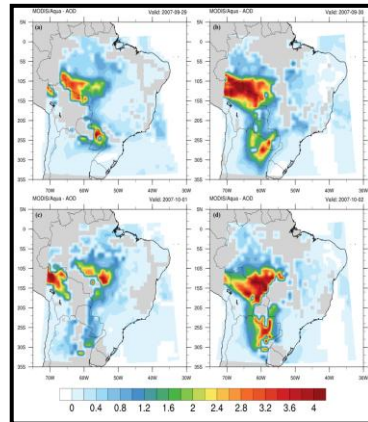
Umberto Rizza – Fabio Grasso: CNR/ISAC, Lecce; Vagner Anabor – Douglas Lima: UFSM, Santa Maria (Brasil); Mauro Morichetti: CNR/ISAFOM, Perugia

AMAZON Basin

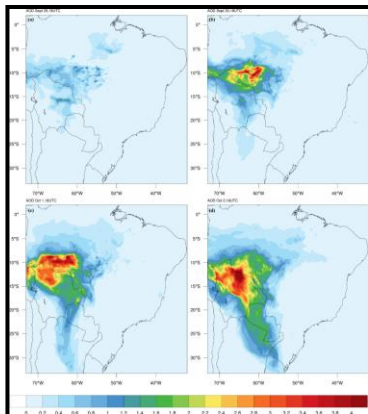
Oct 1, 20027 - NASA-Worldview



AOD - MODIS/Aqua

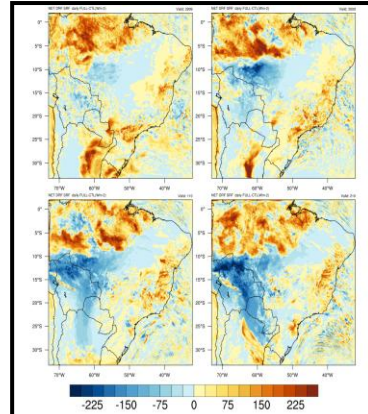


AOD – WRF-Chem

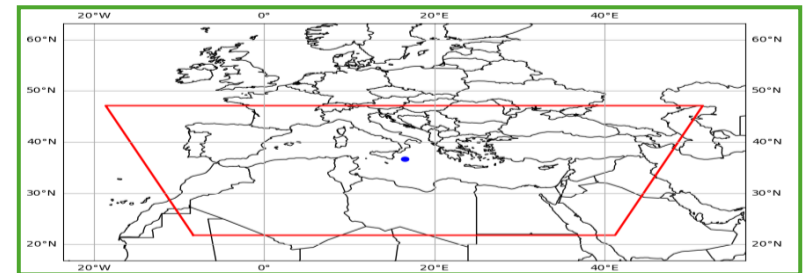
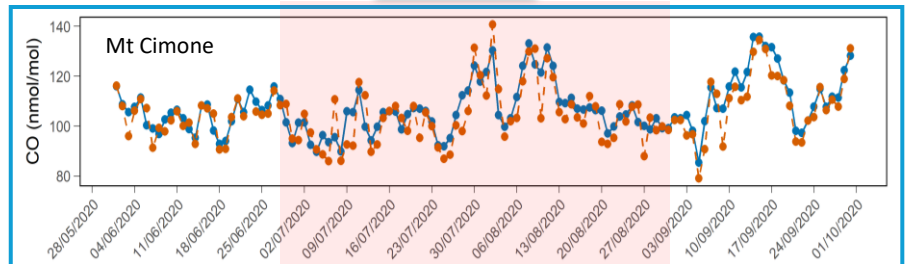


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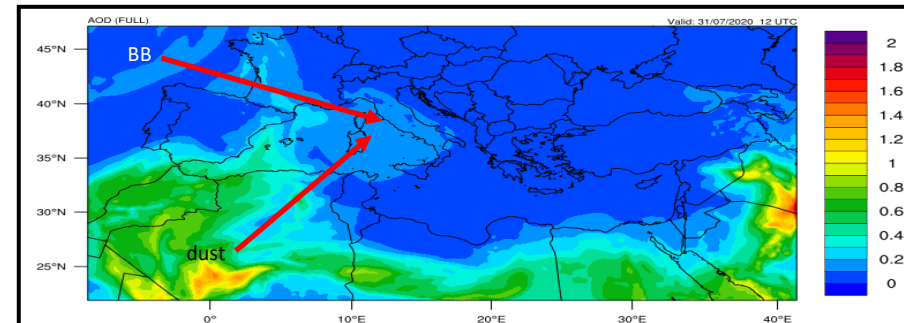
Radiative Forcing – WRF-Chem



