

Supplementary material

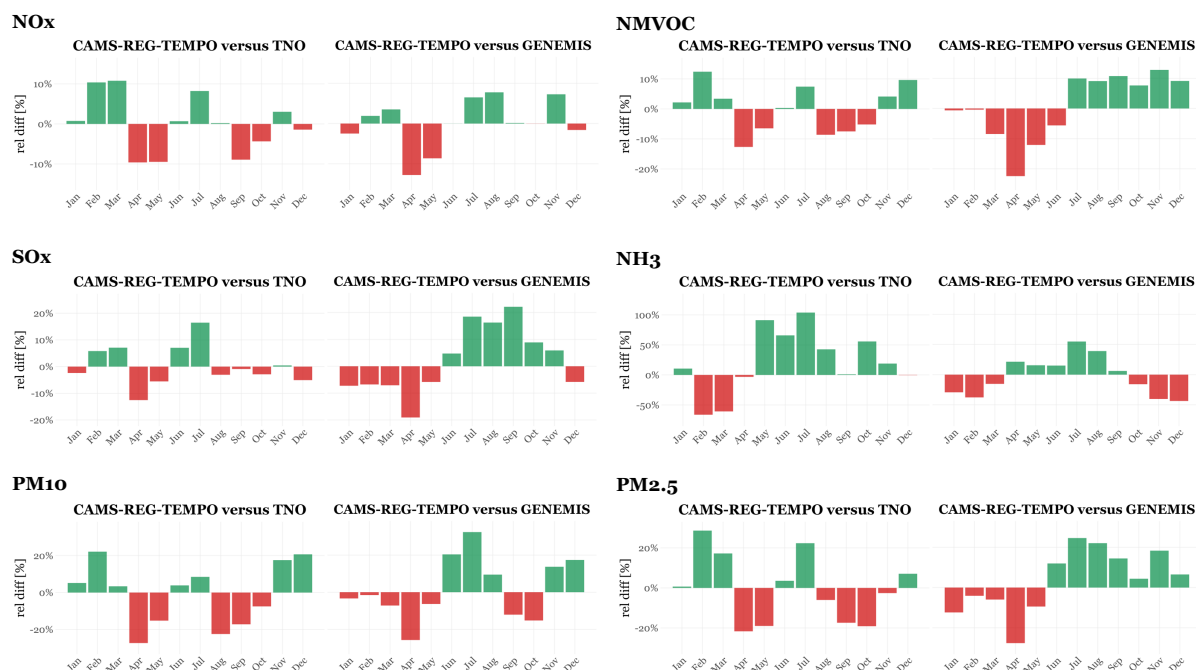


Figure S1: Relative differences [%] of total emissions obtained per month-of-the-year and pollutant (i.e., NO_x, NMVOC, SO_x, NH₃, PM₁₀, PM_{2.5}) at the EU27 plus UK and Norway when comparing the temporal distribution reported by CAMS-REG-TEMPO against the TNO and GENEMIS profiles, respectively. Positive values (highlighted in green) indicate that more emissions are allocated to that month when using CAMS-REG-TEMPO, while negative values (highlighted in red) indicate the opposite.

