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URBAG Integrated System Analysis of Urban Vegetation and Agriculture
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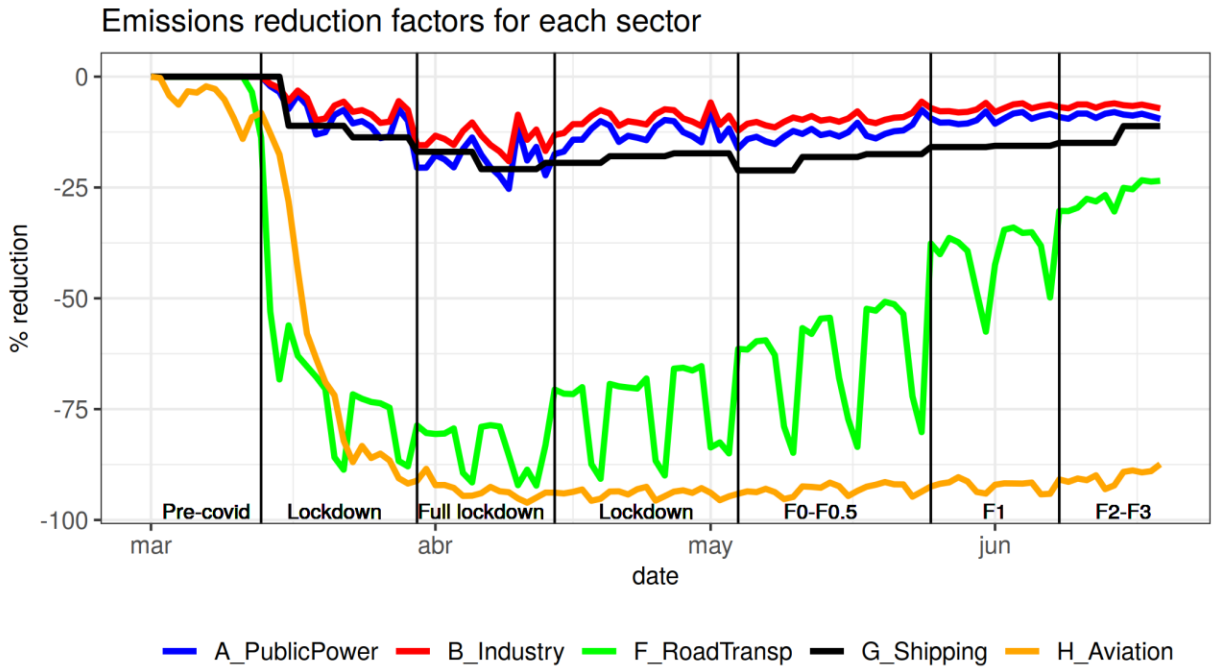
Supplementary:
Response of the ozone chemistry to changes in emissions over the Catalonia region

