

Supplement to "Air quality modelling in the summer over the Eastern Mediterranean using WRF/Chem: Chemistry and aerosol mechanisms intercomparison"

George K. Georgiou¹, Theodoros Christoudias², Yiannis Proestos¹, Jonilda Kushta¹,
Panos Hadjinicolaou¹, and Jos Lelieveld^{3,1}

¹Energy, Environment and Water Research Center, The Cyprus Institute, Nicosia Cyprus

²Computation-based Science and Technology Research Centre (CaSToRC), The Cyprus Institute, Nicosia, Cyprus

³Air Chemistry Department, Max Planck Institute for Chemistry, Mainz, Germany

Correspondence to: George K. Georgiou (g.georgiou@cyi.ac.cy)

Table S1. Pearson’s Correlation Coefficient (R), Mean Bias (MB), Normalized Mean Bias (NMB), and Root Mean Squared Error (RMSE) of hourly values of temperature at 2m, wind speed at 10m, and surface pressure for the CBMZ-MOSAIC (CM), MOZART-MOSAIC (MM), and RADM2-MADE/SORGAM (RMS) mechanisms, with O₃ inflow (reduced by 30%), and dust inflow from the boundaries. Hourly data availability exceeds 90% at all stations.

	Station	CBMZ-MOSAIC				MOZART-MOSAIC				RADM2-MADE/SORGAM			
		R	MB	NMB	RMSE	R	MB	NMB	RMSE	R	MB	NMB	RMSE
T2	CYPHEX	0.70	0.65	0.03	2.34	0.69	0.49	0.02	2.36	0.68	0.69	0.03	2.42
	MET01	0.88	-0.45	-0.02	2.28	0.88	-0.75	-0.03	2.30	0.89	-0.50	-0.02	2.21
	MET02	0.18	-1.46	-0.05	3.29	0.18	-1.48	-0.05	3.32	0.17	-1.45	-0.05	3.31
	MET03	0.65	-0.75	-0.03	2.84	0.65	-0.86	-0.03	2.89	0.67	-0.84	-0.03	2.80
	MET04	0.68	-1.47	-0.06	2.54	0.70	-1.6	-0.06	2.56	0.71	-1.58	-0.06	2.55
	MET05	0.70	0.37	0.01	2.69	0.72	0.19	0.01	2.66	0.72	0.17	0.01	2.61
	MET06	0.74	-0.84	-0.03	2.64	0.76	-1.05	-0.04	2.65	0.79	-0.86	-0.03	2.46
	MET07	0.80	-1.39	-0.06	2.75	0.80	-1.74	-0.08	2.95	0.78	-1.30	-0.06	2.80
	MET08	0.61	0.03	0.00	3.22	0.60	-0.06	0.00	3.32	0.60	-0.01	-0.00	3.29
	Average	0.66	-0.59	-0.02	2.73	0.66	-0.76	-0.03	2.78	0.67	-0.63	-0.02	2.72
PSFC	CYPHEX	0.81	45.88	0.05	45.90	0.81	46.04	0.05	46.05	0.80	45.81	0.05	45.83
	MET01	0.87	0.10	0.00	1.26	0.87	0.31	0.00	1.29	0.86	0.07	0.00	1.35
	MET02	0.88	-2.03	0.00	2.37	0.88	-1.83	0.00	2.19	0.87	-2.08	0.00	2.46
	MET03	0.88	-10.07	-0.01	10.15	0.88	-9.88	-0.01	9.95	0.87	-10.14	-0.01	10.23
	MET04	0.91	-2.19	0.00	2.44	0.91	-1.96	0.00	2.23	0.90	-2.25	0.00	2.54
	MET06	0.90	-10.91	-0.01	10.97	0.89	-10.68	-0.01	10.75	0.89	-10.98	-0.01	11.05
		Average	0.88	3.46	0.01	12.18	0.87	3.67	0.01	12.08	0.87	3.41	0.01
WS₁₀	CYPHEX	0.36	0.05	0.02	1.63	0.36	0.09	0.03	1.66	0.35	-0.01	0.00	1.63
	MET01	0.52	2.24	1.09	2.99	0.53	2.34	1.13	3.06	0.49	2.167	1.05	2.94
	MET02	0.55	0.32	0.07	2.70	0.56	0.41	0.09	2.71	0.56	0.27	0.06	2.64
	MET03	0.62	3.37	1.51	3.82	0.61	3.49	1.57	3.93	0.58	3.33	1.50	3.80
	MET04	0.48	0.02	0.00	1.84	0.49	0.09	0.02	1.84	0.47	-0.11	-0.03	1.88
	MET05	0.46	2.02	1.22	2.54	0.47	2.09	1.26	2.59	0.44	2.03	1.23	2.55
	MET06	0.46	1.51	0.93	1.96	0.46	1.56	0.96	2.02	0.48	1.54	0.94	1.96
	MET07	0.27	2.45	2.34	3.04	0.27	2.53	2.41	3.11	0.26	2.44	2.337	3.01
	MET08	0.52	3.82	4.33	4.37	0.50	3.91	4.43	4.49	0.53	3.74	4.24	4.26
	Average	0.47	1.76	1.28	2.77	0.47	1.83	1.32	2.82	0.46	1.71	1.26	2.74

