Surveillance of SARS-CoV-2 in urban wastewater in Italy
4th Report
Update to week 25 of 2022 (26.06.2022)

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Main findings:

- As of week 25 of 2022 (26.06.2022), a total of 6.475 wastewater samples were collected throughout Italy in the framework of the SARS-CoV-2 environmental surveillance (EU Commission Recommendation 2021/472)
- 6451 wastewater samples were analysed for SARS-CoV-2, and 87.2% of them were positive.
- The national trend of SARS-CoV-2 concentrations in wastewater showed a "dangerous increase" (>30%) in SARS-CoV-2 concentrations in the weeks 24 and 25, 2022 (period 13.06.2022 - 26.06.2022), compared to the previous weeks.
- The same increasing trend was documented in most of the Regions/Autonomous Provinces.
- The observed significant increase of SARS-CoV-2 loads suggests a rise in the number of individuals excreting SARS-CoV-2, which is in agreement with the current new growth of Covid-19 cases, possibly in relation to the spread of the Omicron sublineage BA.5.

On 17th March 2021, the "EU Commission Recommendation 2021/472 on a common approach to establish a systematic surveillance of SARS-CoV-2 and its variants in wastewaters in the EU", strongly encouraged Member States to put in place national wastewater surveillance systems aimed at the collection of data on SARS-CoV-2 and its variants[1]. The implementation of the Recommendation was granted by the Decree Law n. 73 of 25.05.2021, art. 34 and coordination of the activities was assigned to Istituto Superiore di Sanità (ISS).
As on June 2022, 20 of the 21 Italian Regions/A.P. provide SARS-CoV-2 concentration data within the environmental surveillance program. Details on enrolled Regions/Autonomous provinces, sampling sites, sampling frequencies and methods can be found in the 1° Report on Surveillance of SARS-CoV-2 in urban wastewater in Italy (https://www.iss.it/en/cov19-acque-reflue).

The aim of this report is to update the results of the environmental surveillance of SARS-CoV-2 up to week 25 of 2022 (26.06.2022).

Results

The data on SARS-CoV-2 concentrations in wastewater are produced by the SARI network laboratories (see Acknowledgement section). Results (SARS-CoV-2 detection) obtained since October 2021 are shown in Table 1.

Table 1. Results obtained in 20 Regions/Autonomous Provinces and as on week 25, 2022

Region/A.P.	N° of WTP	Collected Samples	Analysed samples	Positive samples	% of positive samples
Abruzzo	5	190	190	64	33.7%
Basilicata	2	71	70	45	64.3%
Calabria	6	100	100	98	98.0%
Campania	10	574	574	497	86.6%
Emilia Romagna	14	607	606	510	84.2%
Friuli Venezia Giulia	3	114	114	97	85.1%
Lazio	13	443	440	413	93.9%

1 Commission Recommendation (EU) 2021/472 of 17 March 2021 on a common approach to establish a systematic surveillance of SARS-CoV-2 and its variants in wastewaters in the EU. (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021H0472&qid=1628798981209)

Liguria	16	667	666	549	82.4%
Lombardia	15	644	643	589	91.6%
Marche	6	193	193	182	94.3%
Molise	3	88	88	38	43.2%
Piemonte	7	244	239	226	94.6%
Puglia	16	511	508	493	97.0%
Sicilia	17	588	580	545	94.0%
Toscana	13	346	346	205	59.2%
Umbria	3	105	105	105	100.0%
Valle d'Aosta	2	150	150	136	90.7%
Veneto	10	418	417	410	98.3%
A.P. Bolzano	3	194	194	194	100.0%
A.P. Trento	3	228	228	227	99.6%
Total	**167**	**6.475**	**6451**	**5623**	**87.2%**

Data reported since October 2021, extrapolated by the GIS database on 27 June 2022, at 10:00 AM.

Weekly changes in term of SARS-CoV-2 concentrations are shown in Table 2. Variation compared to the previous week are shown with arrows (red= increase, green = decrease, black = stationary). Data from the last 14 weeks of surveillance are shown in the table.

Table 2. Weekly changes. Variations compared to the previous week are shown with arrows (red= increase, green = decrease, black = stationary).The last three months of surveillance are represented.

Region/A.P.	week													
	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Abruzzo	↗	↗	↘	↘	↘	↗	↗	↗	↘	↘	↘	↘	↗	↗
Basilicata	↗	↗	↘	↘	↘	↗	↗	↘	↘	↘	↗	↘	↗	↗
Campania	↗	↗	↗	↘	↘	↘	↘	↘	↘	↘	↗	↗	↗	↘
Calabria	↗	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↗	n.a.	n.a.
Emilia-Romagna	↗	↗	↘	↗	↗	↘	↘	↗	↘	↘	↘	↗	↗	↘
Friuli-Venezia Giulia	↗	↗	↗	↘	↘	↘	↗	↗	↔	↘	↘	↔	↗	↗
Lazio	↘	↘	↗	↗	↗	↔	↗	↘	↘	↗	↘	↘	↗	↗
Liguria	↗	↗	↗	↗	↘	↗	↗	↘	↘	↘	↘	↗	↗	↗
Lombardia	↗	↘	↘	↘	↘	↘	↘	↘	↗	↗	↗	↘	↘	↘
Marche	↗	↗	↗	↗	↗	↘	↘	↘	↘	↘	↗	↗	↗	↗
Molise	↗	↗	↗	↘	↘	↗	↗	↗	↗	↘	↘	↘	↗	↗
A.P. Bolzano	↗	↘	↘	↔	↘	↘	↔	↘	↘	↘	↗	↔	↗	↗
A.P. Trento	↗	↘	↘	↘	↘	↔	↘	↗	↘	↘	↗	↗	↗	n.a.
Piemonte	↗	↗	↗	↘	↘	↔	↗	↗	↘	↘	↘	↘	↗	↘
Puglia	↘	↘	↗	↗	↗	↗	↘	↘	↘	↘	↗	↗	↘	↘
Sicilia	↗	↘	↘	↔	↗	↗	↗	↘	↘	↘	↘	↘	↘	↔
Toscana	↗	↗	↘	↘	↘	↘	↗	↗	↘	↘	↘	↘	↗	↘
Umbria	↗	↘	↘	↘	↘	↘	↘	↘	↗	↘	↘	↘	↗	↗
Valle d'Aosta	↗	↗	↗	↗	↘	↘	↘	↘	↘	↗	↗	↗	↘	↘
Veneto	↗	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↗	↗	↗
Italy	↗	↘	↘	↘	↘	↘	↗	↗	↔	↘	↘	↘	↗	↗

Week 12=–data at 27.03.2022; week 25=– data at 26.06.2022; n.a. not available

Quantitative data were used to elaborate the Quiver graphs, as described previously[2]. Figure 1 represents the global data obtained in Italy since October 2021 and as on week 25, 2022. In the last two weeks, a "dangerous increase" (>30% increase, arrow in dark red) was documented suggesting an increase in the number of individuals excreting SARS-CoV-2 in wastewaters.

