

Supplement of Atmos. Chem. Phys., 15, 5627–5644, 2015  
<http://www.atmos-chem-phys.net/15/5627/2015/>  
doi:10.5194/acp-15-5627-2015-supplement  
© Author(s) 2015. CC Attribution 3.0 License.



*Supplement of*

## **Development of a custom OMI NO<sub>2</sub> data product for evaluating biases in a regional chemistry transport model**

**G. Kuhlmann et al.**

*Correspondence to:* G. Kuhlmann (gerrit.kuhlmann@my.cityu.edu.hk) and Y. F. Lam (yunflam@cityu.edu.hk)

The copyright of individual parts of the supplement might differ from the CC-BY 3.0 licence.

Table S1: Evaluation of WRF with meteorological observations in Hong Kong.

Parameter	IOA	r	MB	NMB <sup>a</sup>	RMSE	CV <sup>a</sup>
Hong Kong Observatory (HKO)						
$T$ ( $^{\circ}\text{C}$ )	0.97	0.96	-0.2	-0.8	1.7	8.0
$q$ (g/kg)	0.93	0.94	-1.7	-14.1	2.2	18.2
$p$ (hPa)	0.99	0.98	-0.0	-0.0	0.9	0.1
$v$ (m/s)	0.57	0.28	+0.5	+23.2	1.5	71.4
Hong Kong International Airport (HKIA)						
$T$ ( $^{\circ}\text{C}$ )	0.98	0.97	-0.2	-0.7	1.3	6.1
$q$ (g/kg)	0.97	0.95	-0.3	-2.3	1.4	12.8
$p$ (hPa)	0.99	0.98	+0.1	+0.0	0.9	0.1
$v$ (m/s)	0.68	0.47	-0.4	-10.4	1.6	46.0
Waglan Island (WGL)						
$T$ ( $^{\circ}\text{C}$ )	0.94	0.94	+1.2	+5.7	2.0	9.5
$q$ (g/kg)	0.88	0.95	+2.5	+21.7	2.8	24.2
$p$ (hPa)	0.99	0.98	+0.4	+0.0	1.0	0.1
$v$ (m/s)	0.84	0.72	+0.0	+0.7	2.1	33.0

$T$ : temperature at 2 m above ground level (agl),  $q$ : water vapour mixing ratio 2 m agl,  $p$ : sea level pressure,  $v$ : wind speed (at station height), <sup>a</sup> unit percent

Table S2: Evaluation of CMAQ NO<sub>2</sub> mixing ratios with the PRD RAQM network.

Station name	IOA	r	MB	NMB	RMSE	CV
Chengzhong	0.47	+0.22	-13.1	-50	21.2	82
Donghu	0.44	+0.21	+18.7	+80	27.6	118
Haogang	0.59	+0.37	-9.2	-30	20.4	65
Huijingcheng	0.60	+0.49	-18.7	-40	28.9	62
Jinguowan	0.42	+0.19	-2.6	-46	5.9	105
Liyuan	0.58	+0.37	+14.4	+41	25.0	70
Luhu Park	0.71	+0.60	-14.0	-38	23.6	64
Shunde D.	0.47	+0.22	-23.7	-61	31.8	81
Tangjia	0.50	+0.17	-13.4	-41	27.6	85
Tap Mun	0.29	-0.09	-2.3	-26	10.5	118
Tianhu	0.46	+0.25	-4.2	-60	7.6	110
Tsuen Wan	0.75	+0.58	-1.4	-3	17.9	41
Tung Chung	0.63	+0.45	-10.9	-30	22.0	61
Wanqingsha	0.43	+0.07	-13.8	-39	29.3	82
Xiapu	0.48	+0.42	-12.8	-67	19.1	100
Zimaling P.	0.57	+0.32	-10.2	-24	23.3	56
HK & SZ	0.56	+0.33	-0.0	-5	18.9	73
FS & GZ	0.55	+0.34	-17.6	-44	28.4	72
all stations	0.52	+0.30	-7.3	-27	21.4	81

Units: [MB] = ppbv, [NMB] = %, [RMSE] = ppbv, [CV] = %.