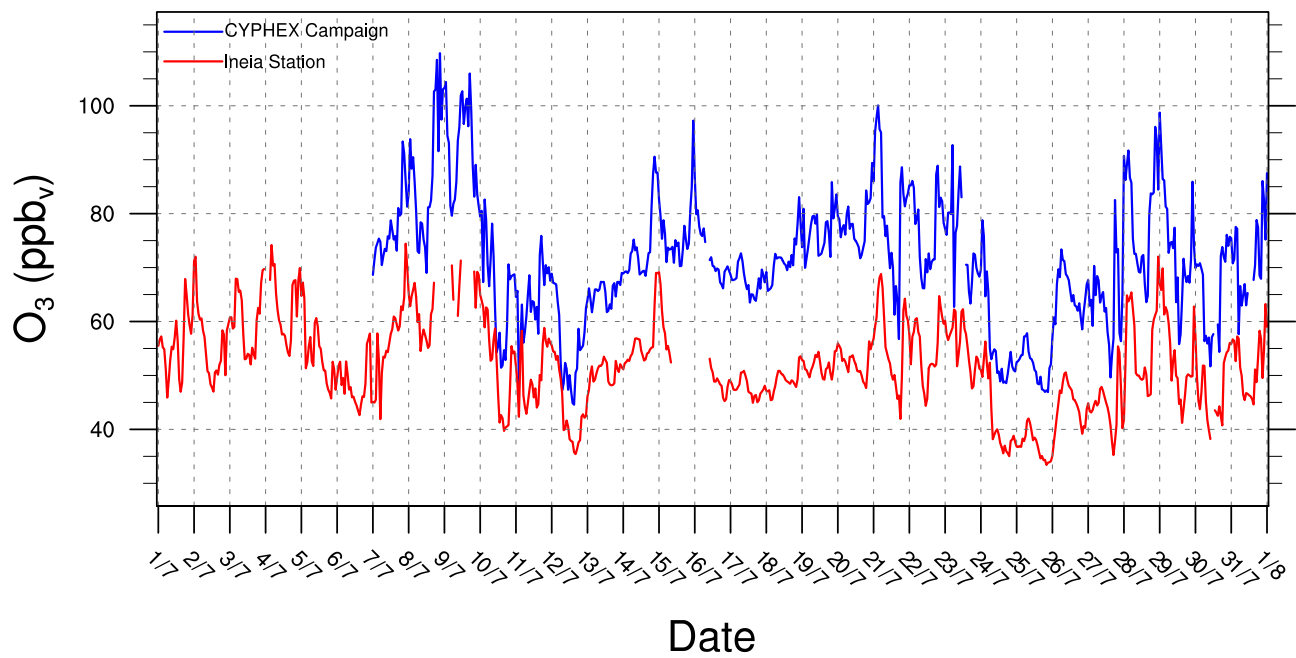


Figure S1. Observed O₃ concentrations during the CYPHEX Campaign (blue line) and at the Ineia station (red line).