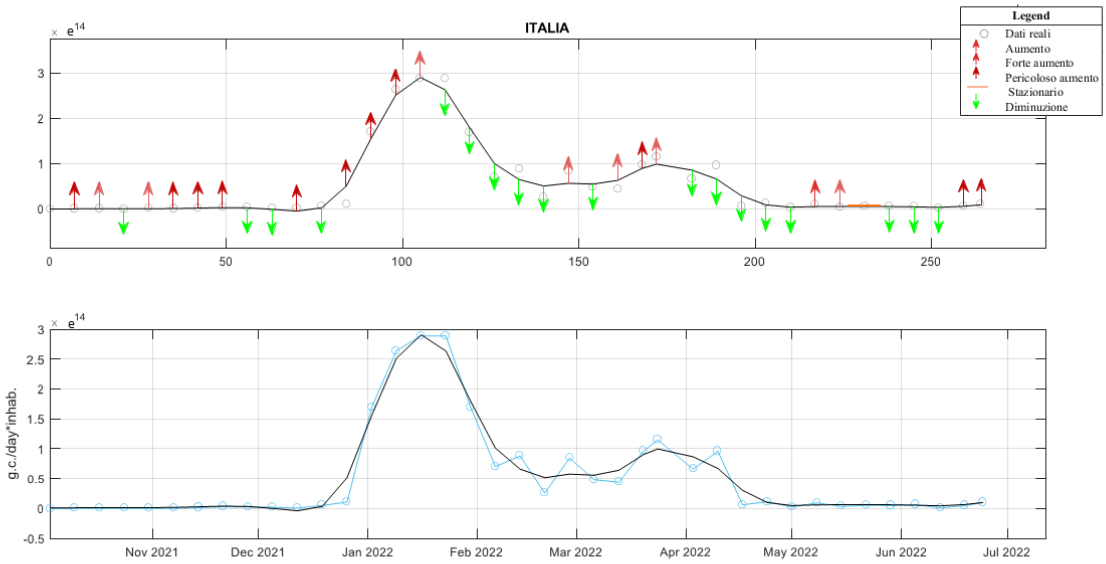


Figure 1. Quiver graph representing SARS-CoV-2 trends in wastewater in Italy in the period 1 October 2021 – 26 June 2022. Increase = 2%-20%; strong Increase = 20%-30%; dangerous Increase = >30%; stationary = 0-2%.

Legend (relative variation compared to previous week):
Increase = 2%-20%
Strong Increase = 20%-30%
Dangerous Increase = >30%
Stationary = 0-2%
Decrease = reduction of the concentration

Quiver graphs for each Region/A.P. are shown in Appendix 1.

[2] Surveillance of SARS-CoV-2 in urban wastewater in Italy 1° Report (Study period: 01 October 2021 - 31 March 2022. 8e5e2edb-bae0-f1b0-ee6e-08255c76484f (iss.it)

Limitations of the study

- The geographical and population coverage of the surveillance network is still incomplete, as 20 of the 21 Italian Regions/A.P. are actively reporting data to the surveillance system.
- Caution should be used in the interpretation of the most recent data, as trend analysis may be affected by missing data.
- According to EU Rec. 2021/472 and the national protocol adopted for SARS-CoV-2 analysis in wastewaters, analytical results should be uploaded to the SARI 2.0 databases within 48 hours after sample collection. According to available data, laboratories of the surveillance network comply with this time limit in most cases. However, different technical issues (e.g. the need to repeat the analysis to reach the quality assurance criteria, delays in samples collection/shipment, unexpected personnel shortage, delays in data validation or uploading, etc.) may hamper the timely update of results. Therefore, data within the last two weeks of observation should always be taken with caution, as they might be not completely consolidated yet.
- Molecular analytical methods applied to complex environmental matrices like wastewaters may be hampered by low viral concentration, poor recovery of the analyte, and/or inhibition of PCR amplification. Therefore, both the detection and quantification of SARS-CoV-2 in wastewaters may be affected by false negative results and/or by underestimation. According to collected data (Table 1), samples positivity rate varied significantly among Regions/A.P. and may conceal variability of detection performance. Besides this, analytical issues may sporadically arise depending on specific climatic/meteorological conditions or due to the characteristics of some samples or sampling points, leading to outlier results and, in turn, to trend alterations.
- Sewage networks are highly diverse (e.g. linear development, daily flow, ramification complexity, the ratio of urban to industrial waters, single/large vs. multiple/small WTPs, etc.) and the effect of such diversity on the representativeness of the different sampling points and on virus detectability is unknown.

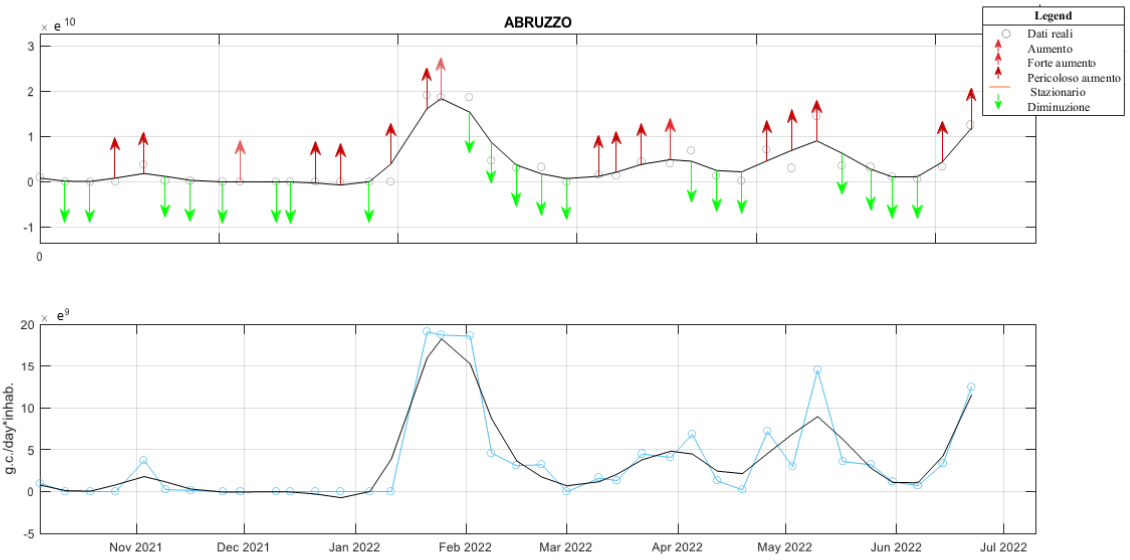
Conclusions and final considerations

The observed SARS-CoV-2 loads in sewage has grown considerably since mid-June 2022, suggesting an increase in the number of SARS-CoV-2 excretors, possibly linked to the diffusion of the Omicron sublineage BA.5

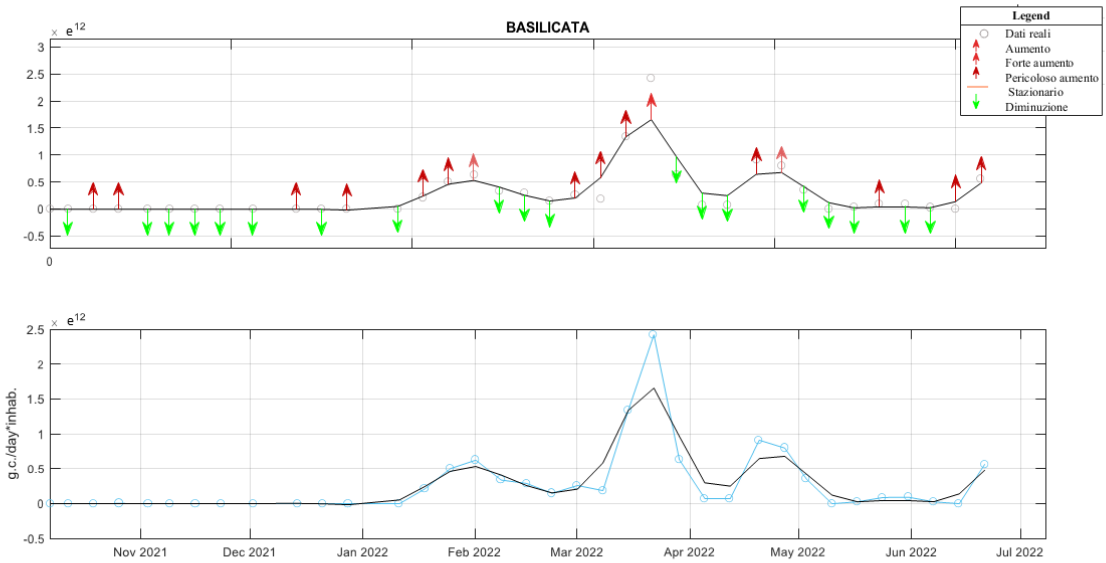
Appendix 1: Quiver graphs for Regions and Autonomous Provinces.

