
High-altitude Climatic Observation System and Climate Station Network

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High-altitude Climatic Observation System and Climate Station Network

ECV	Reference programmes	Monitoring station						
		PRS	MRG	CMN	CMP	CUR	CGR	LMP
CO ₂	WMO/GAW ICOS-RI	X		X		X	X	X
CH ₄		X		X		X	X	X
N ₂ O				X				X
SF ₆	WMO/GAW			X				
CFCs				X				
HCFCs				X				
HFCs				X				
CO				X		X	X	X
O ₃		X	X	X	X	X	X	X
SO ₂				X		X	X	
NO				X		X	X	
NO ₂	WMO/GAW ACTRIS			X		X	X	
Particle scattering				X			X	
Particle absorption				X			X	
Particle size distribution				X	X	X	X	
Particle concentration				X		X	X	
Coarse particle size distribution				X		X		
AOD				X				X
Total O ₃	WMO/GAW							X
UV radiation						X		X
Meteorological parameters	WMO/GAW		X	X	X	X	X	X
Solar radiation			X	X	X	X	X	X
Atmospheric Hg	GMOS		X			X		



High-altitude Climatic Observation System and Climate Station Network: **goals**

- **To contribute in implementing an integrated system for long-term continuous observation of atmospheric composition**
- To provide open access products (based on ECVs data series) to be used by NextDATA , coordinated programs (es. WMO/GAW) and external users in research/assessment studies.
- **To contribute towards a better understanding of atmospheric processes affecting atmospheric composition variability (with emphasis on exposure of mountain environments: acute events and changing background)**

High-altitude Climatic Observation System and Climate Station Network: **activities**

To contribute towards harmonization of measurement techniques, SOP, QA/QC (reference to international programmes, es: GAW-WMO, ICOS, ACTRIS-2)

Continuous near-surface and ground-based measurements of ECVs: reactive gases (RGs), long-lived greenhouse gases (LLGG), atmospheric aerosol and ancillary parameters.

To activate quality-assessed near-real time data delivery (COPERNICUS, ICOS, WMO/GAW, WIGOS) and early warning (es. SDS-WAS).

To contribute in implementing a system for the publication of available data series (Integration with NextDATA General Portal)

High-altitude Climatic Observation System and Climate Station Network: **international framework**

- National contribution to WMO/GAW: formal contribution to **UNFCC, GCOS (Global Climate Observation System), IPCC**
- Support to the **Paris Agreement and GFCS (Global Framework Climate Services)** by participation in IG³IS (Integrated Global Greenhouse Gas Information System)
- Contribution to **COPERNICUS** and **WIGOS** by science services (NRT data delivery, early-warning)
- To support National participation to international programme (e.g. **ICOS-RI, AGAGE, WMO/GAW...**)

NRT data-delivery (case): CAMS on-line model verification



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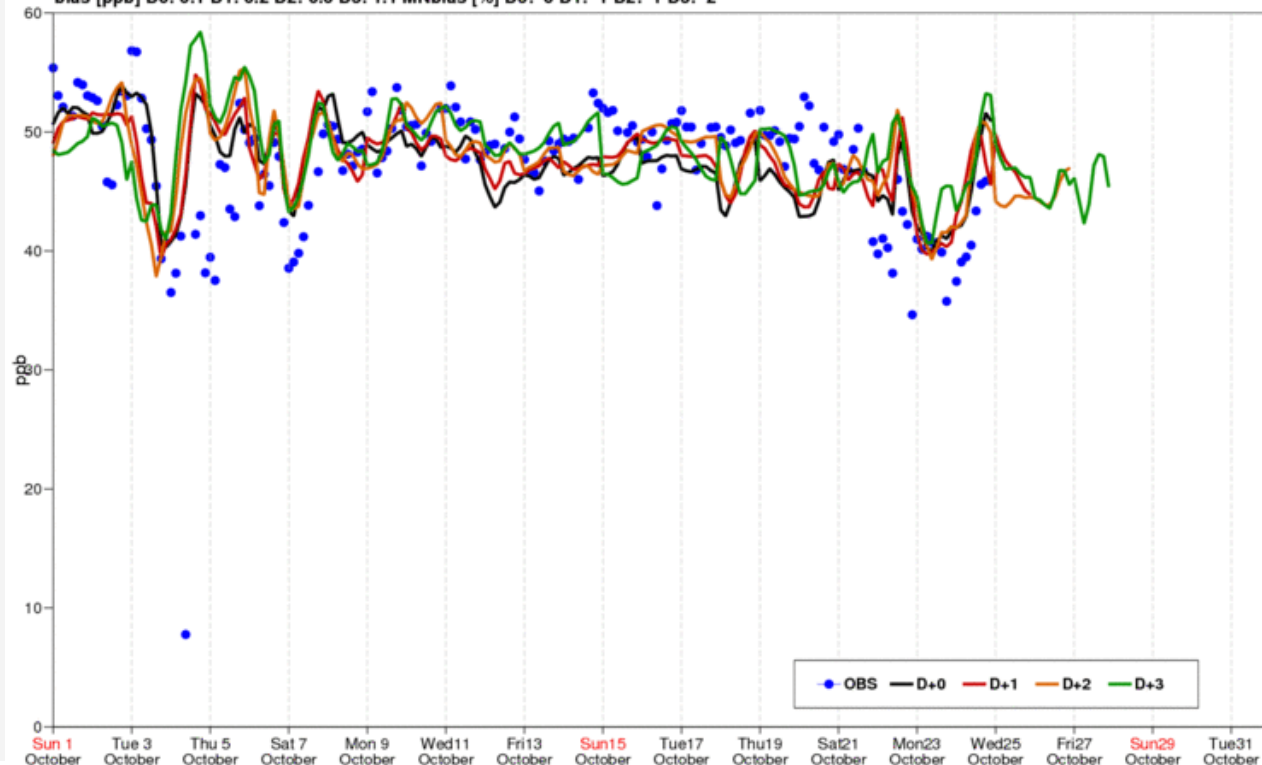
MACC Products > Global Atmospheric Composition > Verification > Reactive gases > Model verification using GAW observations > GAW timeseries>

Model ▾ ▹ ▸
▸ All
CIFS/TM5 AN
CIFS/TM5 FC

Station ▾ ▹ ▸
Hohenpeissenberg
▸ Mt. Cimone
Cape Point
Cape Verde
Jungfraujoch
Minamitorishima
Mt. Waliguan
Neumayer
Plateau Rosa
Ryori
Sonnblick
Ushuaia
Yonagunijima
Zugspitze

Parameter ▾ ▹ ▸

CAMS CIFS/TM5 AN GAW intercomparison Mt Cimone Ozone October 2017
bias [ppb] D0: 0.1 D1: 0.2 D2: 0.6 D3: 1.1 MNbias [%] D0: 0 D1: 1 D2: 1 D3: 2



NRT data-delivery (case): WMO SDS-WAS



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NORTHERN AFRICA-MIDDLE EAST-EUROPE (NA-ME-E) REGIONAL CENTER

WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS)