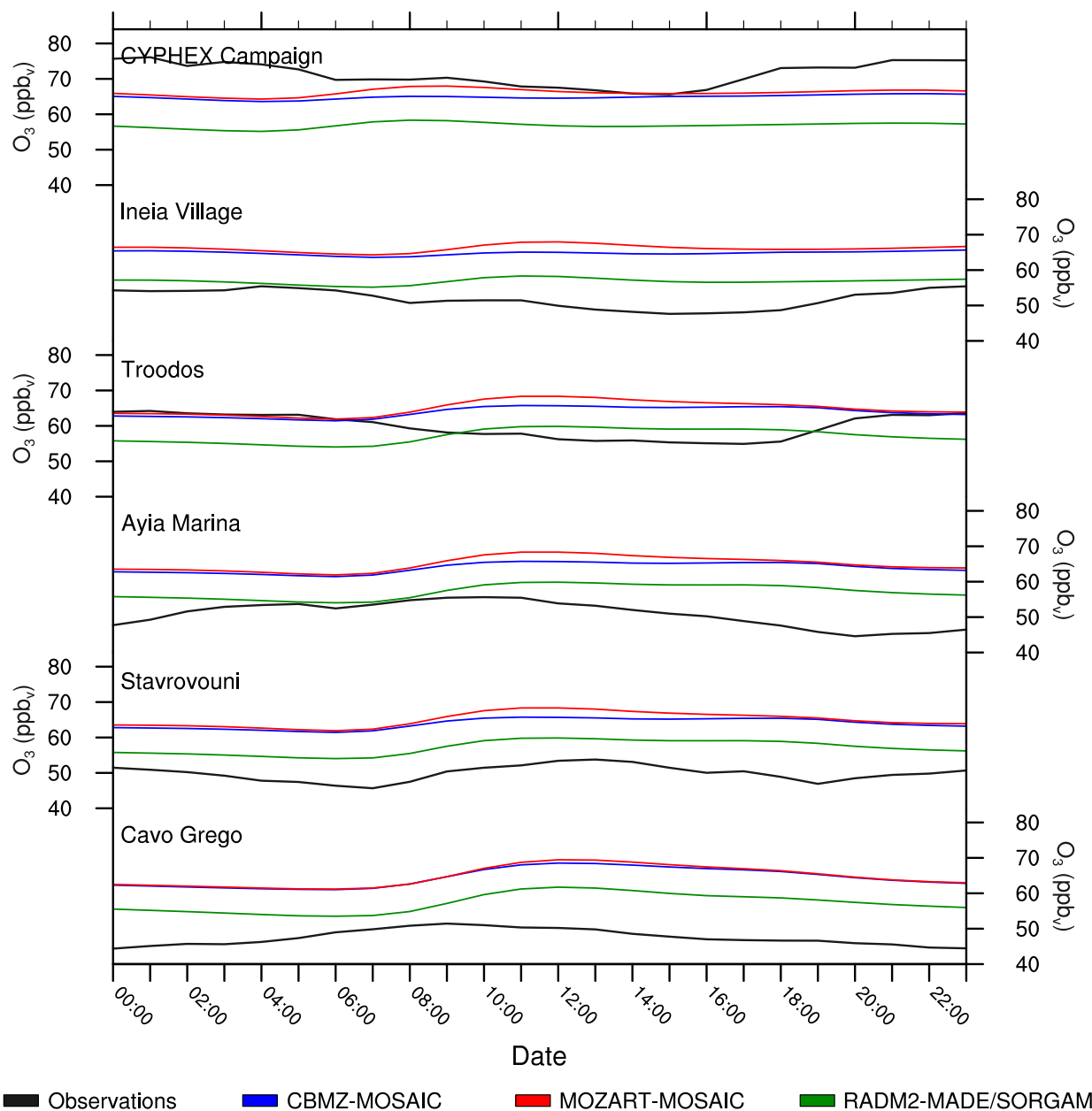


Figure S2. Observed (grey line) and modelled O₃ monthly mean diurnal cycles from the CBMZ-MOSAIC (blue line), MOZART-MOSAIC (red line), and RADM2-MADE/SORGAM (green line) mechanisms.