Legend (relative variation compared to previous week):
Increase = 2%-20%
Strong Increase = 20%-30%
Dangerous Increase = >30%
Stationary = 0-2%
Decrease = reduction of the concentration

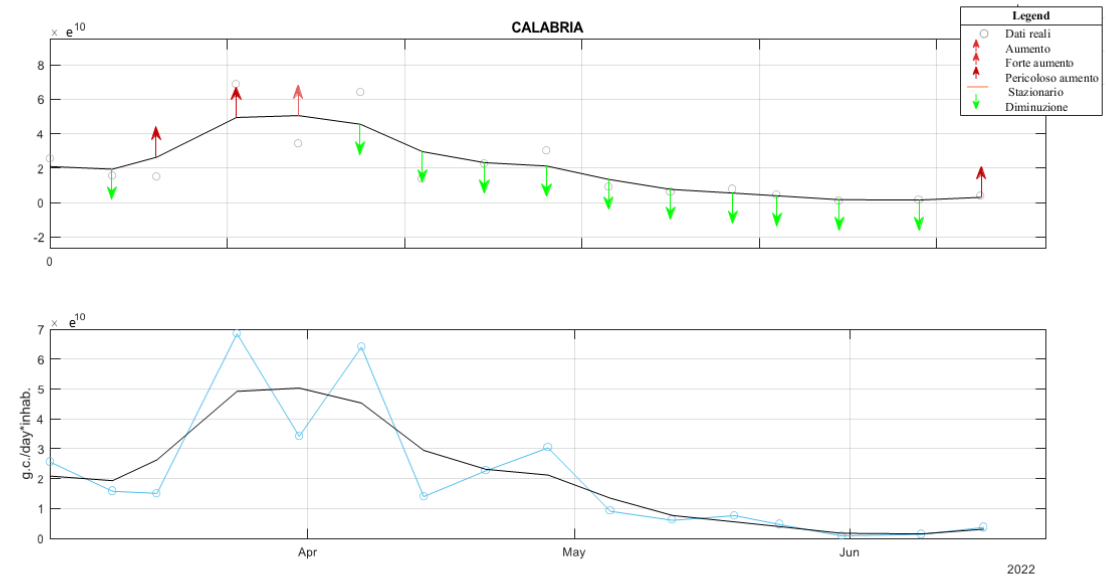
ABRUZZO



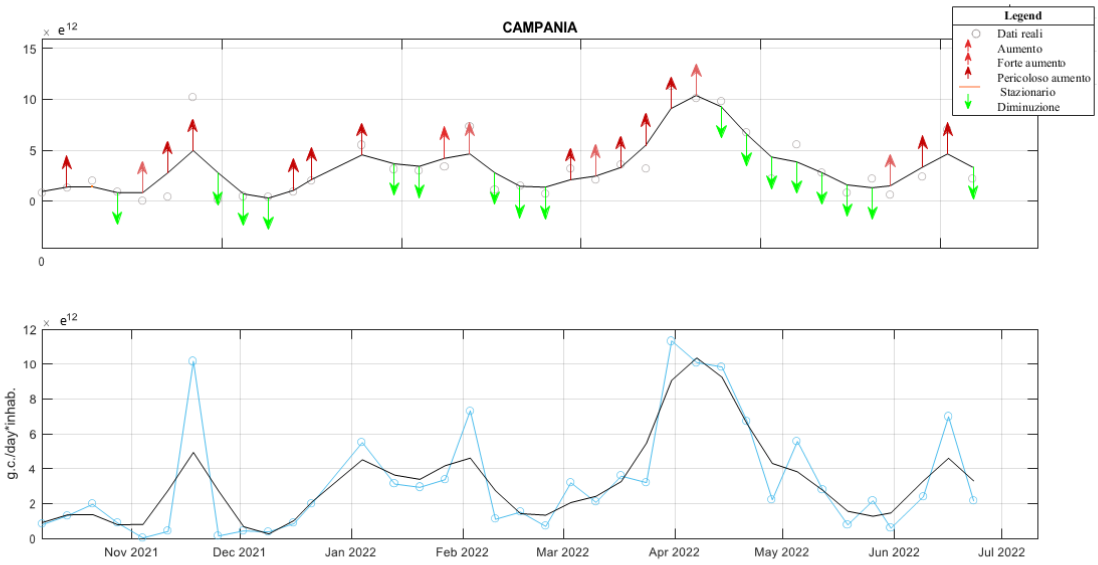
BASILICATA



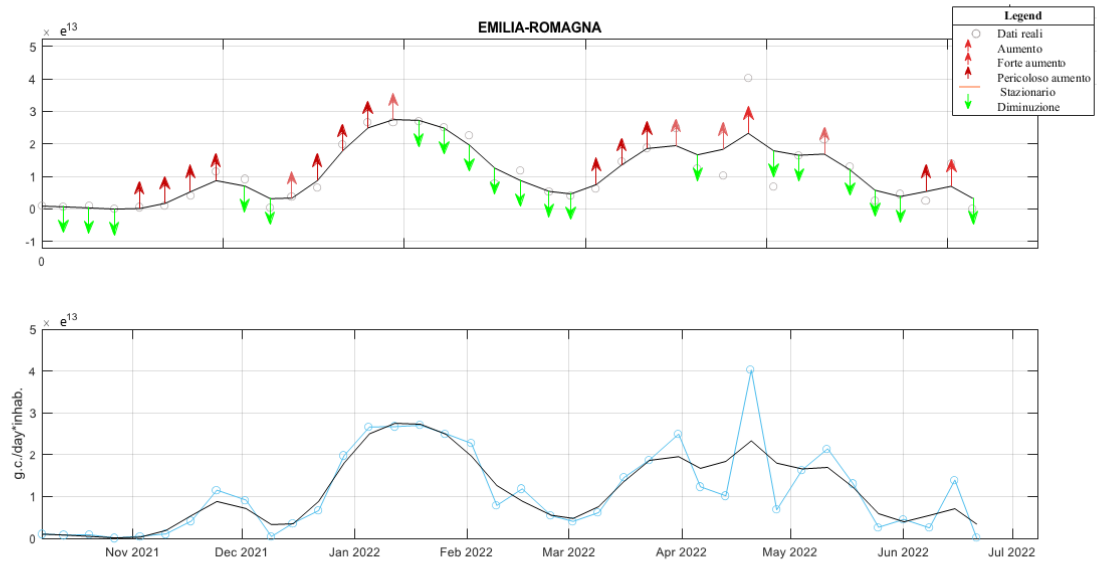
CALABRIA



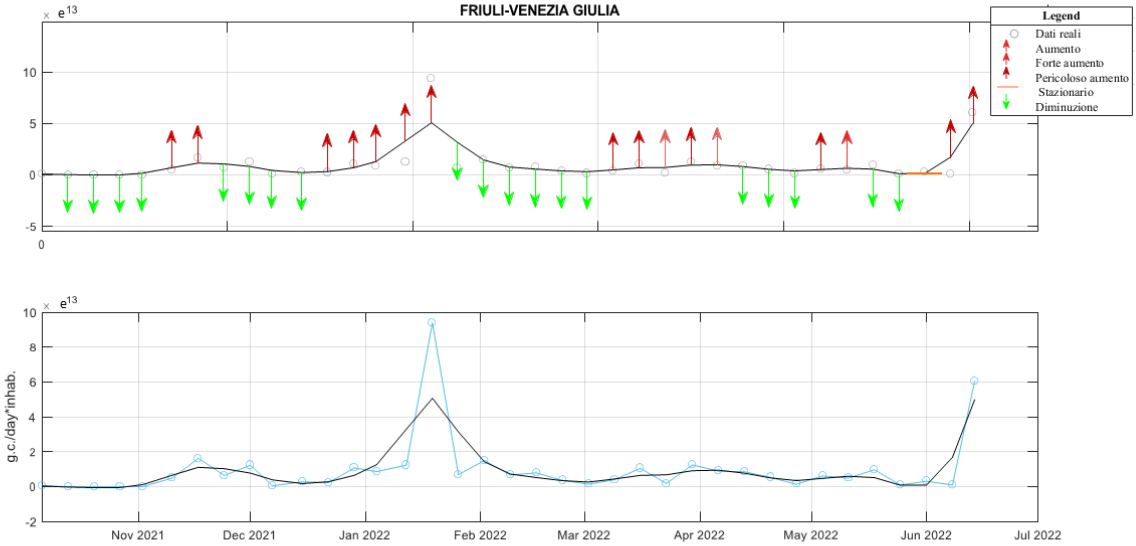
