

Improving the Representation of NMVOC Emissions for Air Quality Modelling in Europe

K. Oliveira¹, M. Guevara¹, J. Kuenen², O. Jorba¹, C. Pérez García-Pando^{1,3}, H. Denier van der Gon²

¹ Barcelona Supercomputing Center, Plaça Eusebi Güell 1-3, Barcelona, 08034, Spain

² Department of Climate, Air and Sustainability, TNO, Princetonlaan 6, Utrecht, 3584 CB, The Netherlands

³ ICREA, Catalan Institution for Research and Advanced Studies, Barcelona, 08010, Spain



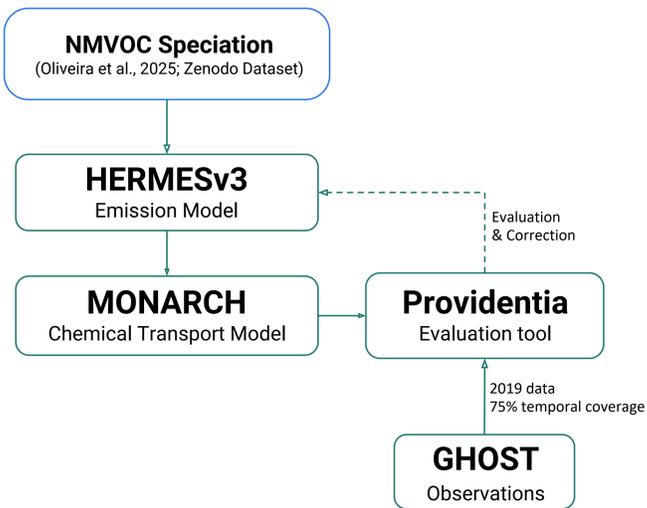
Motivation

- With the new AAQD emphasising modelling and introducing stricter limit values, there is a growing need to reduce NMVOC uncertainties and enhance model performance.
- Major speciated inventories still rely on 1980s/90s speciation data (e.g. Passant, 2002; Theloke & Friedrich, 2007).

Objective

- Assess the impact of revised NMVOC speciation on emissions of individual species and on the modelling of BTX concentrations across Europe.

Methodology



Conclusions

Changing the NMVOC chemical speciation:

- Significantly affects emissions and species' spatial distribution, with all species showing changes greater than $\pm 15\%$.
- Improves the modelling of benzene levels across Europe, mainly due to better characterisation of residential wood combustion emissions.
- Enhances the modelling of toluene and xylenes in urban areas, though some regions show degradation due to inappropriate spatial proxies for industrial solvents.

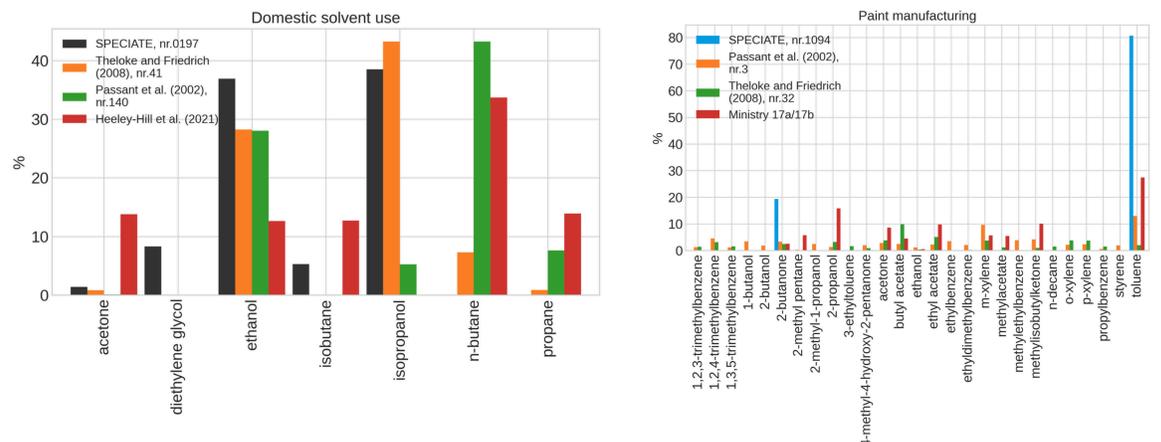
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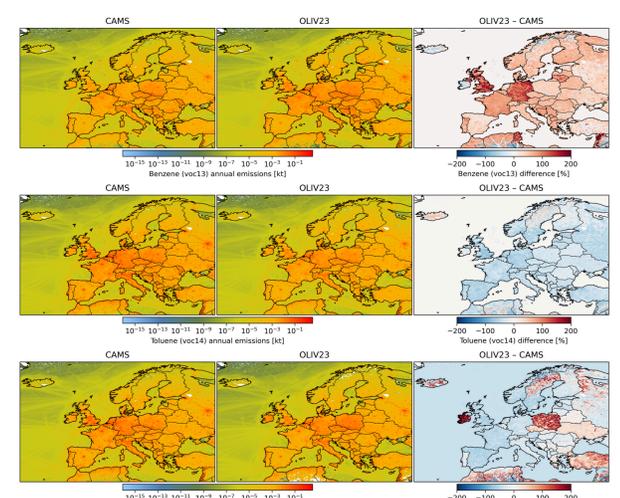
1 Compiled and compared speciation profiles available from multiple databases for 153 sectors