Table S3: Validating OMI NO<sub>2</sub> products with RAQM ground measurements (part 1)

Station name	IOA	r	MB	NMB	RMSE	CV
OMNO2-SP						
Chengzhong	0.31	+0.30	-10.9	-62	12.5	71
Donghu	0.50	+0.43	+15.0	+88	19.8	116
Haogang	0.62	+0.43	-2.9	-16	10.3	57
Huijingcheng	0.51	+0.57	-14.2	-44	18.6	58
Jinguowan	0.40	+0.41	-1.6	-43	2.9	80
Liyuan	0.10	-0.35	-9.6	-35	19.1	70
Luhu Park	0.54	+0.50	-7.0	-31	14.9	65
Shunde Dangxiao	0.40	+0.48	-15.9	-53	22.7	75
Tangjia	0.39	+0.52	-15.4	-51	23.1	77
Tap Mun	0.43	+0.40	-3.3	-52	4.4	69
Tianhu	0.43	+0.83	-3.5	-67	5.1	97
Tsuen Wan	0.32	-0.03	-29.4	-55	38.2	71
Tung Chung	0.37	+0.74	-27.5	-66	31.8	76
Wanqingsha	0.27	+0.33	-20.1	-60	27.5	82
Xiapu	0.13	-0.02	-7.6	-61	11.7	94
Zimaling Park	0.55	+0.44	-9.8	-31	17.1	53
OMNO2-SW						
Chengzhong	0.37	+0.31	-9.9	-56	11.7	66
Donghu	0.48	+0.43	+19.3	+113	24.7	145
Haogang	0.64	+0.43	-2.0	-11	10.2	57
Huijingcheng	0.56	+0.55	-12.9	-40	17.8	55
Jinguowan	0.46	+0.35	-1.0	-28	2.7	74
Liyuan	0.10	-0.37	-5.0	-18	18.4	68
Luhu Park	0.57	+0.47	-6.0	-26	14.8	65
Shunde Dangxiao	0.41	+0.50	-14.9	-49	21.9	73
Tangjia	0.43	+0.37	-12.8	-43	22.4	75
Tap Mun	0.46	+0.23	-2.3	-36	4.2	66
Tianhu	0.46	+0.80	-3.4	-65	5.0	96
Tsuen Wan	0.34	-0.11	-21.5	-40	35.1	65
Tung Chung	0.45	+0.65	-23.3	-56	28.5	68
Wanqingsha	0.30	+0.30	-18.5	-55	26.4	79
Xiapu	0.14	-0.13	-7.0	-56	11.6	93
Zimaling Park	0.60	+0.44	-7.4	-23	16.2	50
HKOMI-1						
Chengzhong	0.37	+0.29	-10.0	-57	11.8	67
Donghu	0.42	+0.42	+22.5	+132	31.4	185
Haogang	0.73	+0.56	-0.5	-3	9.0	50
Huijingcheng	0.63	+0.59	-10.7	-33	16.0	50
Jinguowan	0.58	+0.34	+0.2	+4	2.6	72
Liyuan	0.11	-0.36	+2.7	+10	20.2	74
Luhu Park	0.60	+0.48	-2.9	-12	13.7	60
Shunde Dangxiao	0.33	+0.29	-12.7	-42	21.9	73
Tangjia	0.38	+0.22	-13.3	-44	23.9	80
Tap Mun	0.67	+0.50	-1.7	-27	3.7	58
Tianhu	0.34	+0.57	-3.2	-61	5.1	99
Tsuen Wan	0.40	+0.08	-15.1	-28	32.4	60
Tung Chung	0.53	+0.75	-21.3	-51	26.0	62
Wanqingsha	0.35	+0.28	-16.4	-49	25.3	76
Xiapu	0.13	-0.20	-7.1	-57	11.8	95
Zimaling Park	0.62	+0.40	-2.8	-9	16.8	52
Units: [MB] = ppbv, [NMB] = %, [RMSE] = ppbv, [CV] = %.						