CAMPANIA



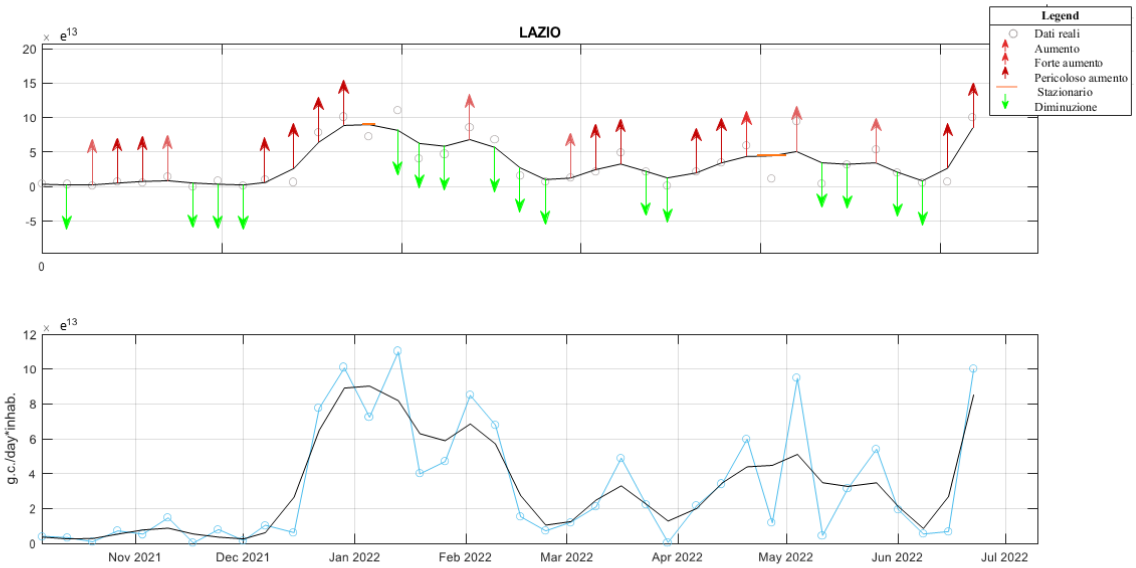
EMILIA-ROMAGNA



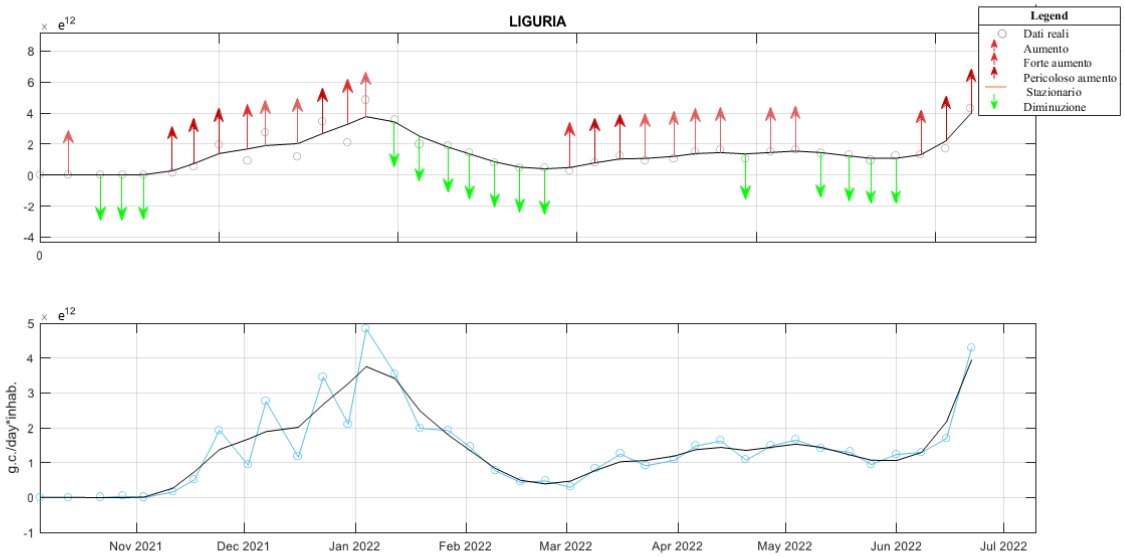
FRIULI-VENEZIA GIULIA



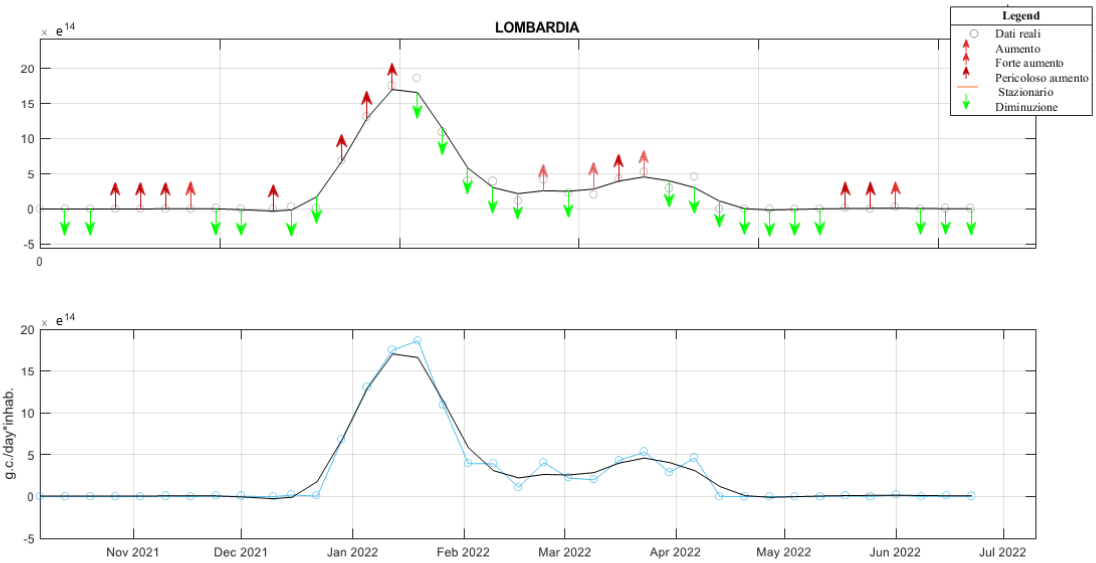
LAZIO



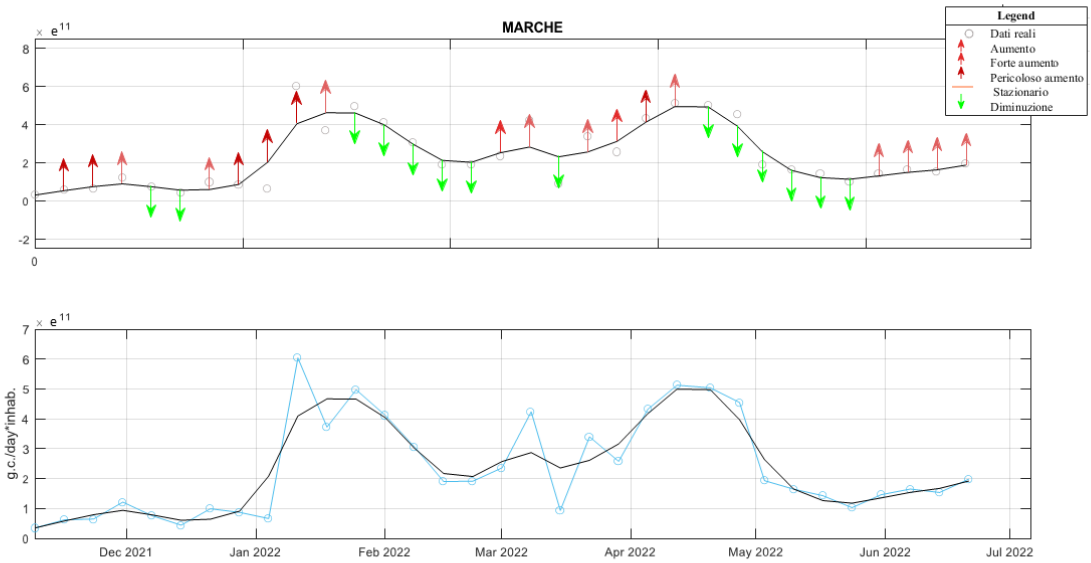
LIGURIA



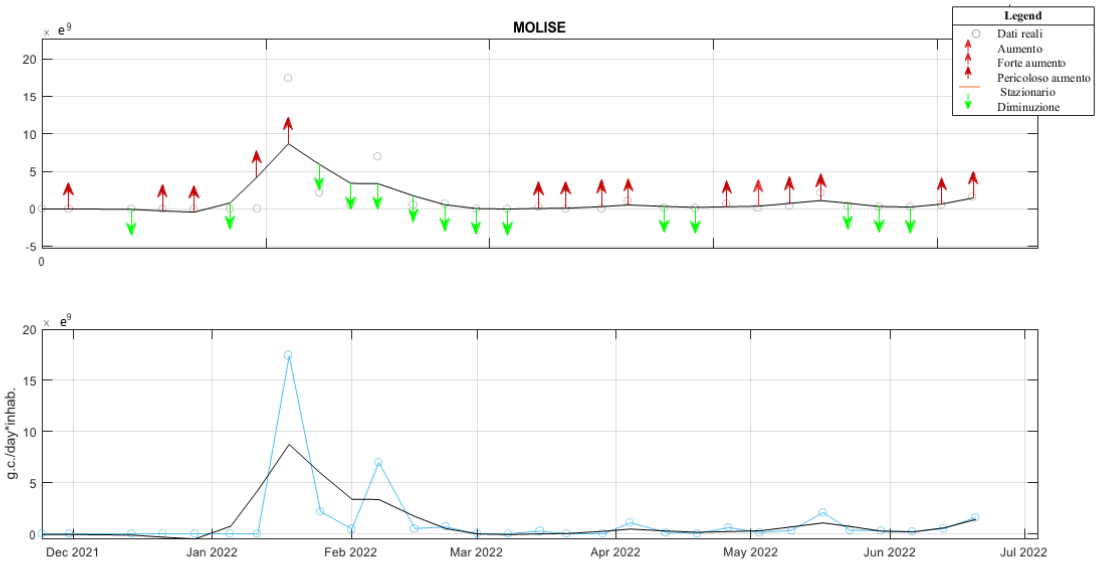
LOMBARDIA



MARCHE


MARCHE
x e11
Legend
Dati reali
Aumento
Forte aumento