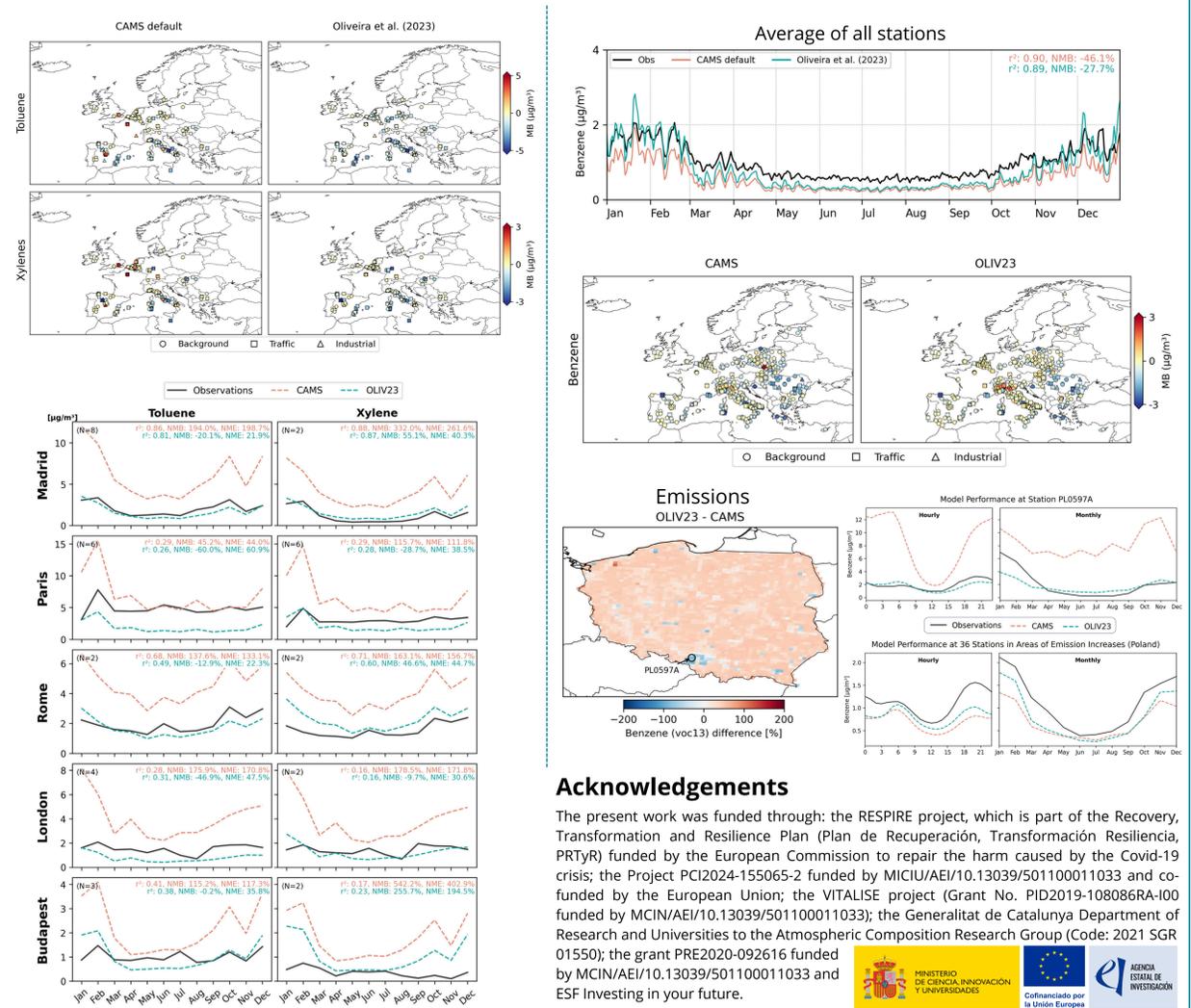
2 NMVOC speciated emissions comparison: CAMS default vs. OLIV23

Table 1. Comparison of the CAMS-REG total EU emissions for 2019 per GEIA species using CAMS and OLIV23 speciation.

GEIA ID	GEIA Group	EU emissions (kt)		Differences	
		CAMS	OLIV23	(kt)	(%)
voc01	Alkanols (alcohols)	1464	1739	274	19
voc02	Ethane	186	227	41	22
voc03	Propane	129	294	165	127
voc04	Butanes	259	423	164	63
voc05	Pentanes	302	257	-45	-15
voc06	Hexanes and higher alkanes	1121	726	-395	-35
voc07	Ethene (ethylene)	298	343	45	15
voc08	Propene	89	107	18	20
voc09	Ethyne (acetylene)	80	157	77	97
voc10	Isoprenes	0	10	10	-
voc11	Monoterpenes	1	83	82	1222
voc12	Other alk(adi)enes/alkynes (olefines)	145	181	35	24
voc13	Benzene	123	188	65	53
voc14	Methylbenzene (toluene)	336	145	-190	-57
voc15	Dimethylbenzenes (xylenes)	294	193	-100	-34
voc16	Trimethylbenzenes	22	4	-18	-83
voc17	Otheraromatics	145	349	204	141
voc18	Esters	408	289	-119	-29
voc19	Ethers (alkoxyalkanes)	346	12	-334	-97
voc20	Chlorinated hydrocarbons	232	125	-107	-46
voc21	Methanal (formaldehyde)	62	86	24	39
voc22	Other alkanals (aldehydes)	196	432	236	121
voc23	Alkanones (ketones)	389	319	-71	-18
voc24	Acids (alkanoic)	450	16	-435	-97
voc25	Other NMVOC	230	605	375	163



3 NMVOC speciation sensitivity analysis: Impact on modelled toluene, xylenes, and benzene



Acknowledgements

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