WMO SDS WAS || Asia Regional Center || America Regional Center

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In-situ measurements

> In-situ measurements

> Monte Cimone - Italy

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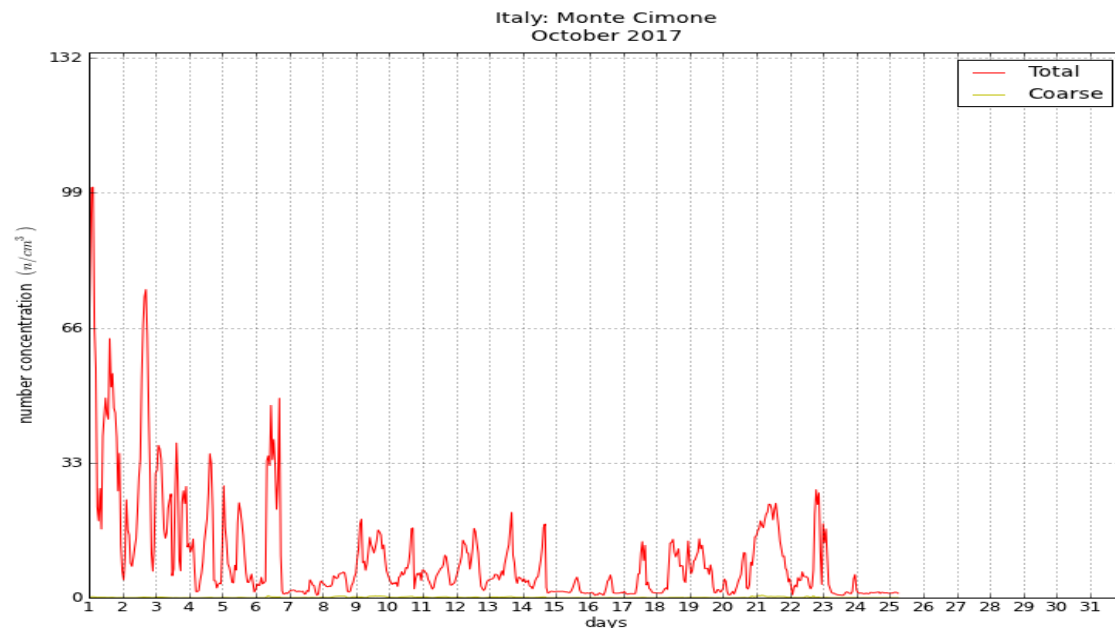
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Monte Cimone - Italy

by [Francesco Benincasa](#) — last modified Aug 01, 2014 10:45 AM

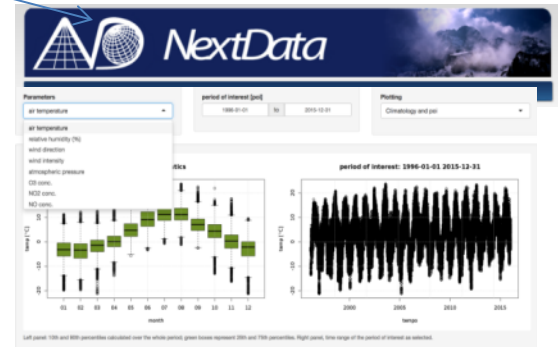
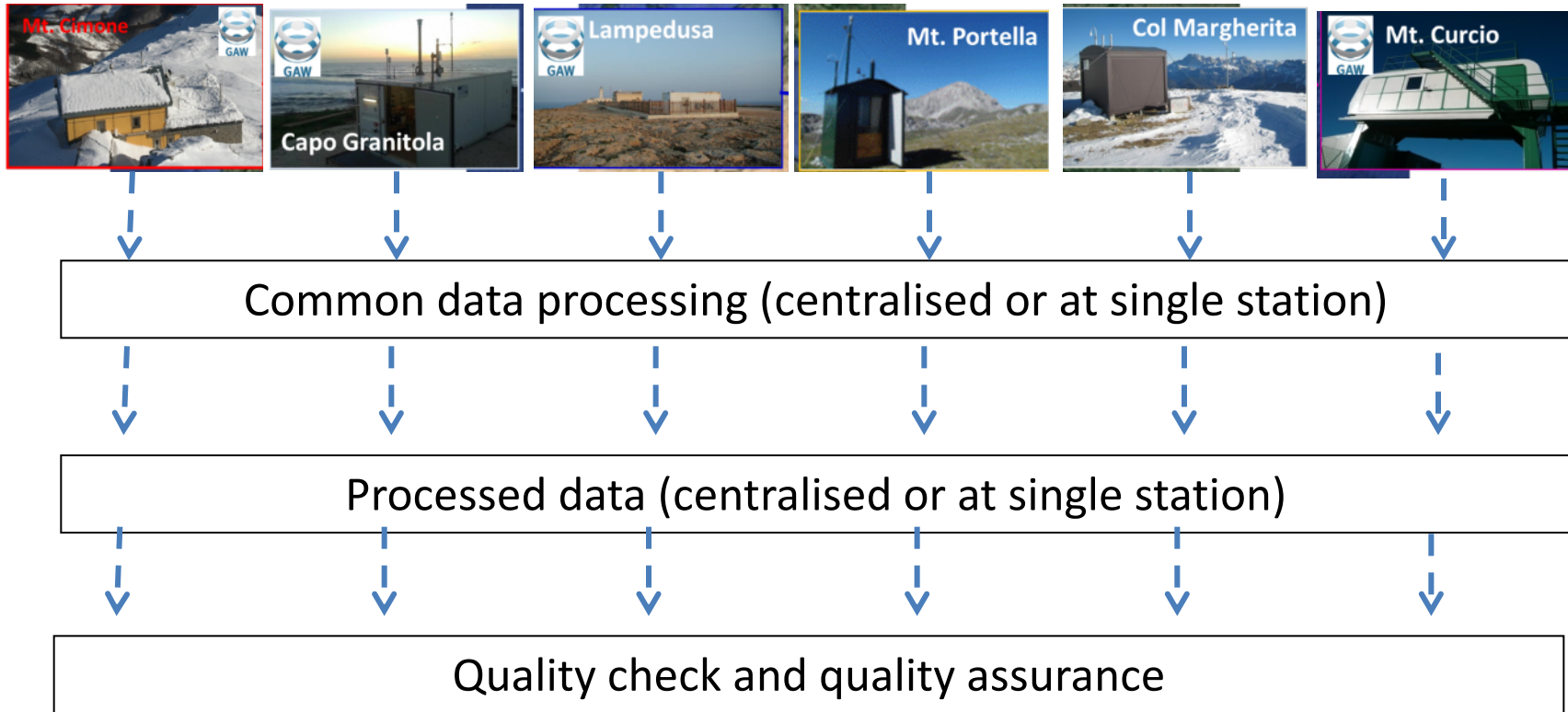