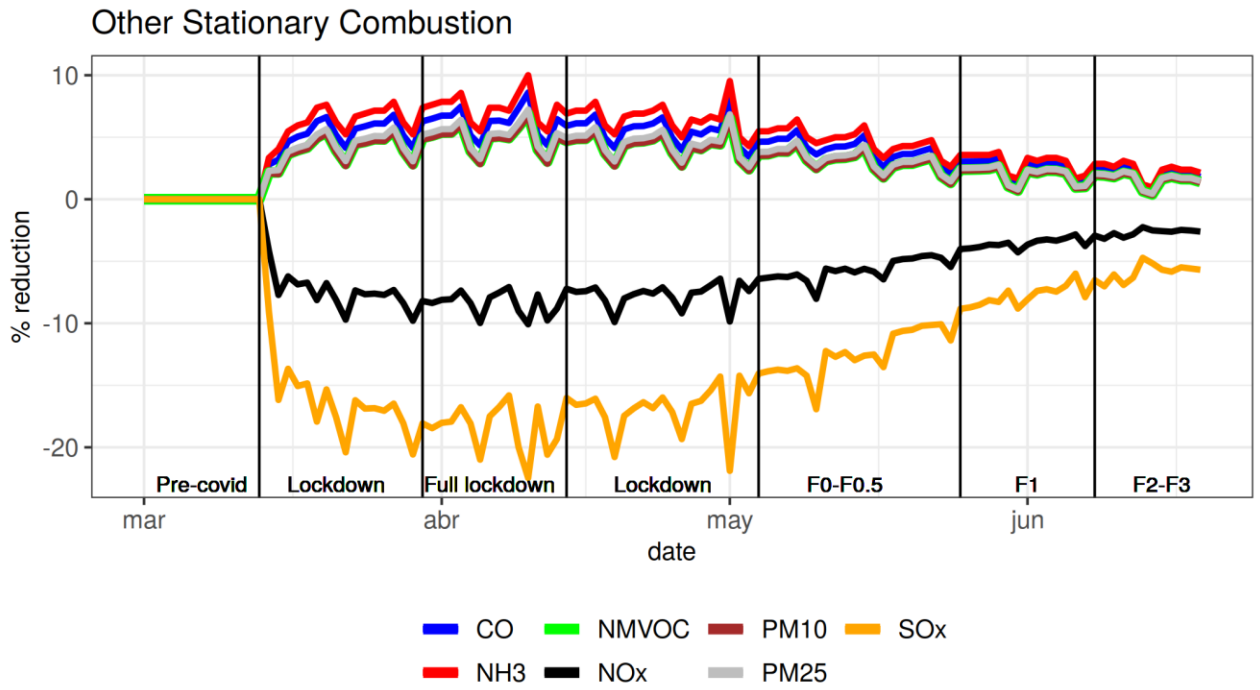
Alba Badia, Veronica Vida, Sergi Ventura, Roger Curcoll, Ricard Segura, and Gara Villalba