Pericoloso aumento
Stazionario
Diminuzione
g.c./day*inhab.
Dec 2021
Jan 2022
Feb 2022
Mar 2022
Apr 2022
May 2022
Jun 2022
Jul 2022

MOLISE


MOLISE
x e9
Legend
Dati reali
Aumento
Forte aumento
Pericoloso aumento
Stazionario
Diminuzione
g.c./day*inhab.
Dec 2021
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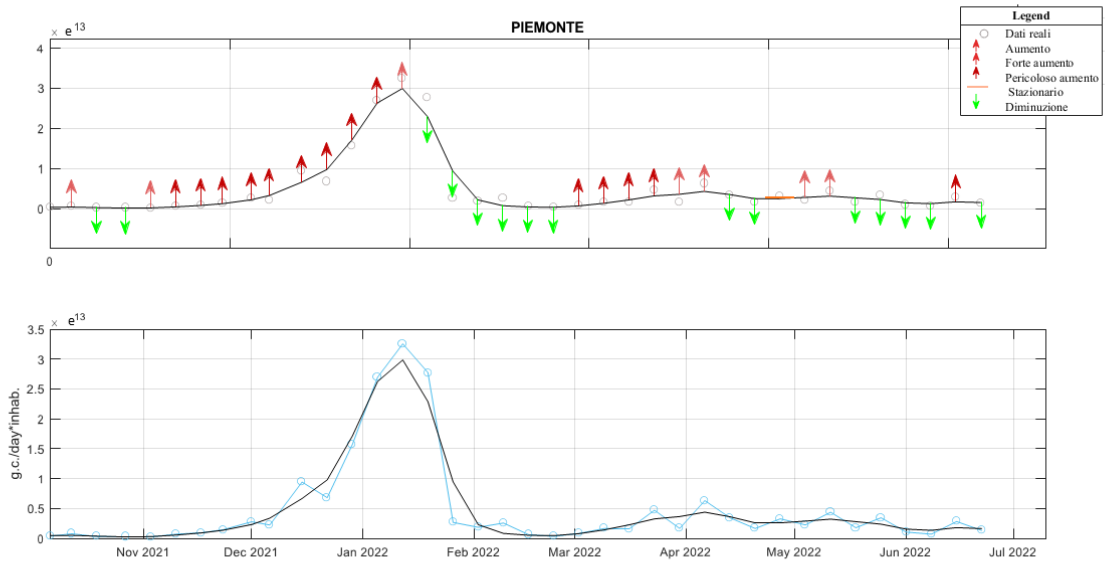
Jul 2022