Table S3: Validating OMI NO<sub>2</sub> products with RAQM ground measurements (part 2)

Station name	IOA	r	MB	NMB	RMSE	CV
HKOMI-2						
Chengzhong	0.47	+0.37	-8.5	-48	10.5	60
Donghu	0.43	+0.44	+36.2	+213	48.1	283
Haogang	0.73	+0.56	+3.1	+17	10.1	56
Huijingcheng	0.77	+0.63	-4.2	-13	13.8	43
Jinguowan	0.57	+0.32	+0.9	+25	2.9	81
Liyuan	0.25	-0.34	+12.4	+45	26.2	96
Luhu Park	0.66	+0.46	+2.7	+12	14.4	63
Shunde Dangxiao	0.48	+0.36	-8.2	-27	19.4	65
Tangjia	0.47	+0.23	-7.6	-25	22.3	75
Tap Mun	0.72	+0.55	-0.4	-6	3.8	59
Tianhu	0.39	+0.54	-2.8	-55	4.9	95
Tsuen Wan	0.35	+0.08	-2.4	-4	38.3	71
Tung Chung	0.76	+0.71	-12.5	-30	19.5	47
Wanqingsha	0.43	+0.24	-11.1	-33	23.6	71
Xiapu	0.14	-0.21	-5.9	-47	11.4	91
Zimaling Park	0.65	+0.47	+7.2	+22	21.0	65
HKOMI-3						
Chengzhong	0.39	+0.29	-9.4	-53	11.3	64
Donghu	0.42	+0.43	+28.0	+165	37.4	220
Haogang	0.72	+0.54	+1.1	+6	9.6	53
Huijingcheng	0.68	+0.57	-8.1	-25	14.9	47
Jinguowan	0.58	+0.36	+0.3	+9	2.6	72
Liyuan	0.16	-0.33	+6.1	+22	21.7	80
Luhu Park	0.63	+0.48	-0.8	-3	13.5	59
Shunde Dangxiao	0.35	+0.29	-10.9	-36	20.9	69
Tangjia	0.39	+0.18	-10.9	-36	23.3	78
Tap Mun	0.65	+0.44	-1.3	-21	3.9	60
Tianhu	0.36	+0.59	-3.1	-59	5.0	97
Tsuen Wan	0.37	+0.04	-11.4	-21	33.0	62
Tung Chung	0.57	+0.66	-18.5	-44	24.4	58
Wanqingsha	0.37	+0.25	-14.4	-43	24.4	73
Xiapu	0.13	-0.21	-6.7	-53	11.6	93
Zimaling Park	0.60	+0.37	+1.0	+3	18.8	58
HKOMI-4						
Chengzhong	0.39	+0.38	-9.6	-55	11.3	64
Donghu	0.44	+0.47	+26.0	+153	33.3	196
Haogang	0.75	+0.58	+1.1	+6	8.9	49
Huijingcheng	0.68	+0.62	-8.6	-27	14.4	45
Jinguowan	0.60	+0.40	+0.2	+5	2.5	69
Liyuan	0.09	-0.40	+4.7	+17	21.3	78
Luhu Park	0.61	+0.48	-1.0	-4	13.3	58
Shunde Dangxiao	0.44	+0.39	-10.8	-36	20.2	67
Tangjia	0.47	+0.43	-11.1	-37	21.1	70
Tap Mun	0.70	+0.52	-1.4	-22	3.5	55
Tianhu	0.38	+0.69	-3.1	-59	5.0	96
Tsuen Wan	0.40	+0.07	-13.5	-25	31.4	58
Tung Chung	0.60	+0.77	-19.5	-47	24.1	58
Wanqingsha	0.40	+0.34	-14.5	-43	23.7	71
Xiapu	0.13	-0.16	-6.7	-54	11.5	92
Zimaling Park	0.64	+0.43	+0.3	+1	17.3	54
Units: [MB] = ppbv, [NMB] = %, [RMSE] = ppbv, [CV] = %.						