26th of April 2023, Vienna

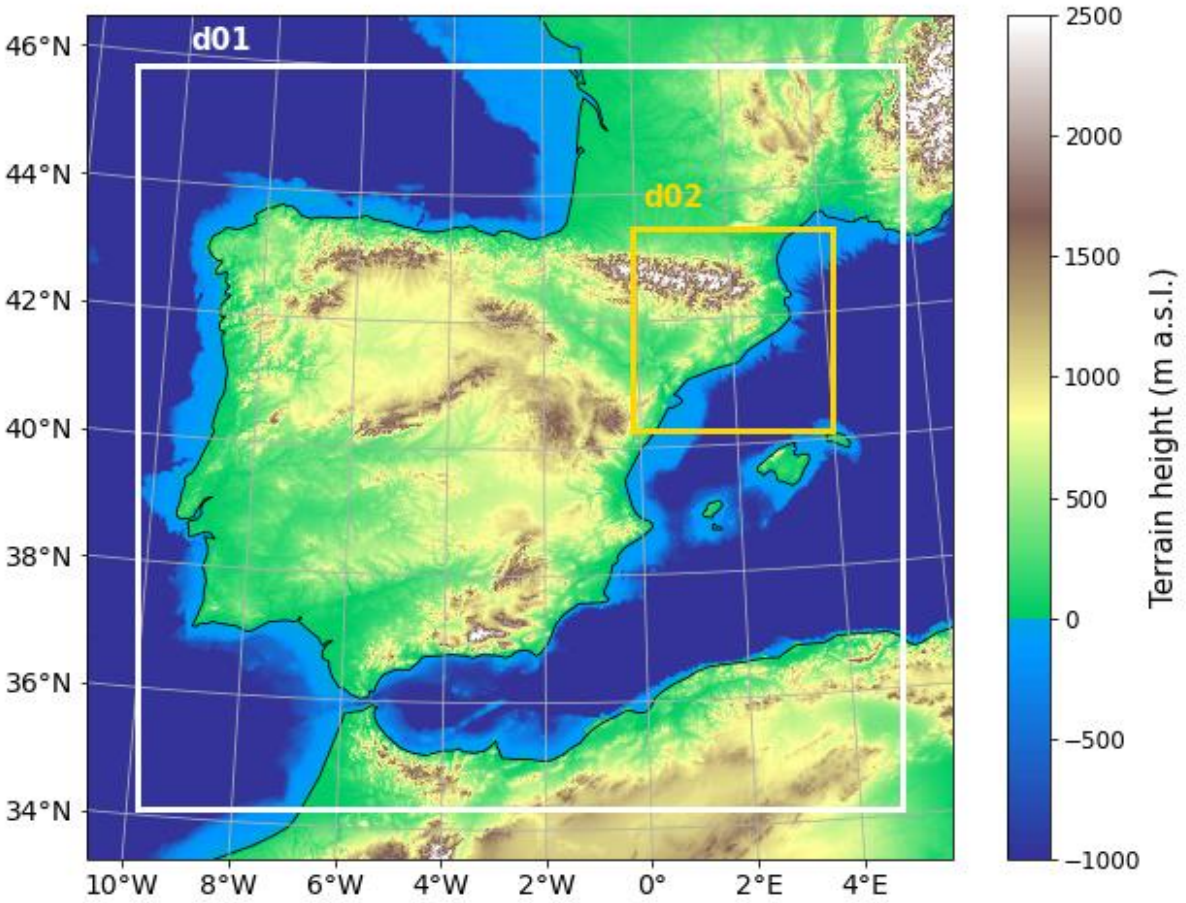
EGU General Assembly 2023

Emissions reduction factors used in the model simulations





Model domains



Model evaluation: meteorology

Table S3. Statistical evaluation of the model chemistry results, COVID simulation, over the Metropolitan Area of Barcelona (AMB) and Catalonia (CAT) for the 30 March - 12 April 2020 from observations in hourly basis. The number of stations are shown in parenthesis on the second column for AMB and CAT, respectively. The observation mean (OM), model mean (MM), mean bias (MB), normalised mean bias (NMB), root-mean-square error (RMSE), correlation (R) and the index of agreement (IOA) and are calculated between simulated and observed concentrations.

Variable	Type	OM		MM		MB		NMB [0,1]		RMSE		R[0,1]		IOA [0,1]	
		AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT
T (ºC)	urban (5/6)	12.94	12.88	13.36	13.20	0.42	0.31	0.04	0.03	1.35	1.37	0.93	0.94	0.94	0.95
	rural (2/19)	12.95	8.93	13.89	9.17	0.94	0.24	0.07	0.27	1.48	1.68	0.95	0.94	0.95	0.94
RH (%)	urban (5/6)	70.82	70.25	68.80	68.97	-2.02	-1.28	-0.03	-0.02	10.47	10.26	0.71	0.75	0.80	0.82
	rural (2/19)	73.34	73.70	68.14	75.08	-5.21	1.38	-0.07	0.02	10.25	12.75	0.79	0.82	0.82	0.84
WS (m/s)	urban (4/5)	2.43	2.38	2.83	2.93	0.40	0.55	0.36	0.39	1.91	1.88	0.79	0.81	0.74	0.76
	rural (1/11)	1.99	1.81	3.23	3.67	1.24	1.86	0.62	1.28	2.39	2.74	0.62	0.48	0.66	0.50

Table S4. Same as Table 2 for the 18 to 30 May.

Variable	Type	OM		MM		MB		NMB [0,1]		RMSE		R [0,1]		IOA [0,1]	
		AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT
T (ºC)	urban (5/6)	21.14	21.20	21.30	21.22	0.16	0.03	0.01	0.00	1.46	1.49	0.90	0.92	0.93	0.94
	rural (2/19)	21.067	17.55	21.96	17.71	0.90	0.16	0.04	-0.00	1.60	1.90	0.93	0.94	0.94	0.94
RH (%)	urban (5/6)	64.36	63.88	65.91	66.04	1.55	2.16	0.03	0.04	10.50	10.31	0.75	0.78	0.84	0.85
	rural (2/19)	69.15	67.02	65.34	71.60	-3.8	4.59	-0.055	0.073	9.37	13.35	0.82	0.82	0.88	0.84
WS (m/s)	urban (4/5)	2.18	2.09	2.19	2.24	0.01	0.15	0.12	0.18	1.42	1.38	0.66	0.69	0.71	0.74
	rural (1/11)	2.08	1.76	2.52	3.08	0.44	1.32	0.21	0.94	1.25	2.27	0.71	0.49	0.82	0.51

