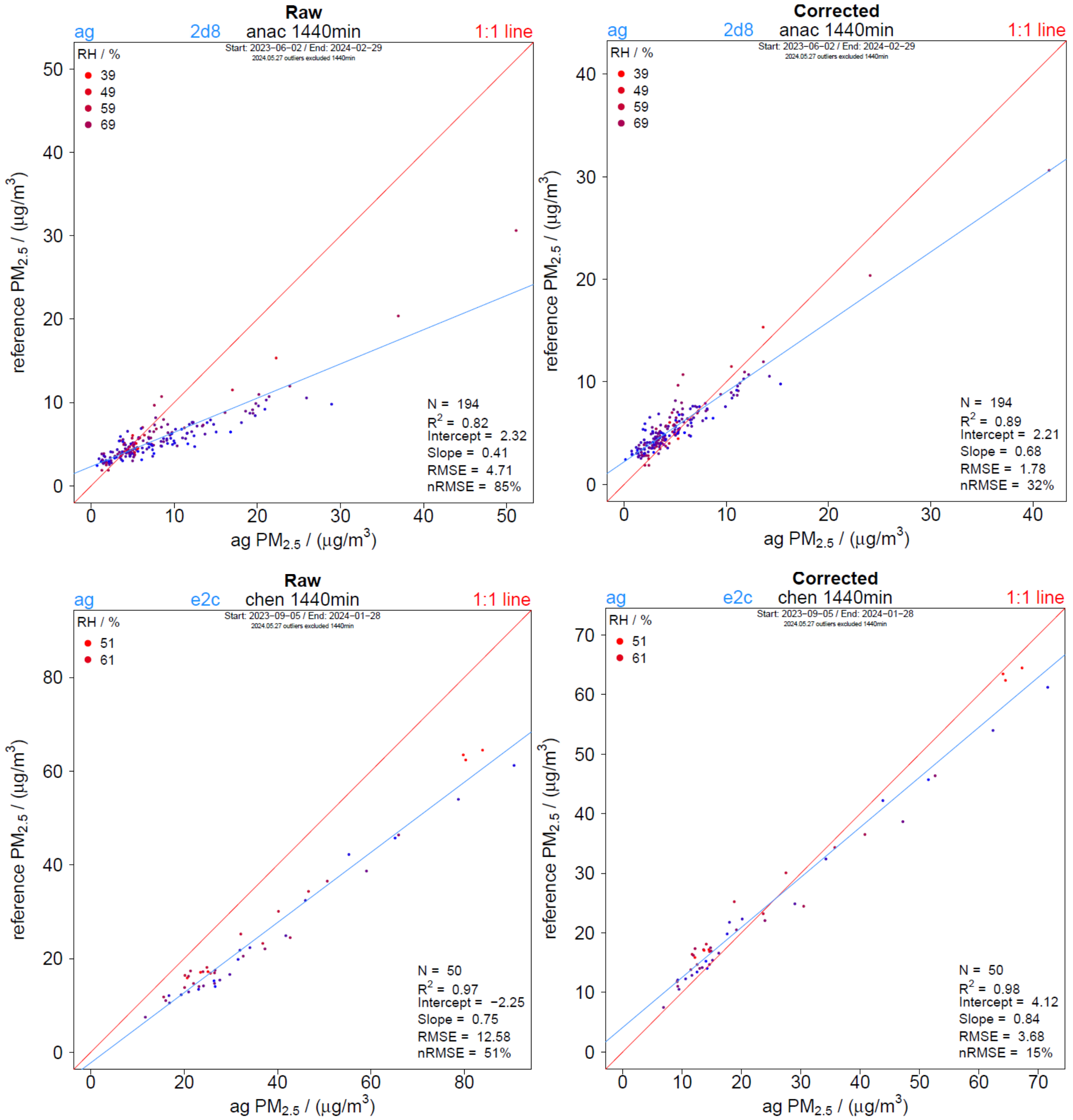
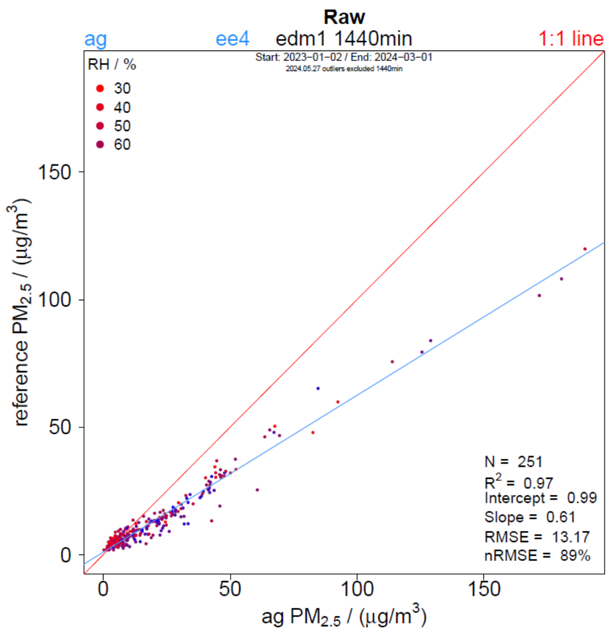
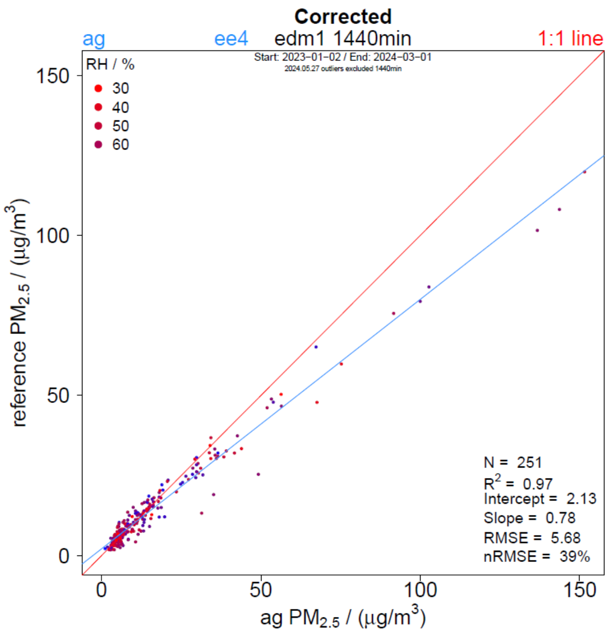
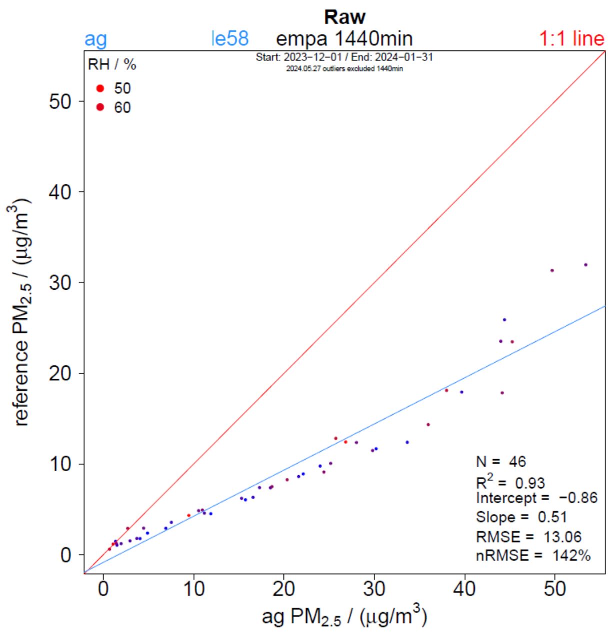
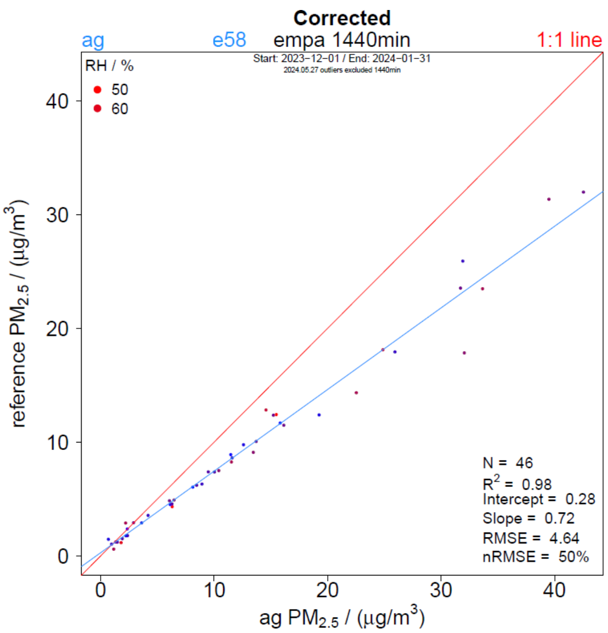