PIEMONTE



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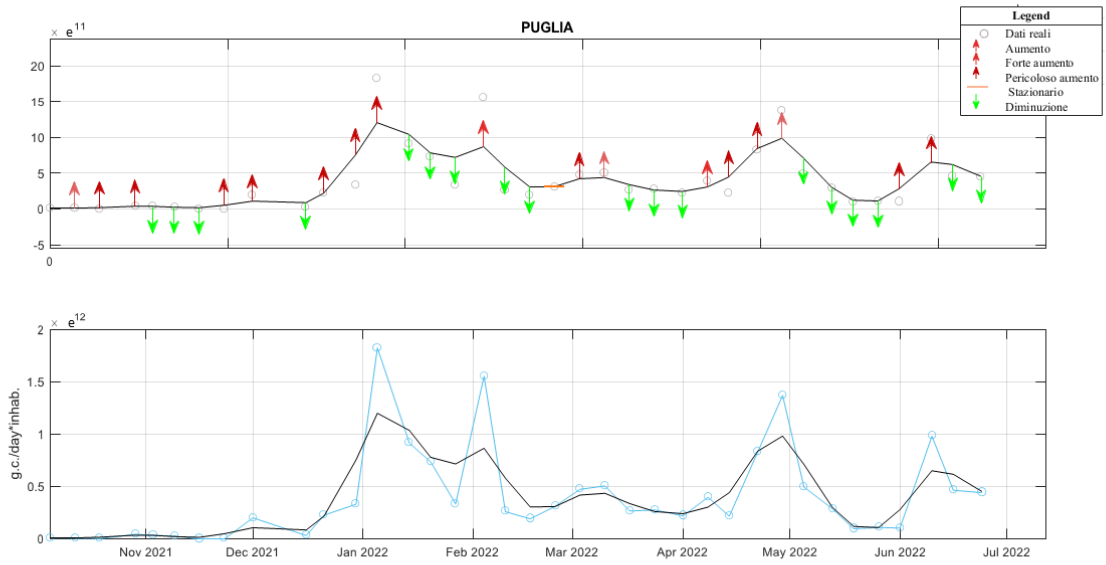
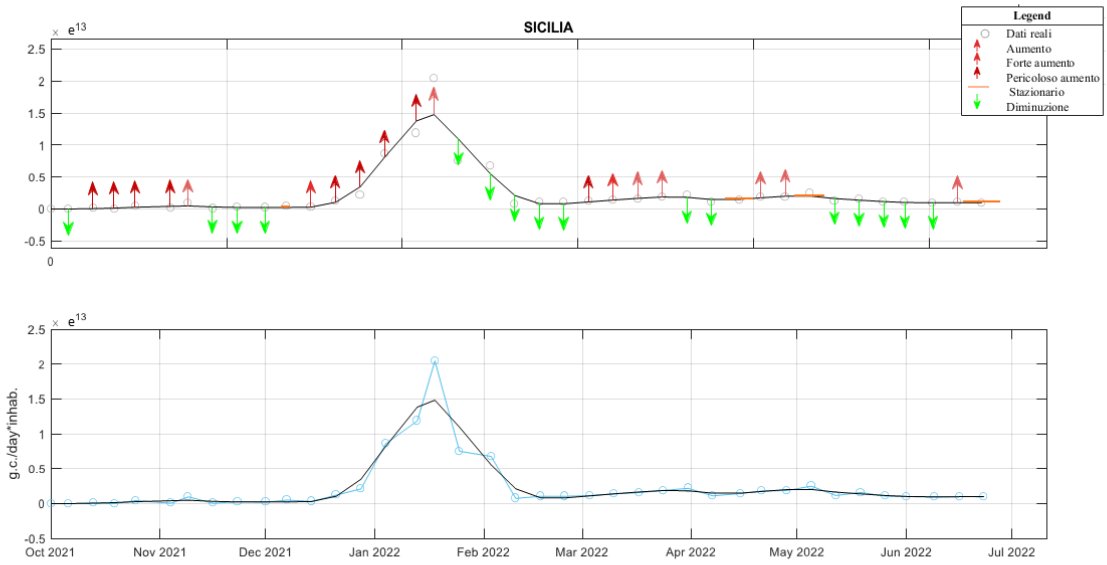
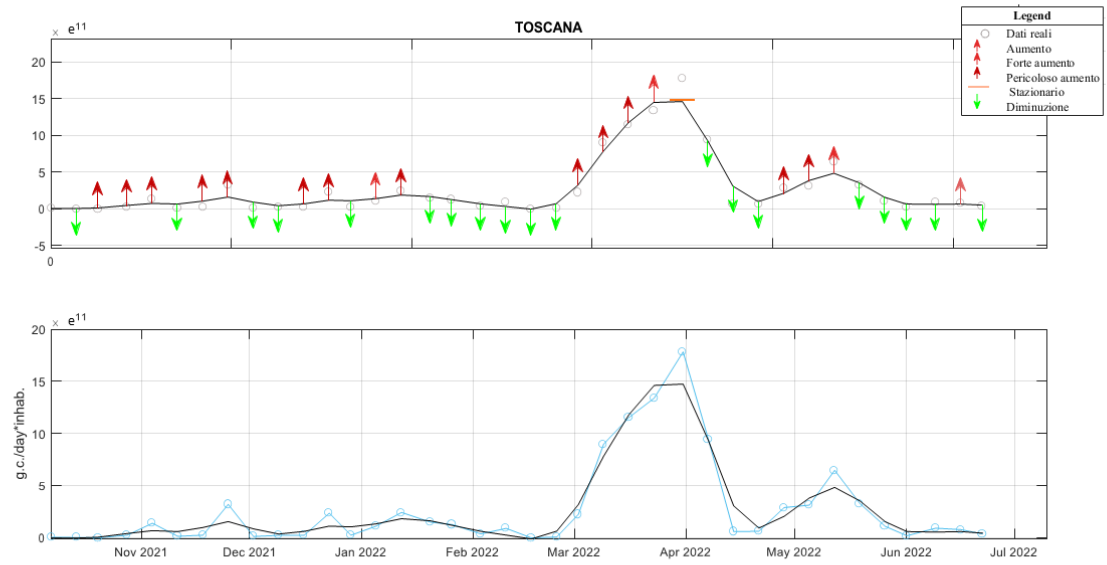