Model evaluation: chemistry

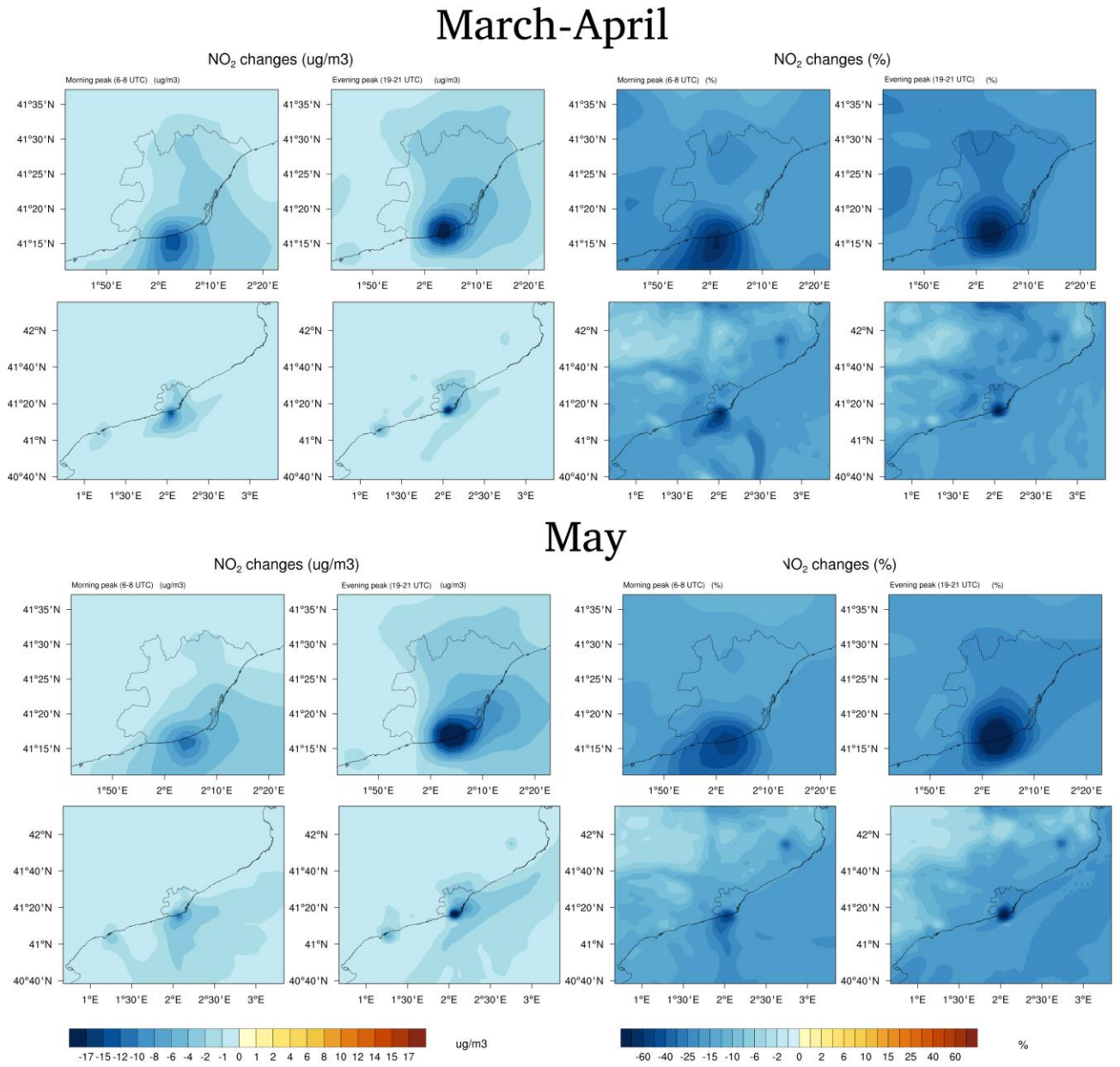
Table S5. Statistical evaluation of the modelled chemistry (COVID simulation), over the Metropolitan Area of Barcelona (AMB) and Catalonia (CAT) for the 30 March - 12 April 2020 in hourly basis. The number of stations are shown in parenthesis on the second column for AMB and CAT, respectively. The observation mean (OM), model mean (MM), mean bias (MB), normalised mean bias (NMB), root-mean-square error (RMSE), correlation (R) and the index of agreement (IOA) and are calculated between simulated and observed concentrations. Stations are classified into urban background, urban traffic, suburban background, and rural background.