High-altitude Climatic Observation System and Climate Station Network: **QA/QC**

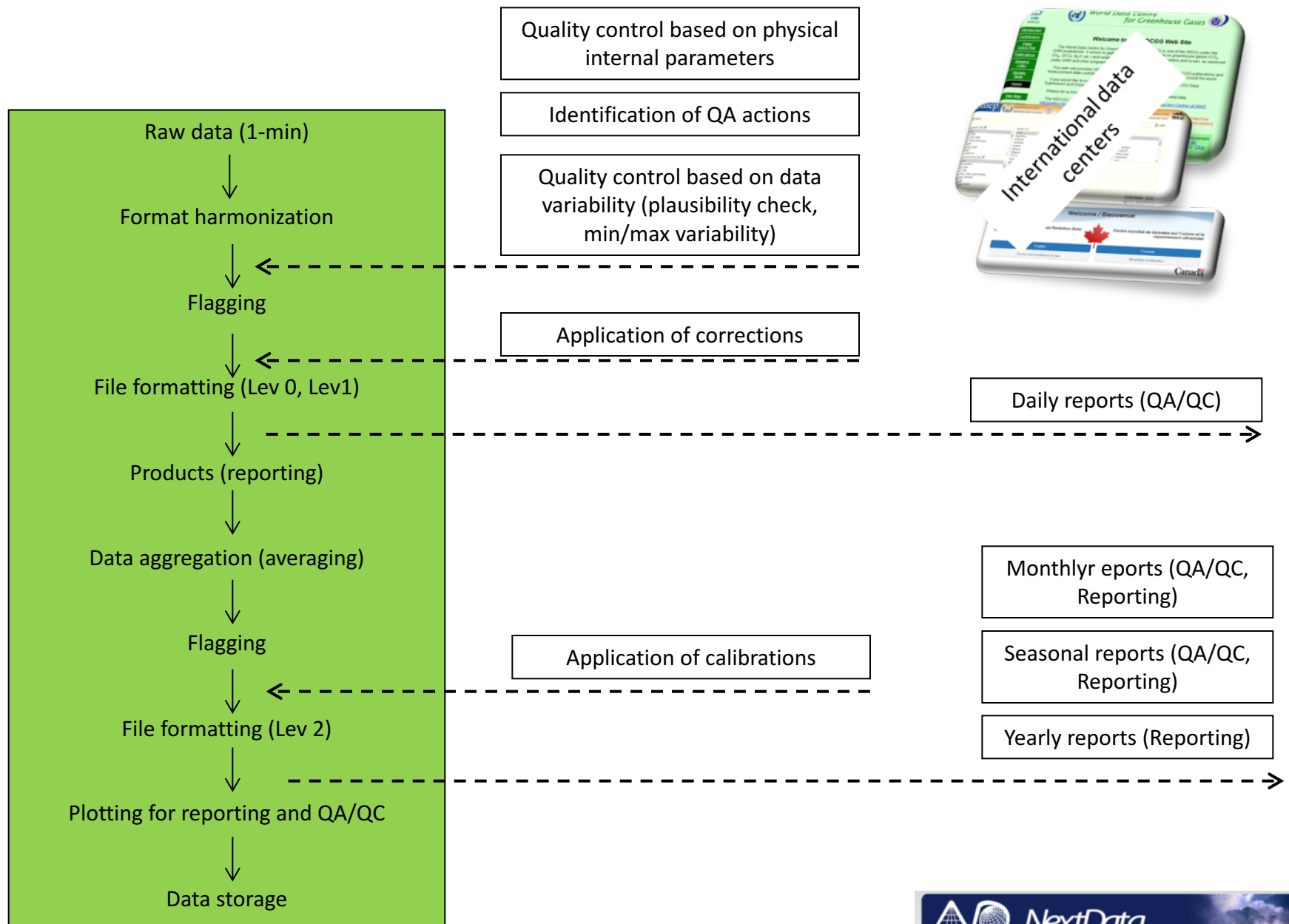
The quality assessment system proposed in the framework of NextDATA for the background measurement network is based on the WMO/GAW approach:

- Network-wide use of only one reference standard or scale;
- Full traceability to the primary standard of all measurements;
- Establishment of guidelines on how to meet these quality targets, i.e., harmonized measurement techniques based on Measurement Guidelines (MGs) and Standard Operating Procedures (SOPs);
- Execution of round-robin exercises within the network for some key parameters;
- Development of common procedures for the data validation to favour the timely submission of data submission to the international reference project/programme and to NextDATA archives.

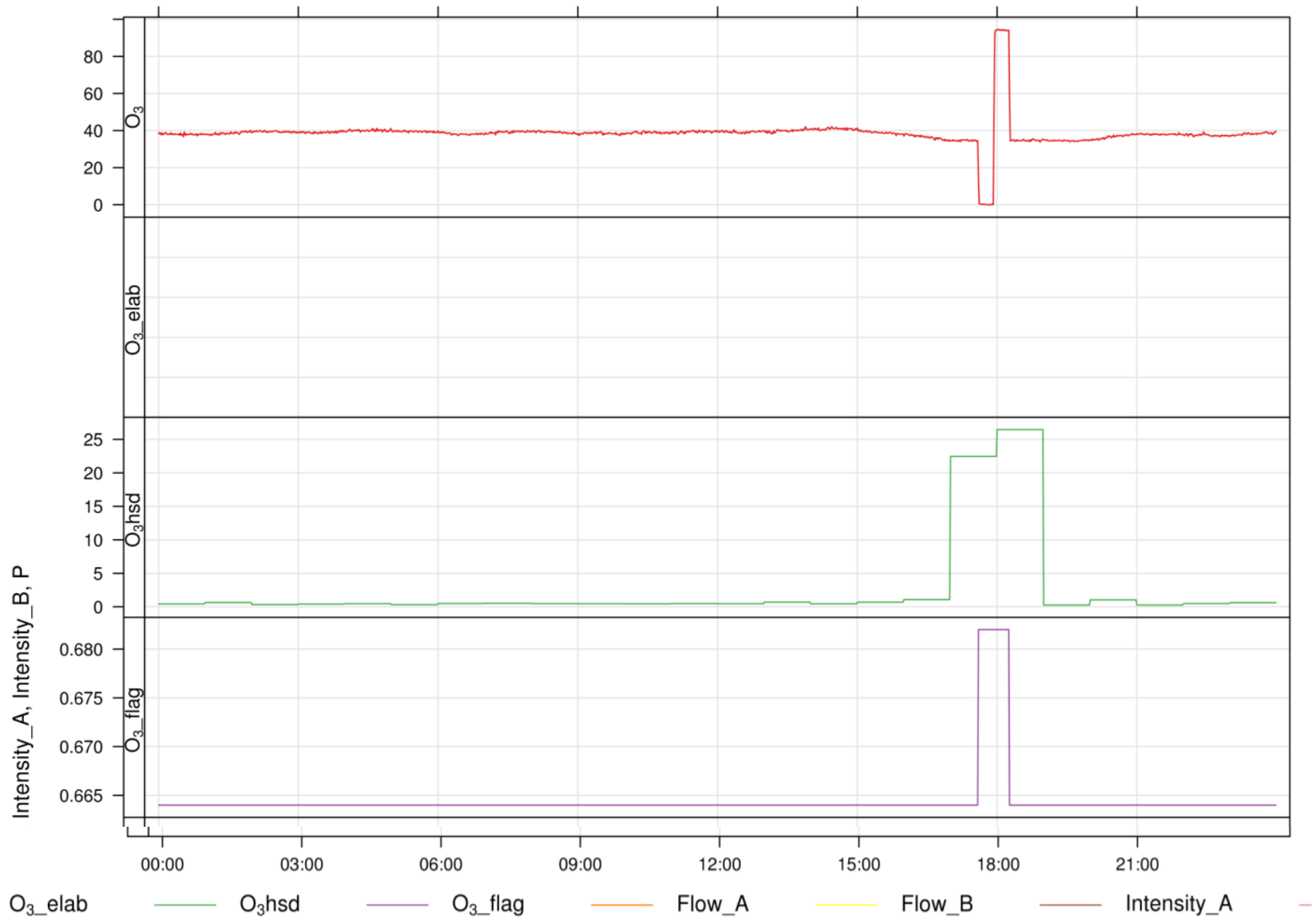
Overview: centralised data processing and flagging