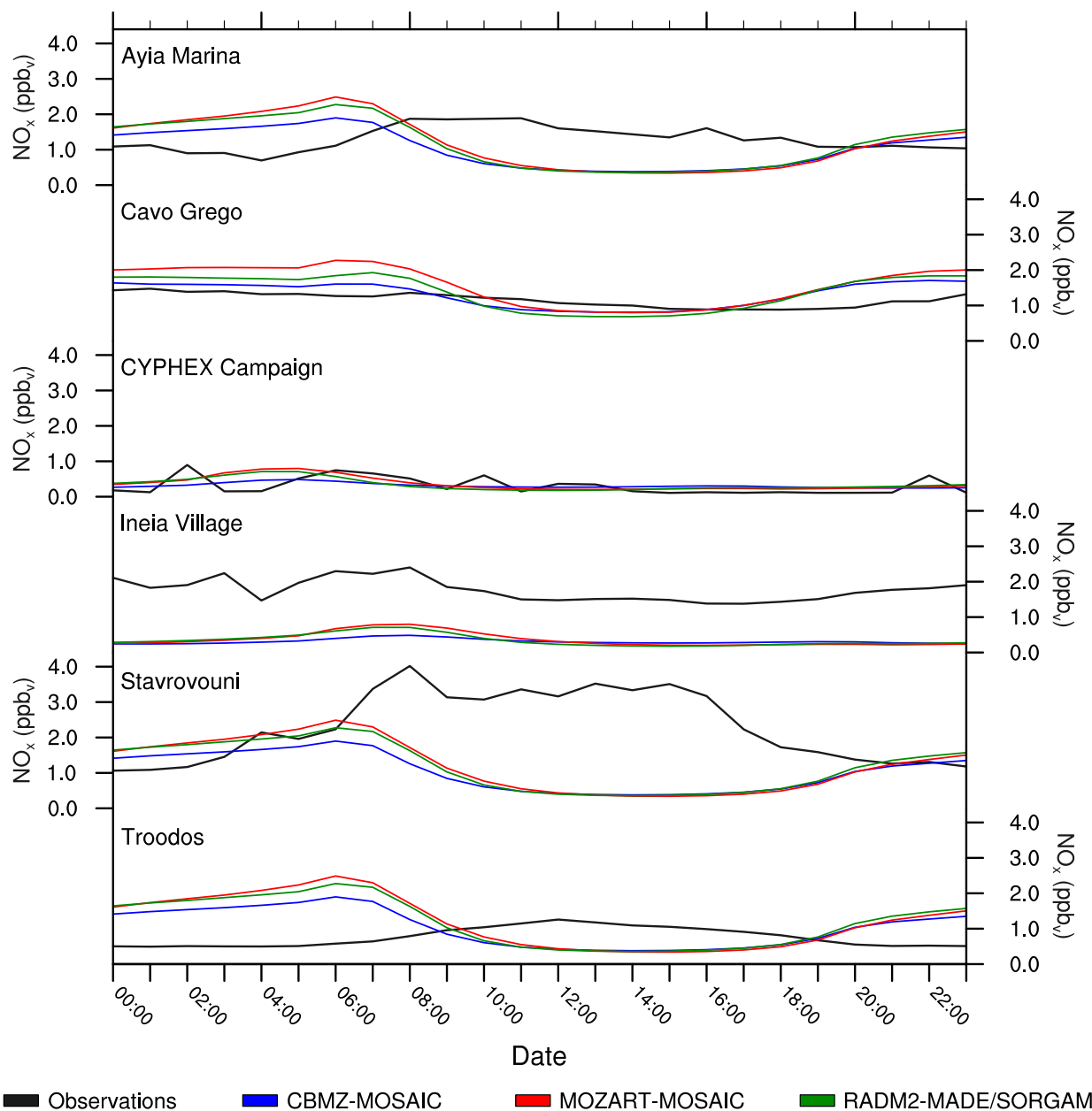


Figure S3. Observed (grey line) and modelled NO_x monthly mean diurnal cycles from the CBMZ-MOSAIC (blue line), MOZART-MOSAIC (red line), and RADM2-MADE/SORGAM (green line) mechanisms.

Table S2. Pearson’s Correlation Coefficient (R), Mean Bias (MB), Normalized Mean Bias (NMB), and Root Mean Squared Error (RMSE) of hourly values of O₃ and NO_x for the global MOZART-4 model and all three domains of the CBMZ-MOSAIC (CM), MOZART-MOSAIC (MM), and RADM2-MADE/SORGAM (RMS) simulations, averaged over all stations. The CYPHEX campaign was excluded from the mean monthly calculations for O₃. Hourly data availability exceeds 90% at all stations except NO_x at the Ineia station (> 75%) and the CYPHEX campaign (> 82%).

	Model/Mechanism	Domain	Resolution (km)	R	MB	NMB	RMSE	
O₃	MOZART-4	global	≈215	0.27	18.93	0.37	20.96	
	CM	d1	80	0.18	12.18	0.24	15.65	
		d2	16	0.21	11.21	0.22	14.97	
		d3	4	0.24	10.98	0.22	14.79	
	MM	d1	80	0.20	13.07	0.26	16.51	
		d2	16	0.27	11.56	0.23	15.14	
		d3	4	0.29	11.67	0.23	15.30	
	RMS	d1	80	0.19	5.08	0.10	11.27	
		d2	16	0.21	4.25	0.09	10.77	
		d3	4	0.25	4.25	0.09	10.77	
	NO_x	MOZART-4	global	≈215	0.09	-0.70	-0.43	1.82
		CM	d1	80	-0.03	-0.50	-0.28	2.01
d2			16	0.04	-0.77	-0.57	2.00	
d3			4	0.09	-0.70	-0.53	2.08	
MM		d1	80	0.00	-0.36	-0.16	2.10	
		d2	16	0.07	-0.69	-0.51	2.02	
		d3	4	0.11	-0.63	-0.48	2.09	
RMS		d1	80	-0.01	-0.41	-0.21	2.08	
		d2	16	0.05	-0.67	-0.49	2.03	
		d3	4	0.08	-0.57	-0.44	2.10	