MED Basin

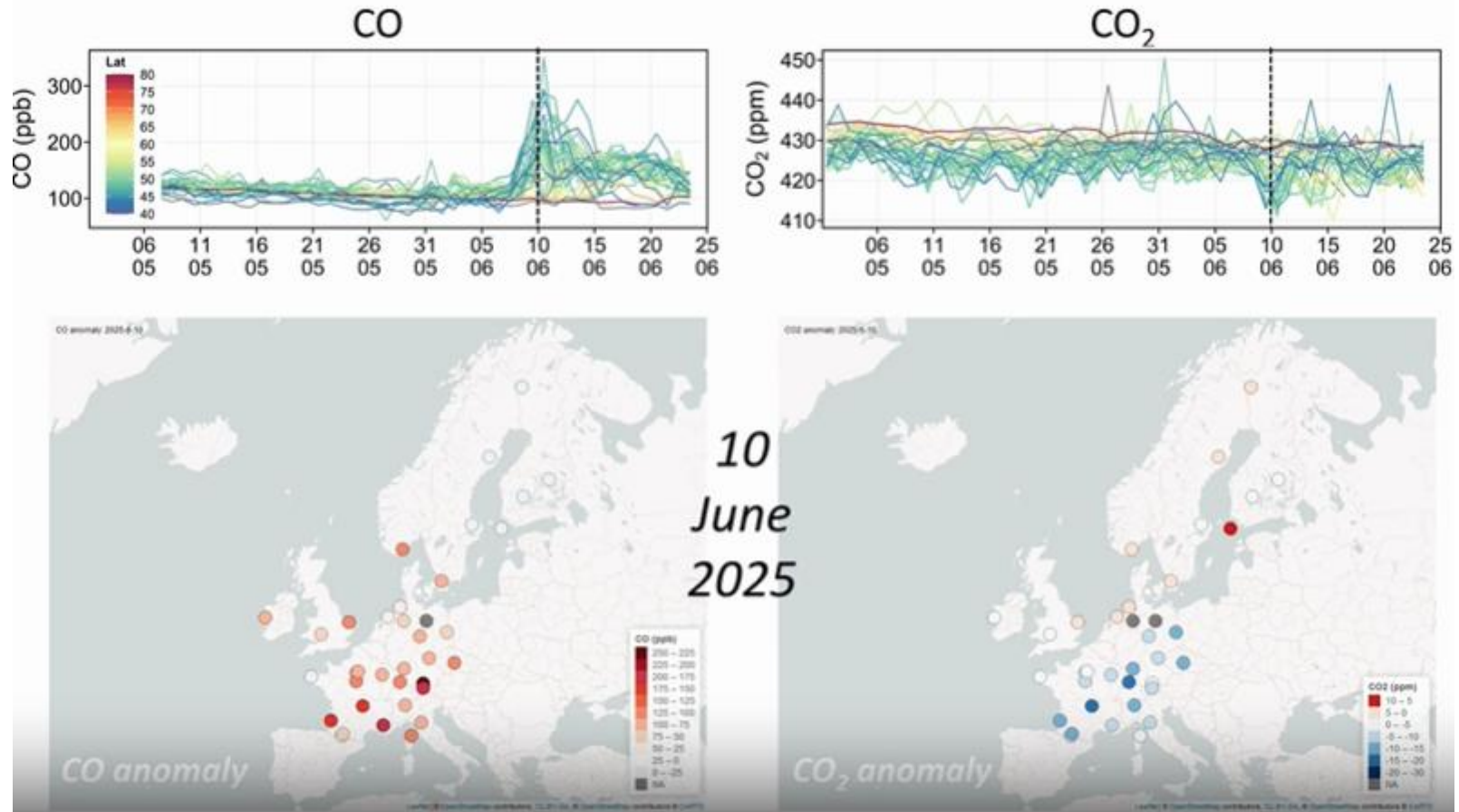


AOD – WRF-Chem



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WG Fires - Analysis of summer 2025



- Evident signals across Europe
- Negative CO₂ anomaly (role of active ecosystems?)
- How representative are measurement sites for long-range plume characterization?