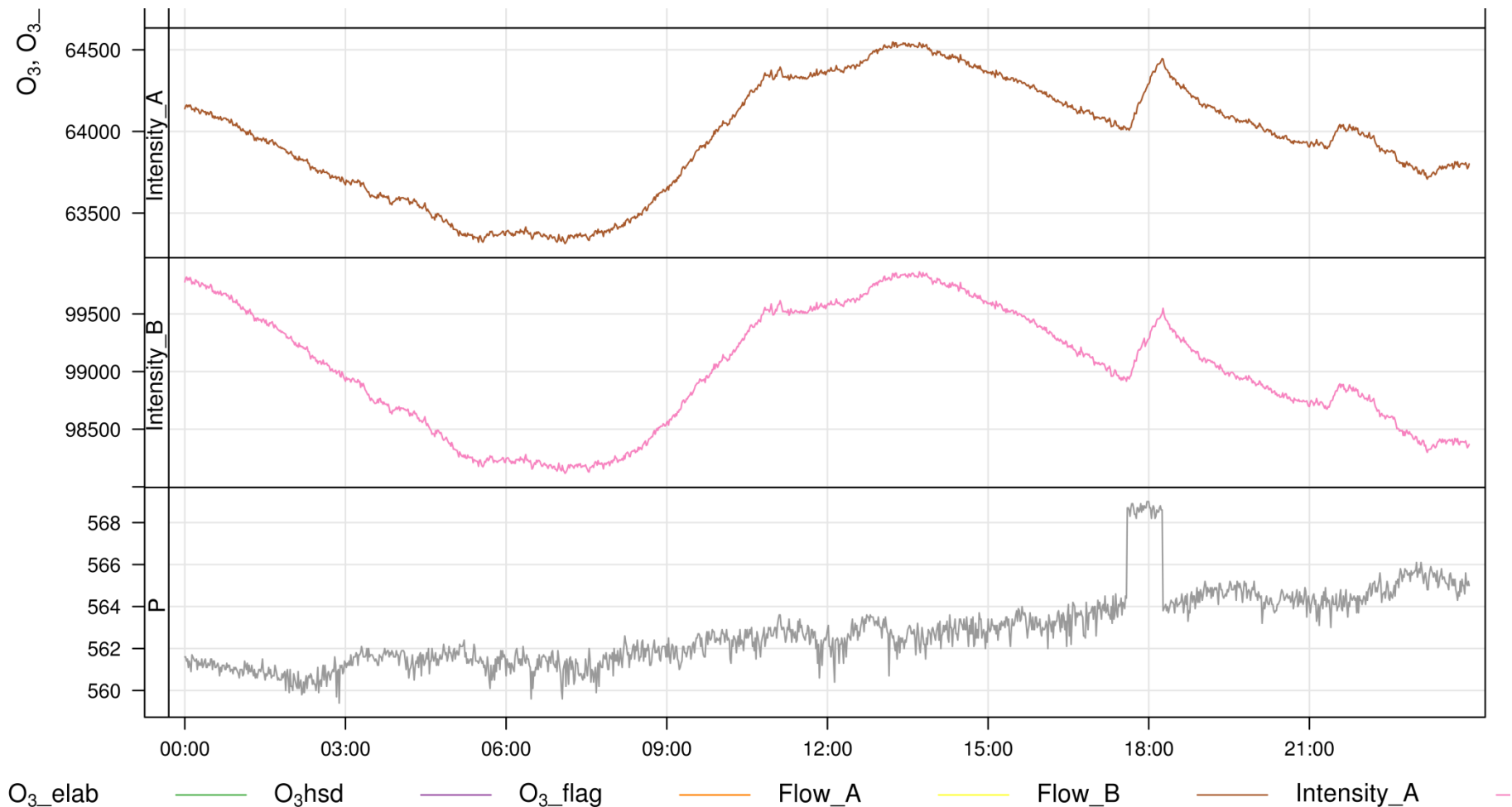
Overview: centralised data processing and flagging



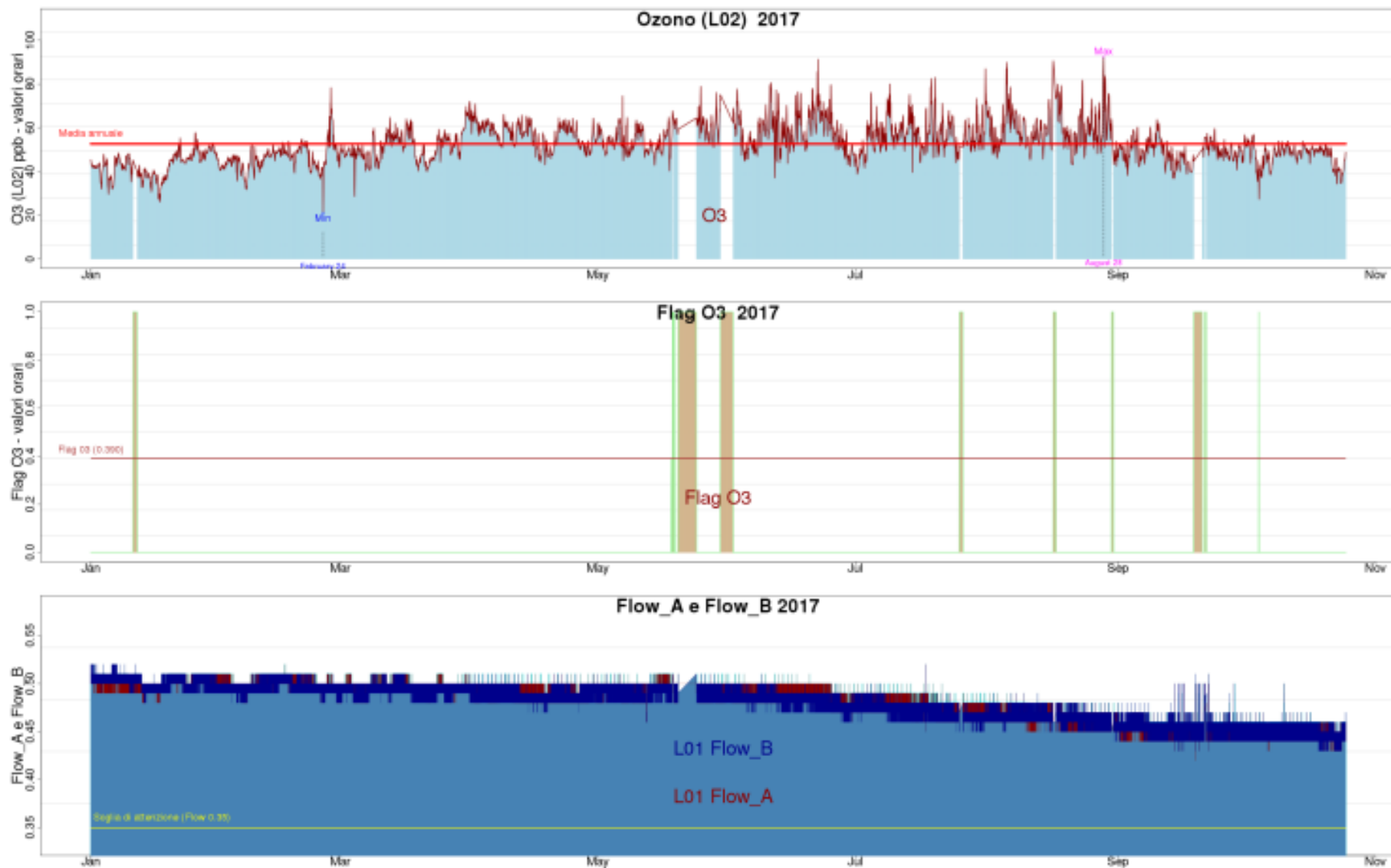
Example: daily report (O3, MRG)