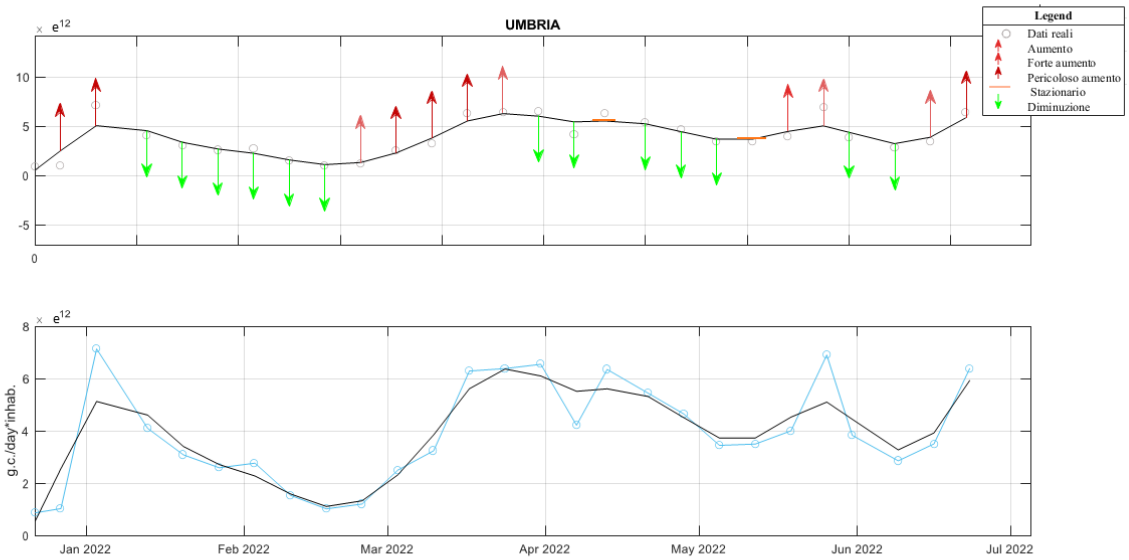
SICILIA



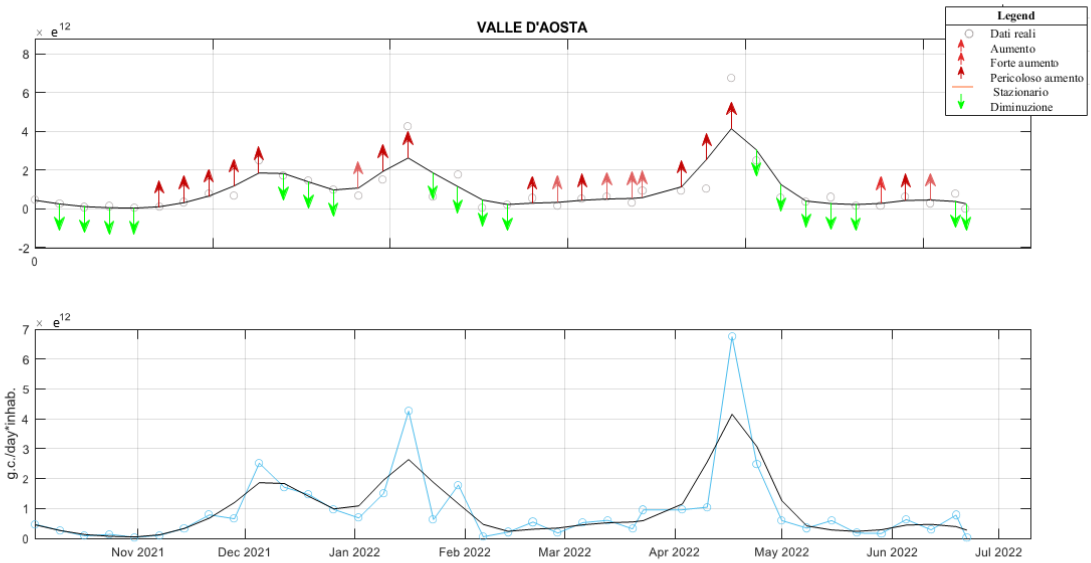
TOSCANA



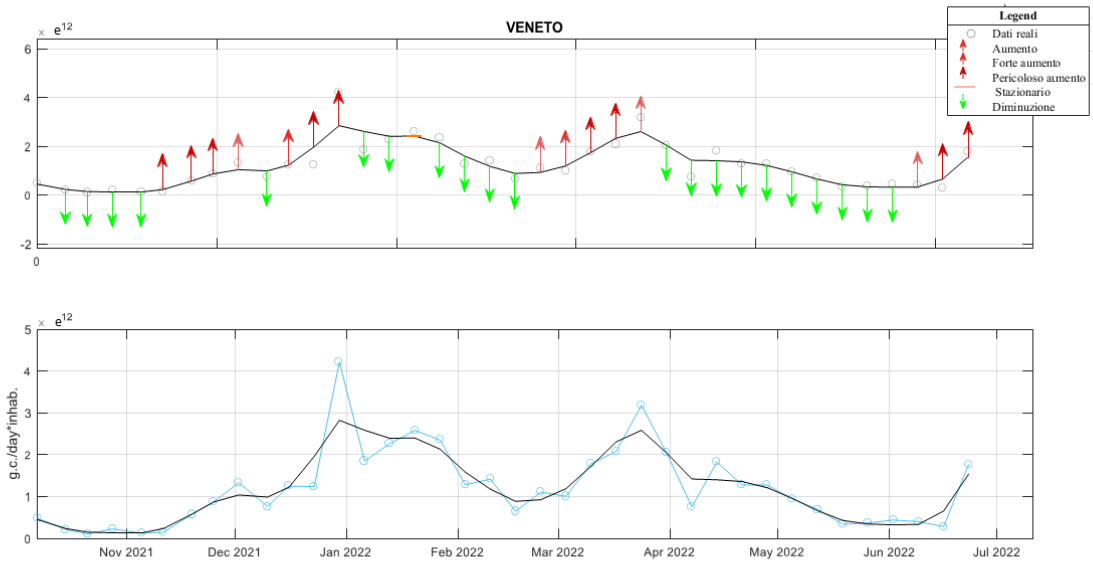
UMBRIA



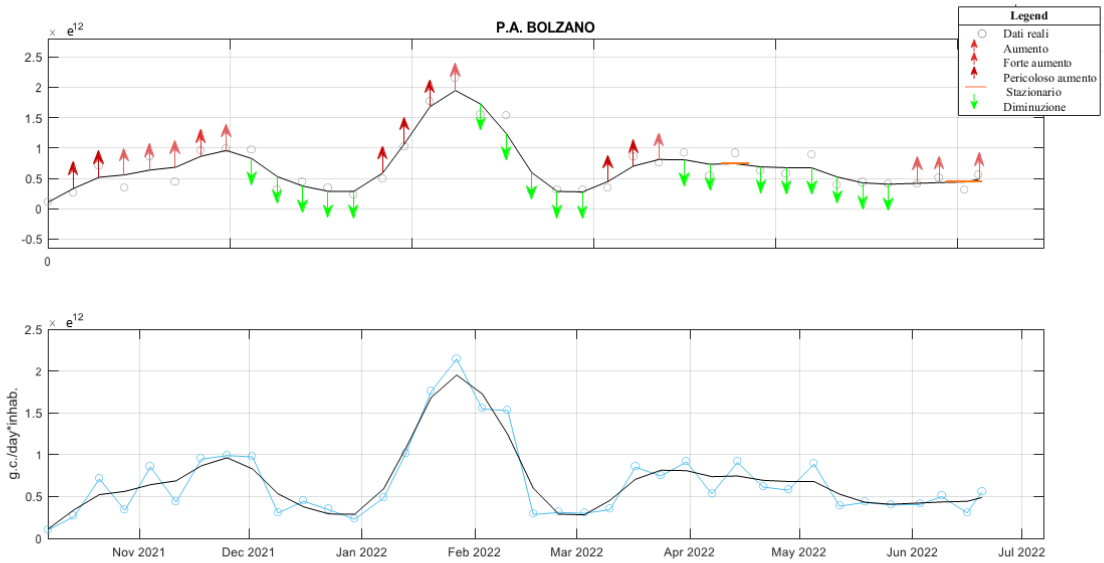
VALLE D'AOSTA



VENETO



P.A. BOLZANO



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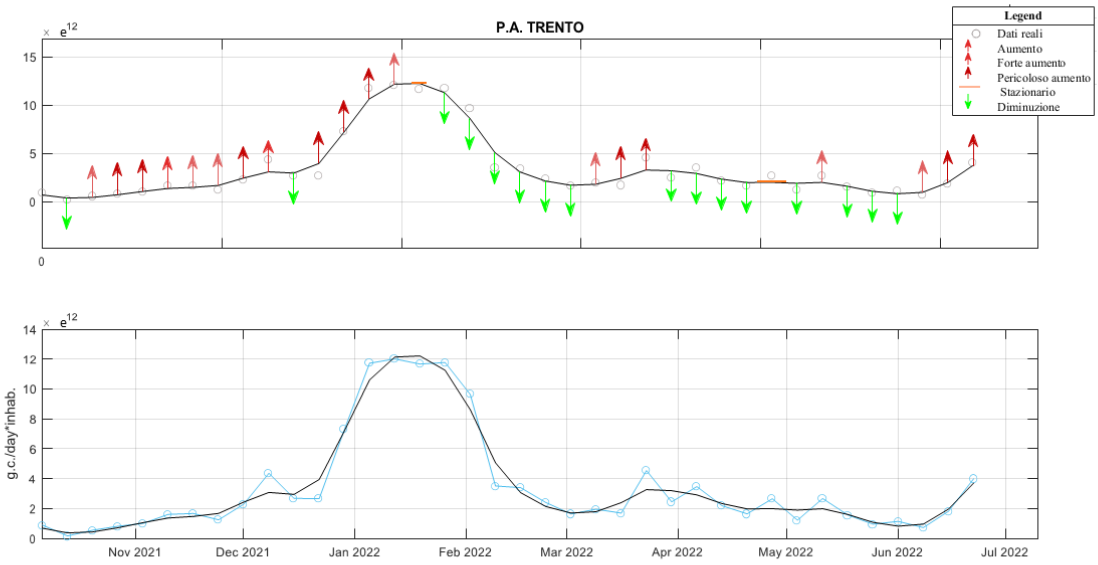