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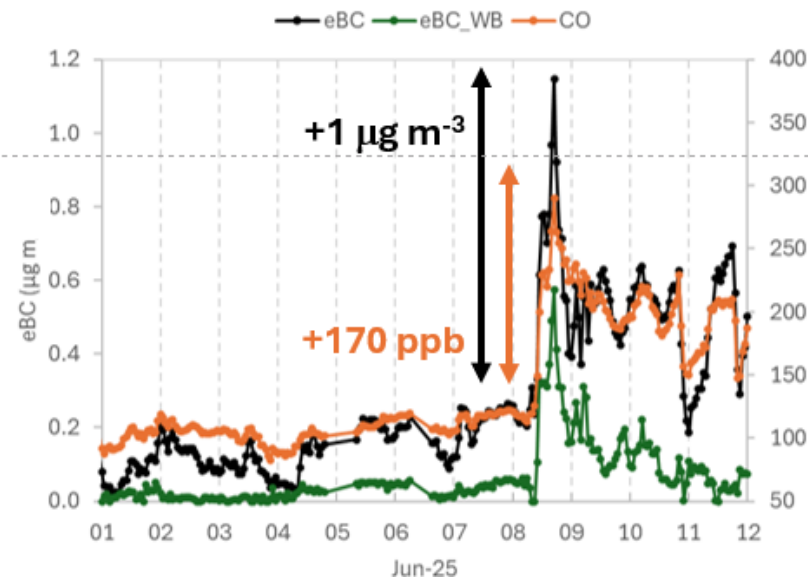
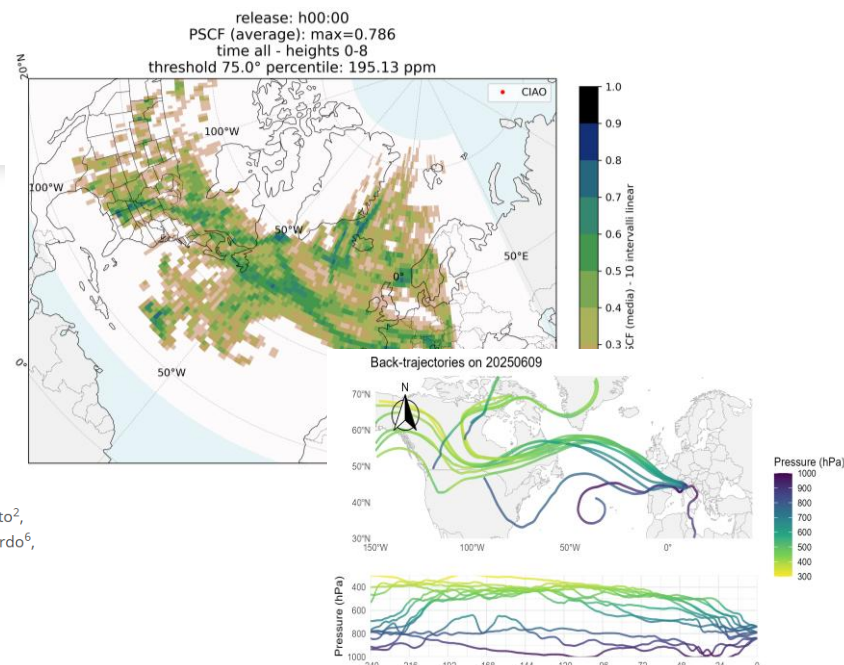
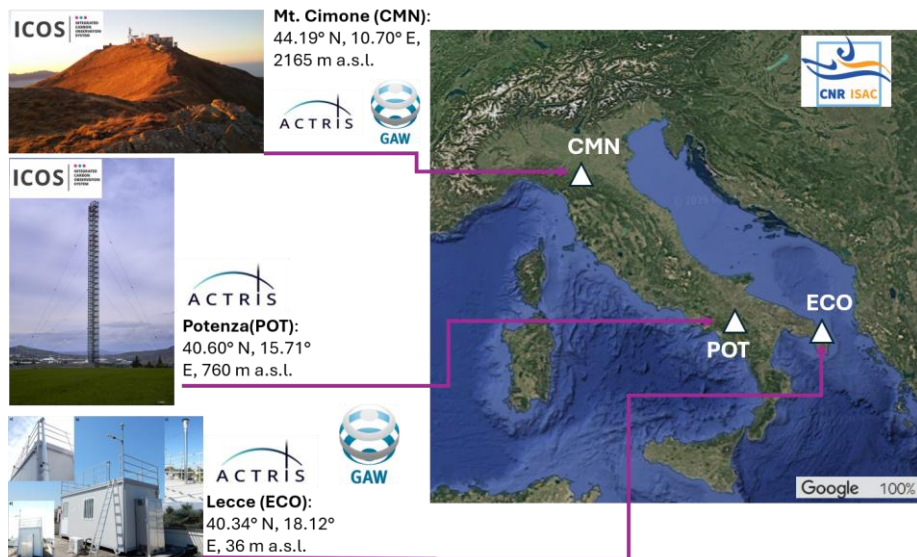
WG Fires - Analysis of summer 2025