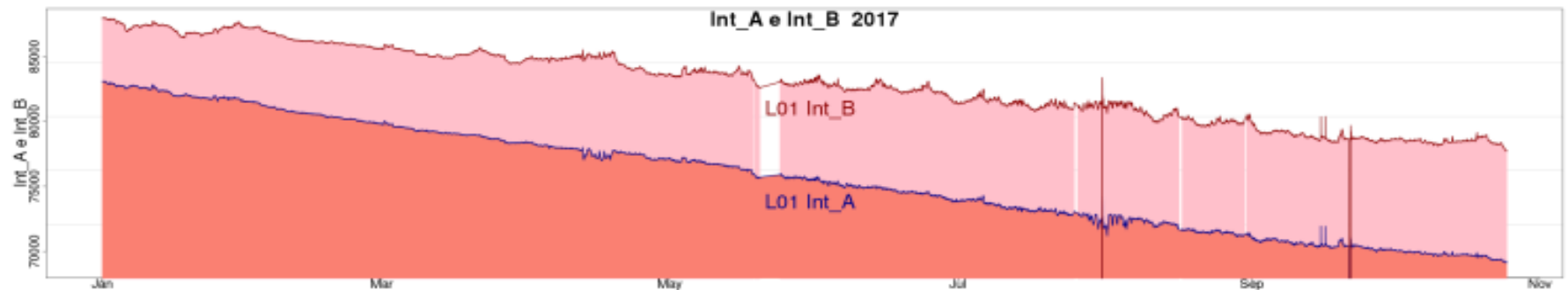
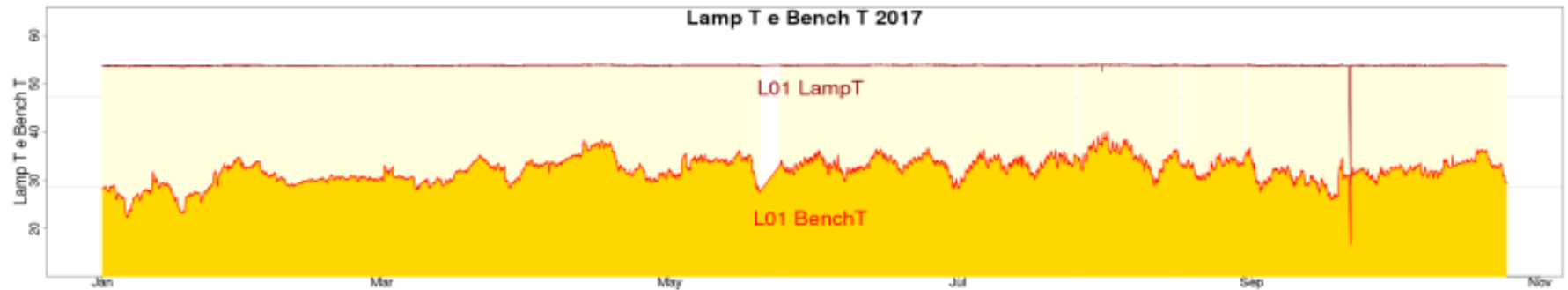
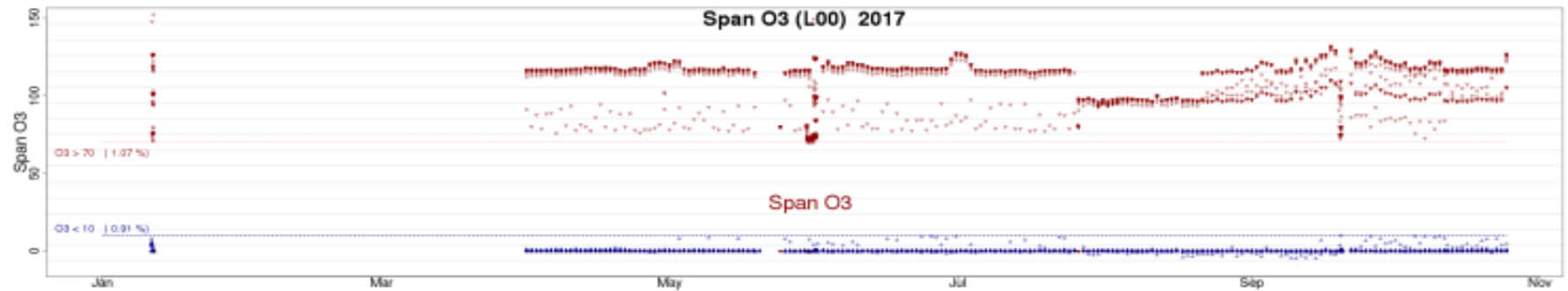
Example: daily report (O₃, MRG)



Annual report (O3, CMN) - 1



Annual report (O3, CMN) - 2



CMN_OZO_2017_ANNUAL_GRAPH_20171025 - 2017

Dati relativi alle osservazioni dal 01 January 2017 al 24 October 2017
(giorni di osservazione: 297)

Valori statistici - 2017

O3 min: (21.1) - O3 max: (92.2) - O3 media: (52.61) - O3 sd: (8.52)
O3 quantili: 5th: (39.8) - 25th: (47.1) - 50th: (51.8) - 75th: (58) - 95th: (67.1)