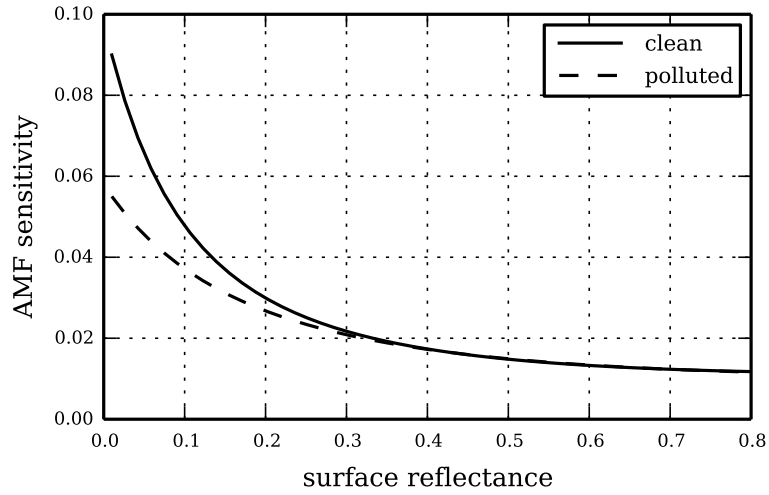


Figure S1: Sensitivity of AMF to a change of 0.01 in surface reflectance for different surface reflectance. The lines show the sensitivity for a polluted and clean aerosol profile (Fig. ??).

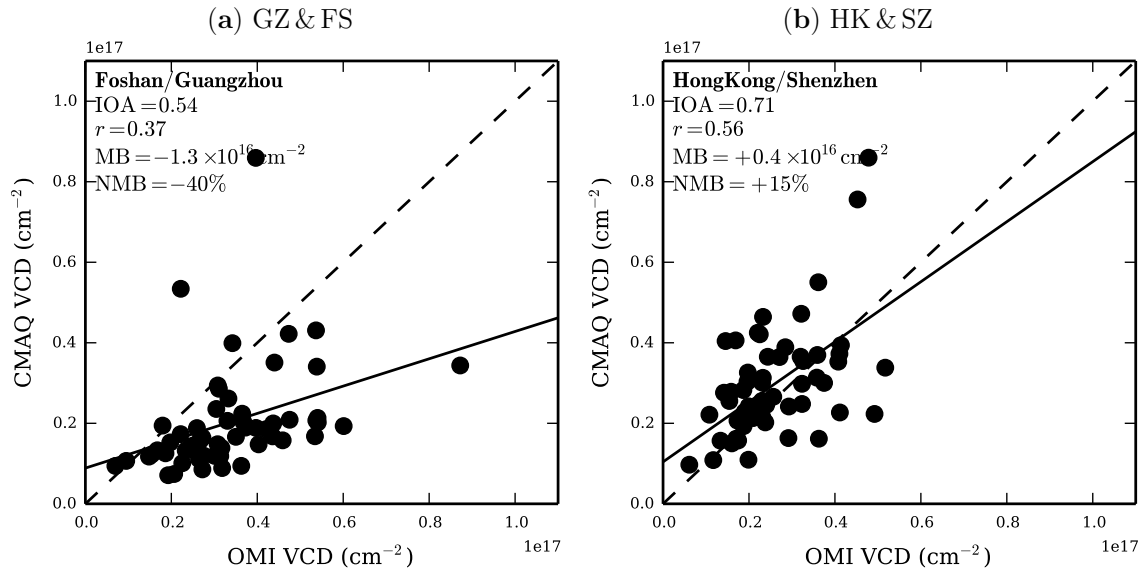


Figure S2: Scatter plot between CMAQ and PRD-4 at (a) GZ & FS and (b) HK & SZ.