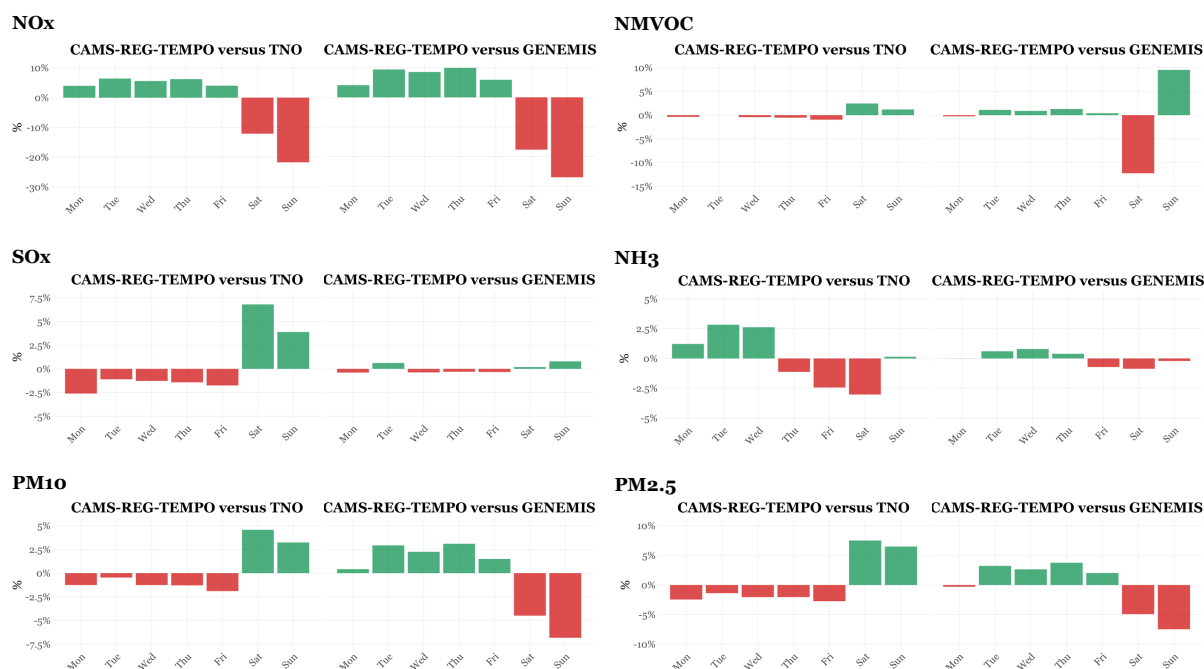


Figure S2: Relative differences [%] of total emissions obtained per day-of-the-week and pollutant (i.e., NO_x, NMVOC, SO_x, NH₃, PM₁₀, PM_{2.5}) at the EU27 plus UK and Norway when comparing the temporal distribution reported by CAMS-REG-TEMPO against the TNO and GENEMIS profiles, respectively. Positive values (highlighted in green) indicate that more emissions are allocated to that day when using CAMS-REG-TEMPO, while negative values (highlighted in red) indicate the opposite.

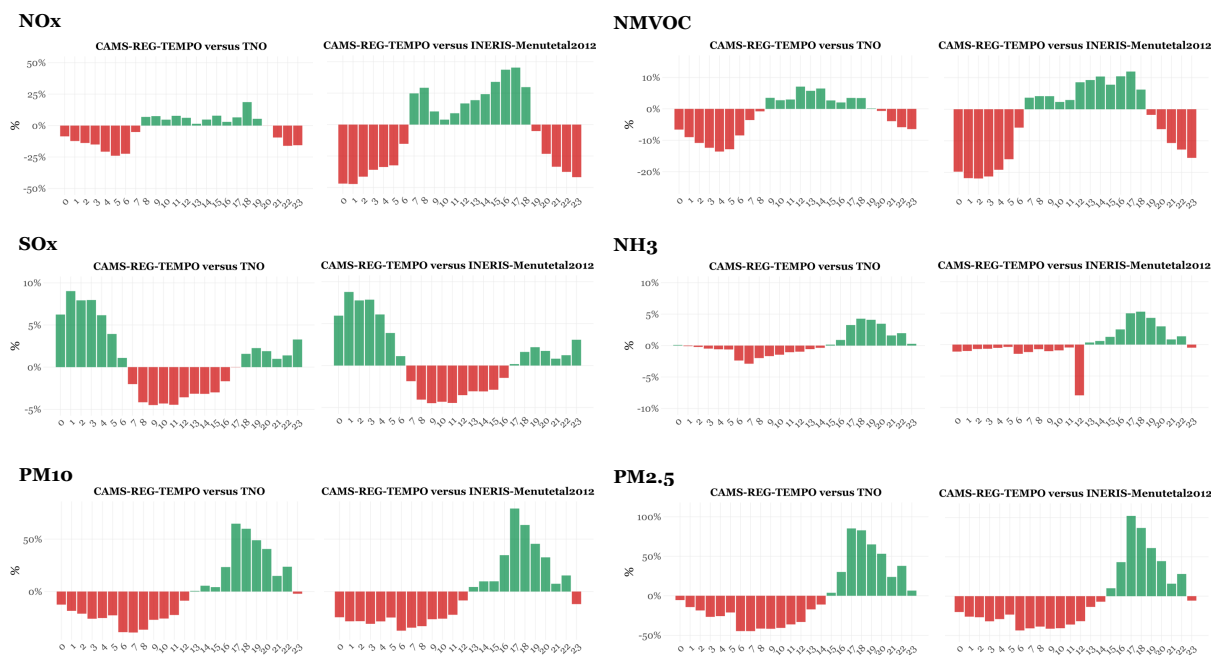


Figure S3: Relative differences [%] of total emissions obtained per hour-of-the-day and pollutant (i.e., NO_x, NMVOC, SO_x, NH₃, PM₁₀, PM_{2.5}) at the EU27 plus UK and Norway when comparing the temporal distribution reported by CAMS-REG-TEMPO against the TNO and GENEMIS profiles, respectively. Positive values (highlighted in green) indicate that more emissions are allocated to that hour when using CAMS-REG-TEMPO, while negative values (highlighted in red) indicate the opposite.