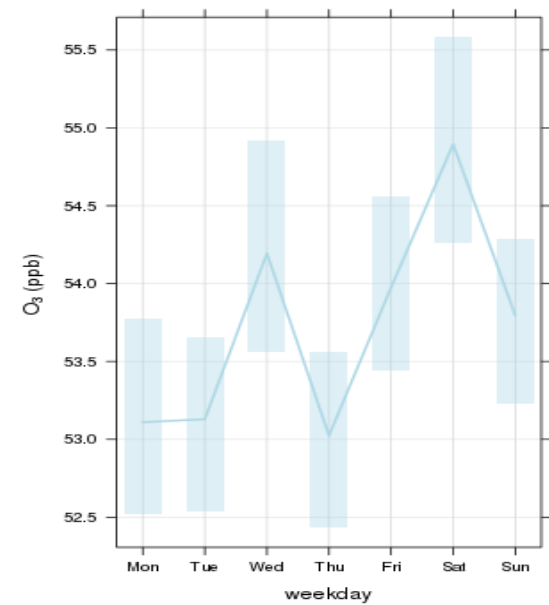
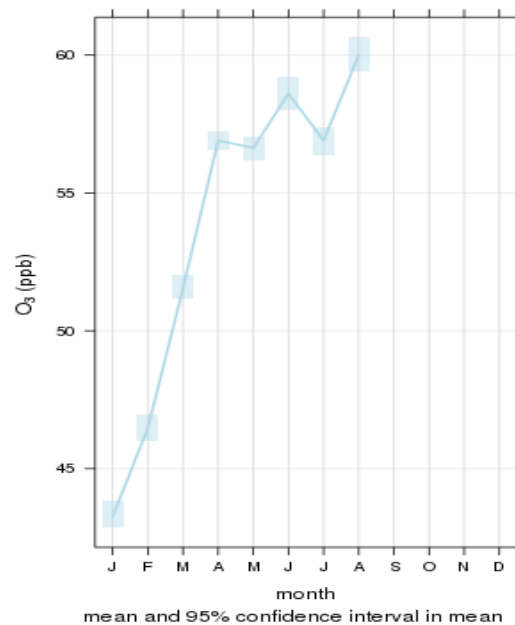
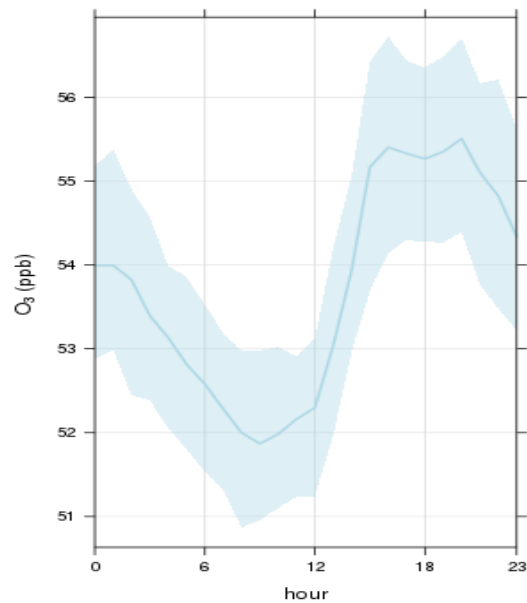
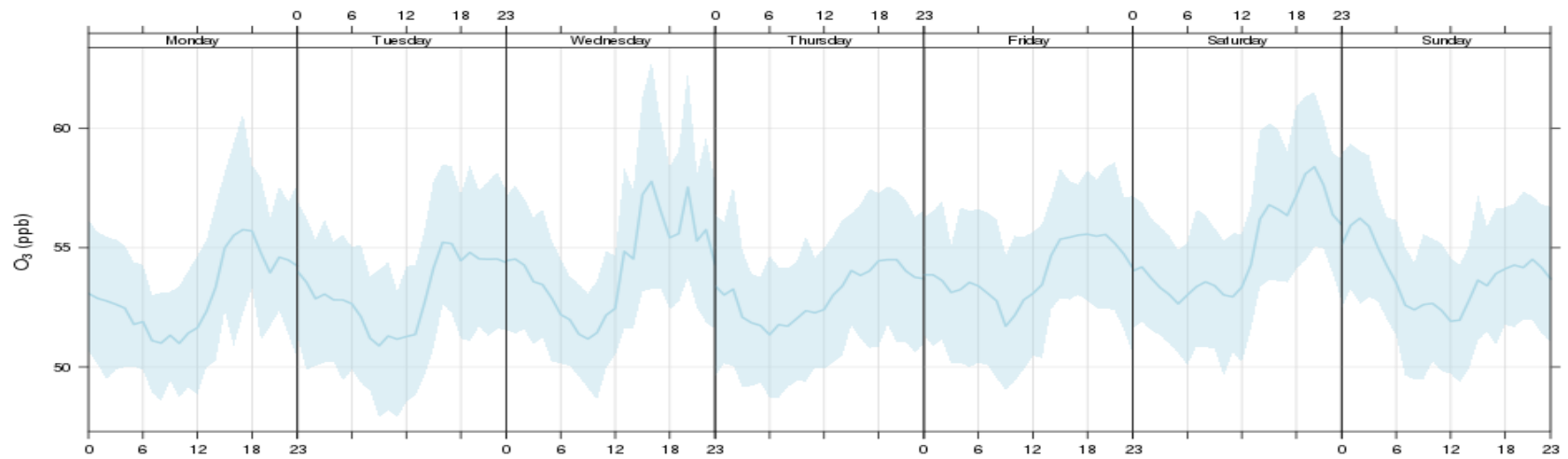
Flag O3 anomalo superiore a 0.390 (giorni affetti nell'anno): 20 (6.73%)

Mesi affetti da Flag O3 anomalo:

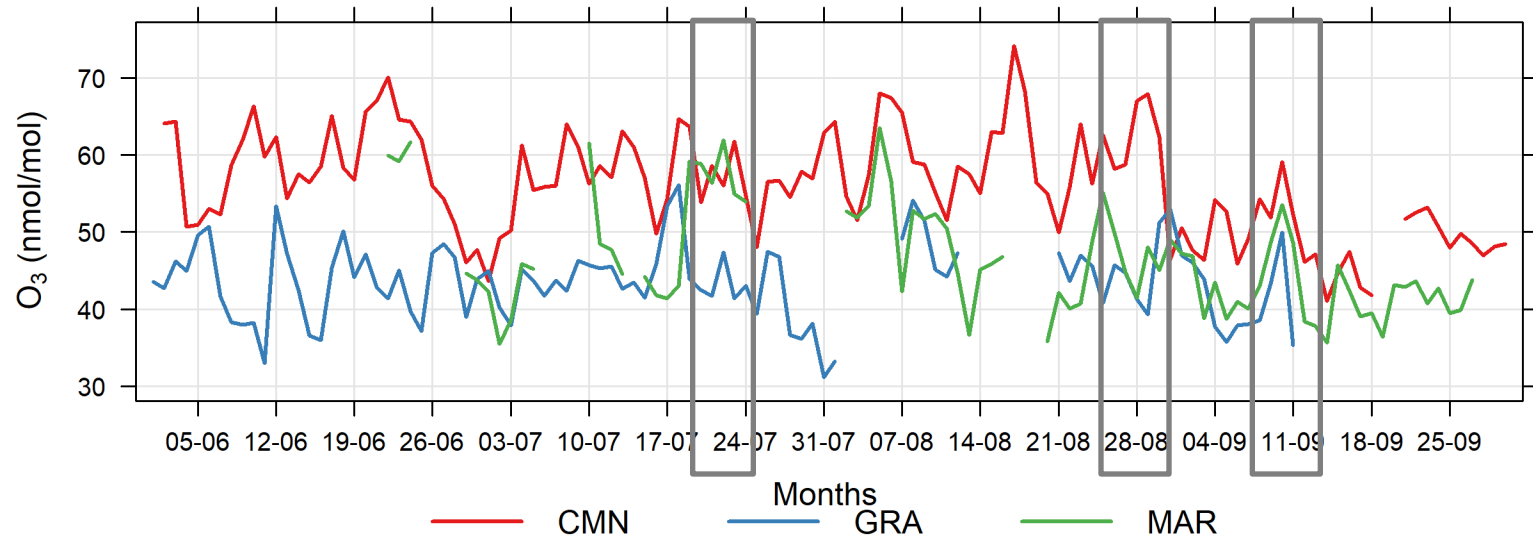
January (3 gg) May (1 gg) June (2 gg) July (1 gg)

August (9 gg) September (1 gg) October (3 gg)

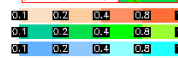
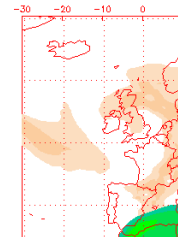
Annual report (O3, CMN) - 3



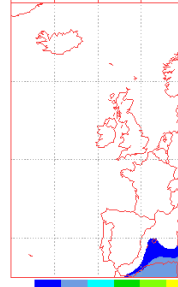
Example case – summer 2017 (O₃)



NAAPS Total Optical Depth for 00:00Z 23 Jul 2017
Sulfate: Orange/Red, Dust: Green/Yellow, Smoke: B