Specie	Type	OM (μg m^{-3})		MM (μg m^{-3})		MB (μg m^{-3})		NMB [0,1]		RMSE (μg m^{-3})		R [0,1]		IOA [0,1]	
		AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT		
NO_2	urban b. (8/13)	14.28	13.81	13.16	11.56	1.75	-2.17	-0.06	-0.15	14.05	13.55	0.45	0.43	0.43	0.39
	urban t. (5/9)	16.65	16.10	11.02	9.92	-1.39	-5.68	-0.37	-0.42	15.46	15.09	0.44	0.4	0.45	0.41
	suburb. b. (5/13)	10.73	9.60	8.21	5.80	-0.14	-0.42	-0.26	-0.45	9.16	8.55	0.39	0.39	0.41	0.34
	rural b. (-/4)	-	3.23	-	1.09	-	-1.7	-	-0.63	-	2.88	-	0.32	-	0.15
O_3	urban b.(4/7)	71.57	71.88	85.67	84.51	18.22	16.26	0.20	0.17	25.12	25.19	0.73	0.70	0.48	0.50
	urban t. (2/8)	65.94	68.96	83.63	88.16	17.69	19.20	0.26	0.28	31.96	30.55	0.61	0.62	0.50	0.51
	suburb. b. (4/8)	83.93	74.74	101.6	93.73	17.69	18.99	0.22	0.26	22.43	25.19	0.73	0.66	0.51	0.46
	rural b. (-/)		76.06	-	92.43	-	16.37	-	0.22	-	27.81	-	0.42	-	0.42

Table S6. Same as Table 3 for the 18 to 30 May.

Specie	Type	OM (μg m^{-3})		MM (μg m^{-3})		MB (μg m^{-3})		NMB [0,1]		RMSE (μg m^{-3})		R[0,1]		IOA [0,1]	
		AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT	AMB	CAT		
NO_2	urban b. (-/12)	19.50	17.91	16.44	13.59	-3.05	-4.32	-0.15	-0.24	18.38	16.58	0.23	0.27	0.41	0.38
	urban t. (5/9)	30.22	23.3	20.4	10.25	-9.86	-13.05	-0.32	-0.6	24.94	21.27	0.20	0.23	0.33	0.25
	suburb. b. (5/13)	13.69	12.14	10.87	7.18	-2.81	-4.96	-0.26	-0.42	11.33	10.94	0.40	0.30	0.528	0.38
	rural b. (-/4)	-	3.23	-	1.09	-	-2.14	-	-0.66	-	2.96	-	0.24	-	0.26
O_3	urban b. (4/7)	66.18	68.14	78.83	79.14	12.65	11.01	0.21	0.17	28.18	27.98	0.62	0.60	0.54	0.55
	urban t. (2/8)	60.03	61.10	77.32	77.62	17.01	16.59	0.28	0.27	29.35	29.62	0.62	0.60	0.48	0.51
	suburb. b. (4/8)	79.00	69.38	88.00	84.87	9.01	15.49	0.13	0.24	28.43	32.31	0.51	0.49	0.52	0.49
	rural b. (-/12)	-	75.86	-	86.44	-	10.57	-	0.16	-	27.82	-	0.42	-	0.44