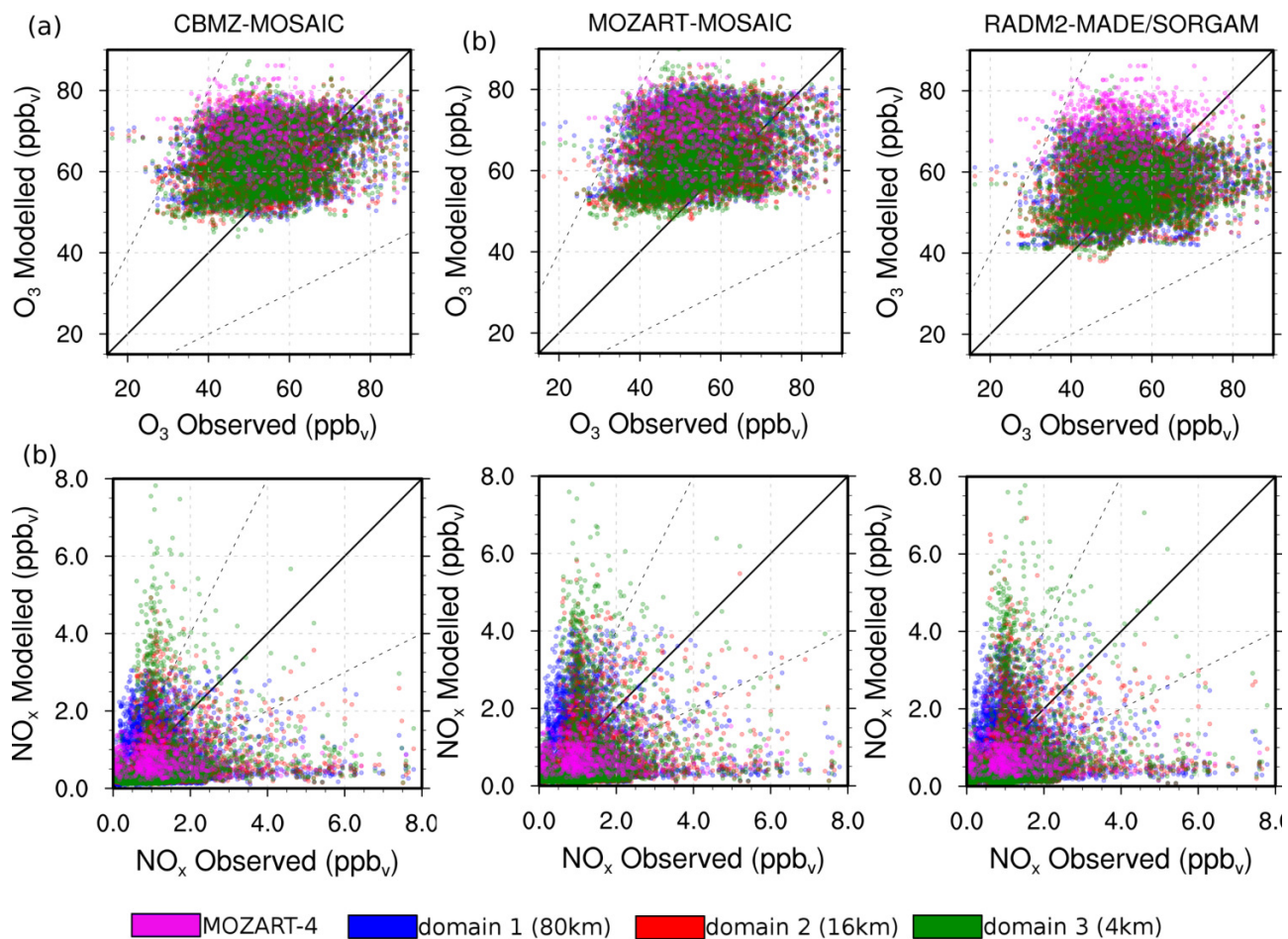


Figure S4. Comparison of observed and modelled O_3 (a, first row) and NO_x (b, second row) concentrations at all stations from the CBMZ-MOSAIC (left column), MOZART-MOSAIC (central column), and RADM2-MADE/SORGAM (right column) mechanisms for the 80km (blue color), 16km (red color), and 4km (green color) domain of the simulations. The corresponding concentrations from the global MOZART-4 (215km) are also shown (magenta color).