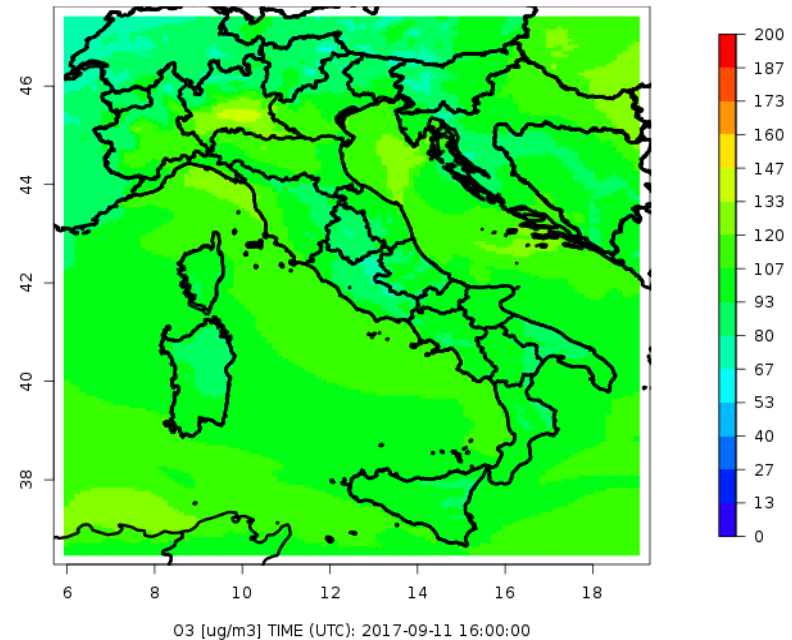


Dust Surface Concentration (g/m²)



*Made Sun Jul 23 16:05:06 UTC 2017

BOLAM (CNR-ISAC)



Data sharing

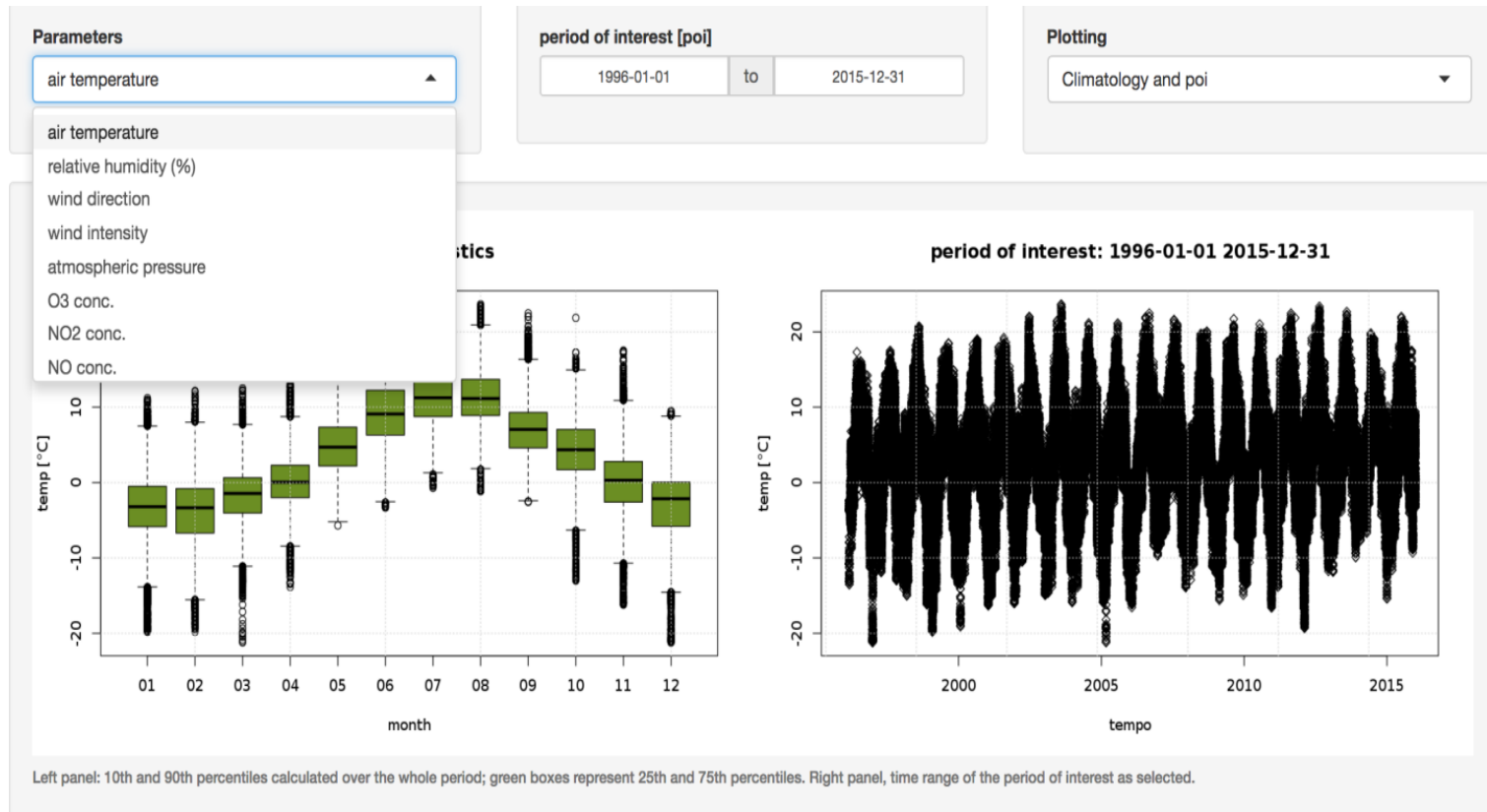
MOVIDA-Multistats

(MonteCimone On-line Visualization and Data Analyses – Multi Stations)

MOVIDA - Multistats

MOVIDA- MultiStats is developed basing on the R language by using Shiny package (<https://shiny.rstudio.com/>) for plotting and downloading recorded ECV data.

The system for the data download and visualization is implemented and presented on a GUI (Graphical User Interface). It provides files in “CSV” format easy to import in the most common scientific technical computing languages (R, Matlab, Octave, Scilab, Julia, Python).



MOVIDA - Multistats

MOVIDA – Multistats represents an “easy-to-use” and very intuitive web resource by which also not experts (e.g. high-school student or teachers, university student, citizens) can have access to the time series of ECVs over the Italian territory.

- **Direct access (download) to data time series**
- **Basic statistical analyses (averages, percentiles, smoothing, outliers)**
- **Flexible period of interests**
- **Flexible time aggregation (daily, monthly and yearly)**

The data-set is composed by «level-2» data (final validated, aggregation on hourly time-scale) submitted to international data centers (WDCGG, WDCA, WDCUV, ACTRIS).

One single entry point for the ECVs observed at the NextDATA stations.

The “beta” version of MOVIDA - Multistat, is currently available at the web address <http://shiny.bo.isac.cnr.it:3838/plot-multistats-en/> and hosts historical time series for the WMO/GAW Observatories Monte Cimone (CNR-ISAC), Plateau Rosa (RSE SpA) and Lampedusa (ENEA).

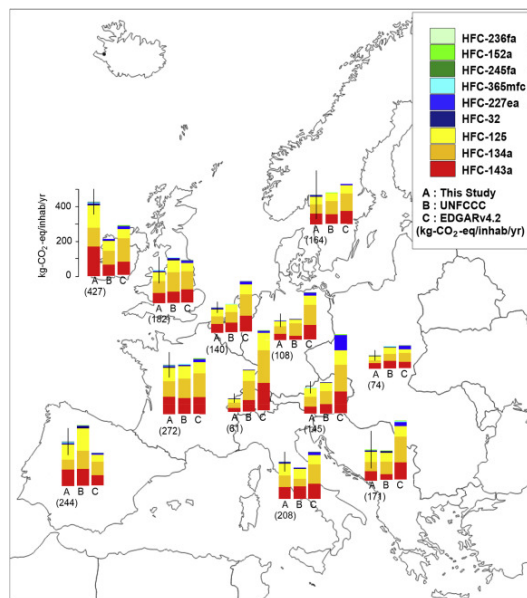
MOVIDA – Multistats is still under development and new functions and data series will be available before December 2018. Users are invited to provide feedbacks and suggestions to MOVIDA-Multistats contacts.