EGU26-11975, updated on 14 Mar 2026
<https://doi.org/10.5194/egusphere-egu26-11975>
 EGU General Assembly 2026
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Impacts of wildfire plumes from Northern America on atmospheric composition as observed by permanent observatories in Italy during June 2025

Paolo Cristofanelli¹, Francesca Barnaba², Alessandro Bracci¹, Claudia Roberta Calidonna³, Rita Cesari⁴, Daniele Contini¹, Luca Diliberto², Francesco d'Amico³, Stefano Decesari¹, Adelaide Dinoi⁴, Leonardo Gori⁵, Angela Marinoni¹, Lucia Mona⁶, Davide Putero⁷, Isabella Zaccardo⁶, and Marco Zanatta¹



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WG Fires – Summary and challenges

Achievements

- ❑ Seminars and meetings represent a useful forum for scientific exchange
- ❑ Strengthened collaborations within ISAC and with external partners
- ❑ Promoted interaction between modelling expertise and ISAC atmospheric observatories
- ❑ Supported the scientific development of a PhD project on wildfire impacts on GHGs

Challenges & Next Steps

- ❑ The WG brings together researchers with complementary expertise but limited overlap in funded activities. Funding schemes (e.g., PRIN) often favour partnerships with external institutions
- ❑ Challenging to develop a stable critical mass around common research actions
- ❑ Tangible scientific outputs (publications, proposals, shared products) limited
- ❑ To broad the engagement across the WG
- ❑ Define the future roadmap and WG coordination after the summer break (overlaps with other internal WGs)
- ❑ **Wildfire is a “hot” topic, attracting increasing interest across several CNR Institutes!**

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WG Fires – List of products (not strictly produced by the WG)

- ❑ Malacaria, L., et al. (2024) **Multiparameter Detection of Summer Open Fire Emissions: The Case Study of GAW Regional Observatory of Lamezia Terme (Southern Italy)**. Fire 2024, 7, 198. <https://doi.org/10.3390/fire7060198>
- ❑ Cristofanelli et al. (2024). **Influence of wildfire emissions to carbon dioxide (CO₂) observed at the Mt. Cimone station (Italy, 2165 m asl): A multi-year investigation**. Atmos. Env., <https://doi.org/10.1016/j.atmosenv.2024.120577>
- ❑ Hundal R.-A., et al. (2024) **Emissions of climate-altering species from open vegetation fires in the Mediterranean region - A review on methods and data**. STOTEN, 177713, <https://doi.org/10.1016/j.scitotenv.2024.177713>.
- ❑ Torrassa, M., Vissio G., Díaz Sierra, R., Magnani M., Eppinga M.B., Baudena M. (2025) **Functional and compositional diversity display a maximum at intermediate levels of fire frequency when modeling the plant-fire feedback**. bioRxiv 2025.06.10.656287, <https://doi.org/10.1101/2025.06.10.656287>
- ❑ Sánchez-Hernández, G., M. Turco, I. Repeto-Deudero, et al. (2025). **Record-Breaking 2025 European Wildfires Concentrated in Northwest Iberia**. Global Change Biology 31, no. 12: e70649, <https://doi.org/10.1111/gcb.70649>Digital Object Identifier (DOI)
- ❑ Vissio G., Biondi G., Baronetti A., Fiorucci P., Provenzale A., Baudena M., Turco M. (2026) **Evaporative demand as a key driver of fires in Italy**. Environmental Research Climate, DOI 10.1088/2752-5295/ae81da.
- ❑ Perello N., G. Vissio, P. Aflakian, G. Biondi, M. D'Andrea, A. Trucchia, M. Baudena, P. Fiorucci (2026). **Vegetation and fires under climate change: a Mediterranean modelled case study from central Italy**. <https://doi.org/10.64898/2026.05.29.728691>
- ❑ Cristofanelli, et al., (2026). **Impacts of wildfire plumes from Northern America on atmospheric composition as observed by permanent observatories in Italy during June 2025**, EGU General Assembly 2026, Vienna, Austria, 3–8 May 2026, EGU26-11975, <https://doi.org/10.5194/egusphere-egu26-11975>
- ❑ Das, K., Flesca, S. & Calidonna, C.R. **Quantifying wildfire impacts on atmospheric pollutants using fire exposure metrics and machine-deep learning approaches**. Sci Rep (2026). <https://doi.org/10.1038/s41598-026-51766-7>

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