Air quality changes: NO_2



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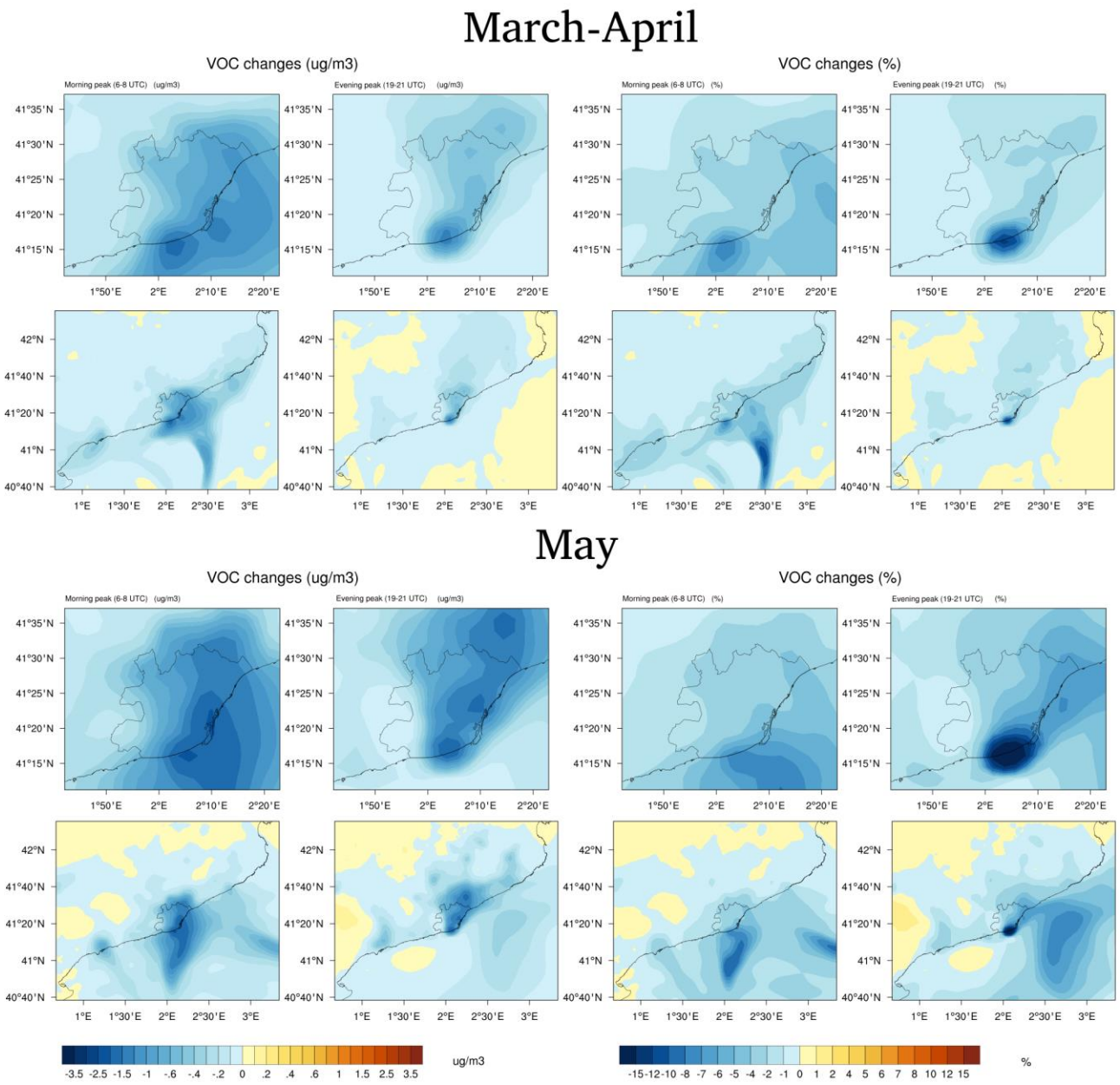
Air quality changes: VOC



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More information in Badia et al., 2023

https://doi.org/10.5194/egusphere-2023-160

08 Mar 2023

Status: this preprint is open for discussion and under review for Atmospheric Chemistry and Physics (ACP).

Modelling the impacts of emission changes on O_3 sensitivity, atmospheric oxidation capacity and pollution transport over the Catalonia region

Alba Badia, Veronica Vidal, Sergi Ventura, Roger Curcoll, Ricard Segura, and Gara Villalba

Abstract. Tropospheric ozone (O_3) is an important surface pollutant in urban areas, and it has complex formation mechanisms that depend on the atmospheric chemistry and meteorological factors. The severe reductions observed in anthropogenic emissions during the COVID-19 pandemic can further our understanding of the photochemical mechanisms leading to O_3

https://doi.org/10.5194/egusphere-2023-160