Acknowledgements

We wish to acknowledge the financial support on the Italian Government (Decree of the Ministry of Health 30.10.2021, GU Serie Generale n.294 del 11-12-2021), of Ministry of Health (program CCM 2020, project “Epidemiologia delle acque reflue: implementazione del sistema di sorveglianza per l'identificazione precoce di agenti patogeni, con particolare riferimento al SARS-CoV-2” [Wastewater based epidemiology: implementation of a surveillance system for the early detection of pathogens, and specifically SARS-CoV-2]) and of EU Commission (Gran Agreement 060701/2021/864481/SUB/ENV.C2).
We wish to thank Dr. Bernd Manfred Gawlik, European Commission's Joint Research Centre, for his coordination on building the EU Sewage Sentinel System for SARS-CoV-2 and its variants.
We also thank Lidia Orlandi, Claudia Del Giudice, Simona Di Pasquale (ISS) for technical and logistical support and Dr. Giuseppe Bortone Director of the Arpae, Emilia-Romagna for the support to the SARS-CoV-2 environmental surveillance in Italy.

We thank all of the members of the SARI network (“Sorveglianza Ambientale di SARS-CoV-2 attraverso i Reflui urbani in Italia”) for the cooperation in sample collection and processing, data gathering and management, organization and logistic support. The SARI network includes:

- **Abruzzo:** Giuseppe Bucciarelli, Paolo Torlontano (Regione Abruzzo); Giuseppe Aprea, Silvia Scattolini, Daniela D’Angelantonio, Giacomo Migliorati (Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale");
- **Basilicata:** Michele La Bianca (Regione Basilicata); Rosa Anna Cifarelli, Achille Palma, Giovanna La Vecchia e Giuseppe Lauria (Agenzia Regionale per la Protezione dell'Ambiente Basilicata – ARPAB); Rosanna Brienza e Patrizia Montenegro (Acquedotto Lucano-AQL);
- **Calabria:** Eduardo Malacaria (Regione Calabria), Giuseppe Folino (Arpacal); Michelangelo Iannone,Filomena Casaburi,Bulotta Giorgia, Barillari Emanuela, Dragone Emanuela, Iolanda Sacco, Carmine Tomaino, Cristina Felicetta, Adelaide Calabria,Ottavia Varcasia, Francesca Stefanizzi, Concetta Vizza
- **Campania:** Angelo D’Argenzio (Regione Campania); Luigi Cossentino, Renato Olivares (Arpac - Agenzia Regionale per la Protezione Ambientale in Campania); Antonio Pizzolante, Giovanna

Fusco (Istituto Zooprofilattico Sperimentale del Mezzogiorno); Alessandra Tosco, Amalia Porta (Università degli Studi di Salerno); Francesca Pennino, Triassi Maria (Università degli Studi di Napoli "Federico II");

- **Emilia Romagna:** Paola Angelini, Lisa Gentili (Regione Emilia – Romagna); Laura De Lellis, Daniele Nasci (HERATech); Giovanni Alborali; Nicoletta Formenti, Flavia Guarneri (Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia-Romagna); Nadia Fontani, Giulia Nani, Franca Palumbo, Gianluca Borlone, Marco Guercio (IREN);
- **Friuli Venezia Giulia:** Marika Mariuz, Gabriella Trani (Direzione Centrale Salute FVG); Anna Pariani (LABORATORIO HERAtech di Sasso Marconi –BO);
- **Lazio:** Carla Ancona (DEPLAZIO - Dipartimento di Epidemiologia del Servizio Sanitario Regionale - Regione Lazio); Alessandra Barca, Flavia Serio (Regione Lazio); Doriana Antonella Giorgi, Irene Ferrante, Monica Monfrinotti, Silvia Riosa, Valeria Capparuccini (ARPA Lazio - Agenzia Regionale per la Protezione Ambientale del Lazio); Maria Teresa Scicluna, Antonella Cersini (IZSLT - Istituto Zooprofilattico Sperimentale del Lazio e della Toscana); Mariaconcetta Arizzi, Giancarlo Cecchini, Claudio Ottaviano (Acea Elabori);
- **Liguria:** Elena Nicosia (Regione Liguria settore tutela della salute negli ambienti di vita e di lavoro); Nadia Fontani, Giulia Nani, Franca Palumbo, Gianluca Borlone, Marco Guercio (Iren); Elena Grasselli; Giorgia Allaria, Lorenzo Dondero, Francesca Rispo (UNIGE - DISTAV); Alberto Izzotti (UNIGE – DIMES); Rosa Maria Bertolotto, Elena Nicosia, Stefano Rosatto, Marta Bellisomi, Irene Tomesani (ARPAL); Micaela Tiso (MICAMO srl);
- **Lombardia:** Emanuela Ammoni, Danilo Cereda (Regione Lombardia); Marina Nadia Losio, Barbara Bertasi (IZSLER - Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia); Desdemona Oliva, Maria Giovanna Guiso, Fabio Ferrari, Maria Mundo ed Antonino Martines (CAP Holding); Sara Castiglioni, Silvia Schiarea, Giulia Salmoiraghi (Istituto Mario Negri IRCCS); Manuela Antonelli, Arianna Azzellino, Francesca Malpei, Andrea Turolla (POLIMI); Sandro Binda, Pellegrinelli Laura, Valeria Primache (Università degli Studi di Milano, Dipartimento di Scienze Biomediche per la Salute), Clementina Cocuzza, Andrea Franzetti, Rosario Musumeci e Marianna Martinelli (Università di Milano-Bicocca); Giorgio Bertanza (Università di Brescia), Maria Luisa Callegari (Università Cattolica del Sacro Cuore);
- **Marche:** Luigi Bolognini, Fabio Filippetti (Regione Marche); Marta Paniccia', Francesca Ciuti, Sara Briscolini (IZSUM - Istituto Zooprofilattico Sperimentale Umbria Marche); Silvia Magi (ARPAM);
- **Molise:** Michele Colitti (Regione Molise); Carmen Montanaro (ASReM); Giuseppe Aprea, Silvia Scattolini, Daniela D'Angelantonio, Giacomo Migliorati (Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale"); Maria Grazia Cerroni (Arpa Molise);
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- **Sicilia:** Mario Palermo (Regione Sicilia); Carmelo Massimo Maida, Walter Mazzucco (Università degli Studi di Palermo-Dipartimento PROMISE - sezione di Igiene); Simona De Grazia, Giovanni Giammanco (Centro di Riferimento Regionale per la Sorveglianza delle Paralisi Flaccide Acute (PFA) e ambientale della circolazione di poliovirus in Sicilia - AOUP Palermo); Giuseppa Purpari (IZS - Istituto Zooprofilattico Sperimentale della Sicilia); Margherita Ferrante; Antonella Agodi, Martina Barchitta (Università degli Studi di Catania - Dipartimento "G. F. Ingrassia");

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- **Valle D'Aosta:** Mauro Ruffier (Regione Valle d'Aosta); Francesca Borney, Eric Grange, Florida Damasco (Laboratorio chimico biologico microbiologico Arpa Valle d'Aosta);
- **Veneto:** Francesca Russo, Gisella Pitter, Vanessa Groppi (Regione Veneto); Franco Rigoli, Marco Zampini (ARPAV - Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto); Tatjana Baldovin, Irene Amoruso (Università di Padova);
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