...and science???



Cristofanelli, P. et al 2017 Investigation of reactive gases and methane variability in the coastal boundary layer of the central Mediterranean basin. *Elem Sci Anth* 5: 12, DOI: <https://doi.org/10.1525/elementa.216>

Investigation of reactive gases and methane variability in the coastal boundary layer of the central Mediterranean basin



Atmospheric Environment

European emissions of the powerful greenhouse gases hydrofluorocarbons inferred from atmospheric measurements and their comparison with annual national reports to UNFCCC

Atmos. Chem. Phys., 17, 1061–1080, 2017
www.atmos-chem-phys.net/17/1061/2017/
doi:10.5194/acp-17-1061-2017
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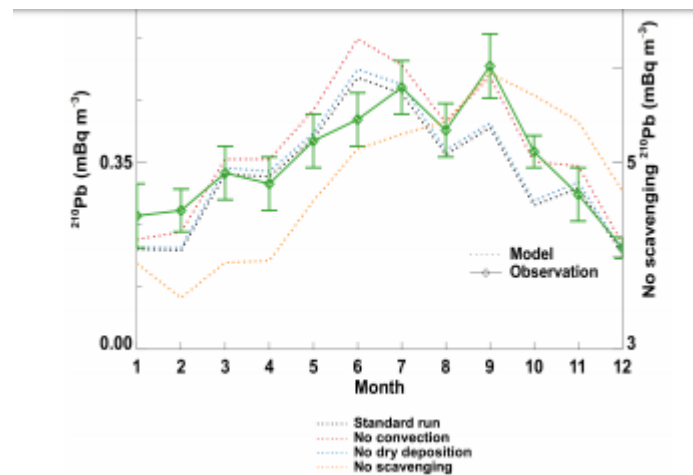
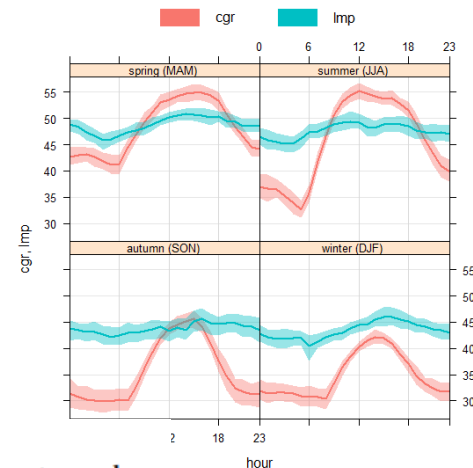


Processes controlling the seasonal variations in ^{210}Pb and ^7Be at the Mt. Cimone WMO-GAW global station, Italy: a model analysis

Erika Brattich¹, Hongyu Liu², Laura Tositti¹, David B. Considine³, and James H. Crawford⁴



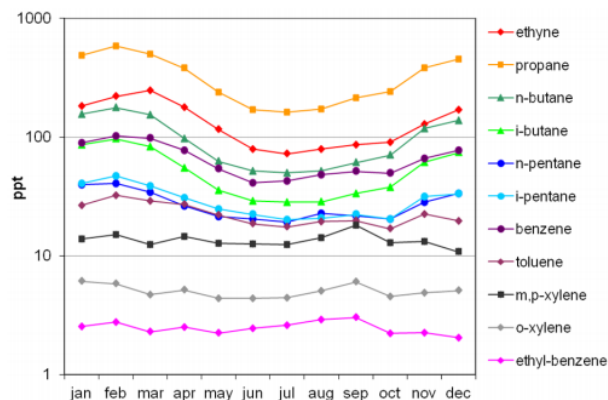
SISC Fifth Annual Conference, Bologna October 26-27, 2017



...and science???



Long-term (2002–2012) investigation of Saharan dust transport events at Mt. Cimone GAW global station, Italy



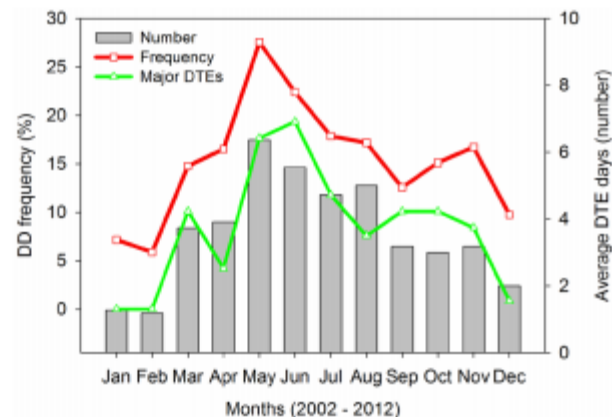
Aerosol and Air Quality Research, 16: 581–592, 2016
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ISSN: 1680-8584 print / 2071-1409 online
doi: 10.4209/aaqr.2015.05.0364

Non-Methane Volatile Organic Compounds in the Background Atmospheres of a Southern European Mountain Site (Mt. Cimone, Italy): Annual and Seasonal Variability

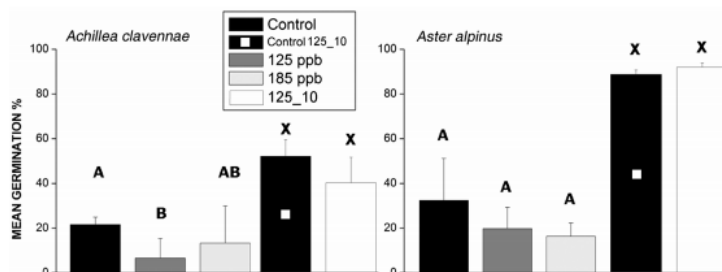
Eleonora Lo Vullo¹, Francesco Furlani^{1,2}, Jgor Arduini^{1,3}, Umberto Giostra^{1,2}, Paolo Cristofanelli³, Martin L. Williams⁴, Michela Maione^{1,2,3*}

Acute and chronic ozone exposure temporarily affects seed germination in alpine plants

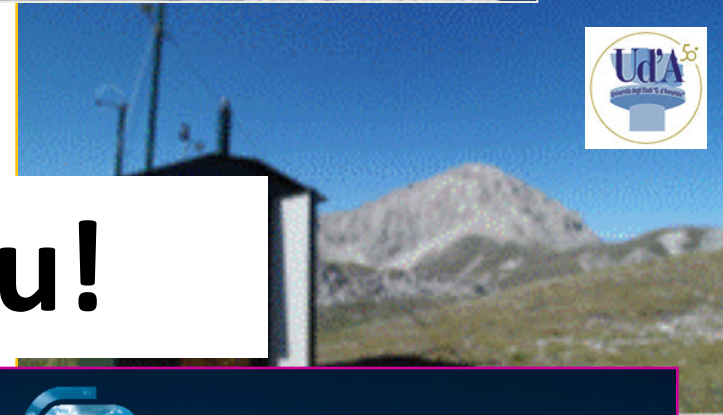
T. Abeli, D. B. Guasconi, A. Mondoni, D. Dondi, A. Bentivoglio, A. Buttafava, P. Cristofanelli, P. Bonasoni, G. Rossi & S. Orsenigo



Elementa: Science of the Anthropocene • 4: 000085 • doi: 10.12952/journal.elementa.000085



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Thank you!