CHIMERE									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	0.02	0.02	0.02	0.01	0.03	-0.03	0.01	0.09	0.00
NO ₂	0.19	0.06	0.07	0.24	0.44	1.00	0.76	0.17	0.10
PM ₁₀	-0.01	-0.02	0.06	0.17	-0.03	0.03	0.17	-0.02	-0.08
PM _{2.5}	-0.08	-0.02	0.01	0.09	-0.08	-0.09	0.10	0.02	-0.09

EMEP									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	0.00	0.00	0.00	0.01	0.06	0.08	0.03	0.05	0.00
NO ₂	0.04	-0.01	0.00	0.04	0.42	0.73	0.48	0.15	0.00
PM ₁₀	0.01	0.00	0.03	0.15	0.07	-0.03	0.05	0.02	-0.03
PM _{2.5}	0.00	0.01	0.03	0.18	0.04	-0.07	0.01	0.02	-0.04

GEMAQ									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	-0.04	-0.01	-0.01	-0.02	0.03	-0.06	-0.01	0.00	-0.01
NO ₂	-0.06	-0.18	-0.15	0.00	0.12	0.14	0.09	0.04	0.01
PM ₁₀	0.02	-0.06	0.02	0.29	0.06	-0.01	0.07	0.03	0.03
PM _{2.5}	0.49	0.01	0.11	0.51	0.05	-0.05	0.04	0.03	0.05

MATCH									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	-0.01	-0.01	0.01	0.00	0.02	-0.06	-0.02	0.01	0.00
NO ₂	-0.1	-0.18	-0.14	-0.11	-0.09	0.19	0.49	-0.08	0.01
PM ₁₀	-	-	-	-	-	-	-	-	-
PM _{2.5}	-	-	-	-	-	-	-	-	-

MOGACE									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	0.00	0.00	0.00	0.00	0.02	-0.08	-0.01	0.01	0.00
NO ₂	0.06	0.01	0.01	0.06	0.16	0.22	0.16	0.06	-0.01
PM ₁₀	0.02	-0.20	-0.07	0.16	0.00	0.00	0.02	0.02	0.05
PM _{2.5}	-0.04	-0.36	-0.13	0.13	-0.02	-0.05	-0.01	0.01	0.08

SILAM									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	-0.02	0.00	0.00	-0.01	0.02	-0.02	0.00	0.03	0.00
NO ₂	0.04	-0.06	-0.05	0.05	0.15	0.10	0.07	0.06	0.00
PM ₁₀	0.00	-0.10	0.02	0.09	0.01	0.01	0.03	0.01	0.01
PM _{2.5}	-0.03	-0.06	-0.08	0.10	0.00	0.02	0.02	0.01	0.02

DEHM									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	-	-	-	-	-	-	-	-	-
NO ₂	-	-	-	-	-	-	-	-	-
PM ₁₀	0.07	-0.04	-0.02	0.16	0.04	-0.01	0.09	0.02	0.06
PM _{2.5}	0.08	-0.03	-0.05	0.16	0.06	-0.13	0.02	0.00	0.05

EURAD-IM									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	-0.03	-0.01	-0.01	-0.04	0.03	-0.08	-0.03	0.03	0.00
NO ₂	0.01	-0.09	-0.08	0.01	0.14	0.07	0.07	0.04	0.02
PM ₁₀	0.02	0.02	0.02	0.07	0.02	-0.01	0.02	0.00	0.07
PM _{2.5}	-0.01	-0.04	0.01	0.09	0.03	-0.05	0.02	0.03	0.10

LOTOS-EUROS									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	-0.01	-0.02	-0.01	-0.01	0.02	-0.06	-0.02	0.01	0.00
NO ₂	-0.03	-0.12	-0.09	-0.02	0.04	0.01	0.01	0.02	0.04
PM ₁₀	0.05	0.00	0.01	0.18	0.00	-0.06	-0.01	0.01	-0.01
PM _{2.5}	-0.02	-0.01	-0.03	0.15	0.01	-0.03	0.00	0.04	0.00

MINNI									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	0.01	0.00	0.00	0.02	0.03	-0.10	-0.02	0.02	0.00
NO ₂	0.17	0.10	0.06	0.21	0.16	0.22	0.16	0.06	0.02
PM ₁₀	0.05	0.02	0.02	0.16	0.05	-0.04	0.01	-0.01	0.04
PM _{2.5}	-0.01	0.02	0.01	0.13	0.05	-0.07	0.01	0.02	0.07

MONARCH									
pollutant	diurnal				weekly				monthly
	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	
O ₃	0.00	0.00	0.00	0.00	0.02	-0.13	-0.04	0.05	0.00
NO ₂	0.06	0.02	0.01	0.07	0.10	0.08	0.08	0.08	0.01
PM ₁₀	0.06	-0.10	0.01	0.07	0.03	-0.01	0.01	0.01	0.06
PM _{2.5}	0.06	-0.14	0.00	0.10	0.02	-0.03	0.00	0.04	0.03

Figure S4: Summary of the correlation differences (expB – expA) per individual CAMS regional model, species (O₃, NO₂, PM₁₀, PM_{2.5}), season (JFM, AMJ, JAS, OND) and cycle (diurnal, weekly, monthly). Boxes highlighted in green/red/grey indicate an improvement/degradation/no significant changes (between -0.01 and 0.01) in the correlation when using CAMS-REG-TEMPO.

Table S1: List of traffic count datasets and corresponding sources of information compiled to compute monthly temporal profiles for road transport emissions in rural areas

Country	Description	Source of Information
Austria	Monthly traffic counts registered at 275 automatic traffic stations for the year 2019	ASFiNAG (2021)
Bulgaria	Hourly traffic counts registered at 65 automatic traffic stations for the year 2017	RIA (2021)
Finland	Hourly traffic counts registered at 500 automatic traffic stations for the year 2019	FTIA (2021)
Ireland	Hourly traffic counts registered at 445 automatic traffic stations for the year 2019	TII (2021)
Italy	Monthly traffic counts registered at 800 automatic traffic stations for the year 2019	ANAS (2021)
Luxembourg	Monthly traffic counts registered at 25 automatic traffic stations for the year 2019	MMTP (2021)
Norway	Hourly traffic counts registered at 720 automatic traffic stations for the year 2019	NPRA (2021)
Poland	Monthly traffic counts registered at 13 automatic traffic stations for the year 2019	GDDKiA (2021)
Portugal	Monthly traffic counts registered at 600 automatic traffic stations for the year 2019	IMT (2021)
Slovakia	Hourly traffic counts registered at the R1 motorway in 2016	MTCSR (2018)
UK	Average daily traffic flows by month, day and hour in the UK road network (2012-2016 average)	GovUK (2018)
Germany	Hourly traffic counts registered at the highways and federal highways stations for the year 2016	BASSt (2018)
Spain	Monthly traffic counts registered at the national transport network for the year 2018	MITMA (2021)

References

ANAS: National Autonomous Roads Corporation. Traffic observatory archive. Available at: <https://www.stradeanas.it/it/le-strade/osservatorio-del-traffico/archivio-osservatorio-del-traffico> , (last accessed, May 2021) 2021.

ASFiNAG: Autobahn and highway financing stock corporation. Statistics of permanent counting stations. Available at: <https://www.asfinag.at/verkehr/verkehrszaehlung/> (last accessed, May 2021), 2021.

BASSt, 2018. Federal Highway Research Institute. Automatic counting stations on highways and federal highways. Available at: https://www.bast.de/BASSt_2017/DE/Verkehrstechnik/Fachthemen/v2-verkehrszaehlung/zaehl_node.html (last accessed April 2018)

FTIA: Finnish Transport Agency. Traffic monitoring system data. Available at: <https://vayla.fi/en/transport-network/data/open-data/road-network/tms-data> (last accessed, May 2021).

GDDKiA, 2021. Continuous Traffic Measurement Stations. Available at: <https://www.gddkia.gov.pl/pl/2876/Stacje-Ciaglych-Pomiarow-Ruchu> (last accessed, June 2021).

GovUK, 2018. Road traffic statistics information. Available at: <https://www.gov.uk/government/collections/road-traffic-statistics> (last accessed March 2018)

IMT Institute of Mobility and Transport. Traffic reports. Available at: <http://www.imt-ip.pt/sites/IMTT/Portugues/InfraestruturasRodoviaras/RedeRodoviaria/Paginas/Relatorios.aspx> last accessed: May 2021), 2021.

MMTP: Bridges and Roads Administration. Traffic counting. Available at: <https://travaux.public.lu/fr/infos-traffic/comptage.html> (last accessed, May 2021).

MTCSR, 2018. Data from automatic traffic counting. Available at: <https://data.gov.sk/dataset/data-z-automatickeho-scitania-dopravy/resource/bf5f4136-8117-4255-a652-e114f8328666> (last accessed, June 2021).

NPRA: Norwegian Public Roads Administration's traffic data. Available at: <https://www.vegvesen.no/trafikkdata/start/om-trafikkdata> (last accessed, May 2021), 2021.

RIA, Road Infrastructure Agency, 2021. Data on traffic from automatic counting points in 2017. Available at: <https://data.egov.bg/data/view/12e8600e-1b25-4df6-bba9-1aac2e8f5edf?rpage=26> (last accessed, June 2021)

TfNSW, 2019. Transport for New South Wales Open Data. NSW Roads Traffic Volume Counts. Available at: <https://opendata.transport.nsw.gov.au/dataset/nsw-roads-traffic-volume-counts-api> (last accessed January 2019)

TII: Transport Infrastructure Ireland. Open Data Portal. Available at: <https://data.tii.ie/> (last accessed, May 2021), 2021.