Appendix for AirGradient's blog post 'Correction algorithm for PM2.5'

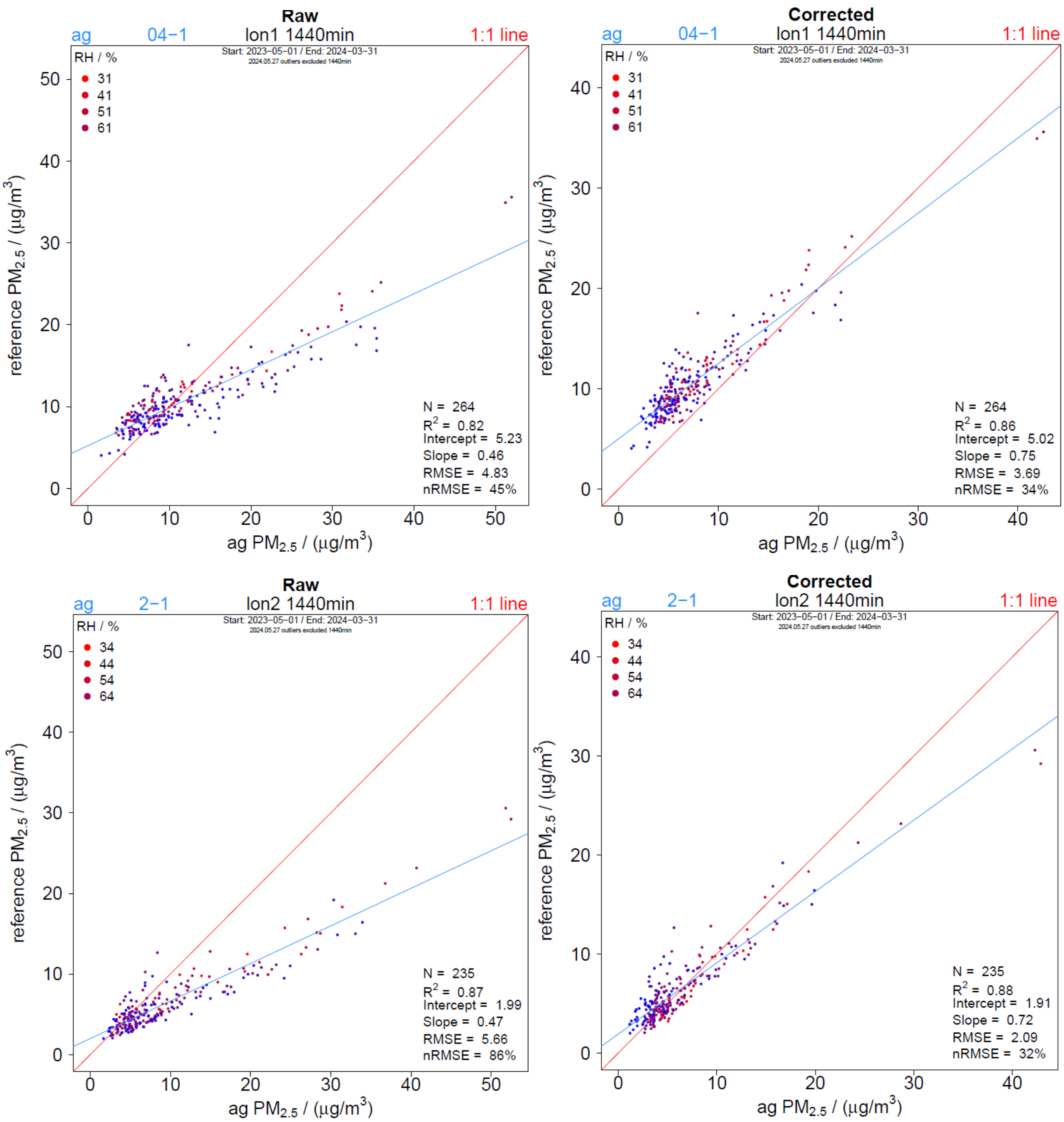



Raw
ag
ee4
edm1 1440min
1:1 line
Start: 2023-01-02 / End: 2024-03-01
2024.05.27 outliers excluded 1440min
RH / %
30
40
50
60
N = 251
R^2 = 0.97
Intercept = 0.99
Slope = 0.61
RMSE = 13.17
nRMSE = 89%
reference $PM_{2.5}$ / (µg/m^3)
ag $PM_{2.5}$ / (µg/m^3)
0
50
100
150

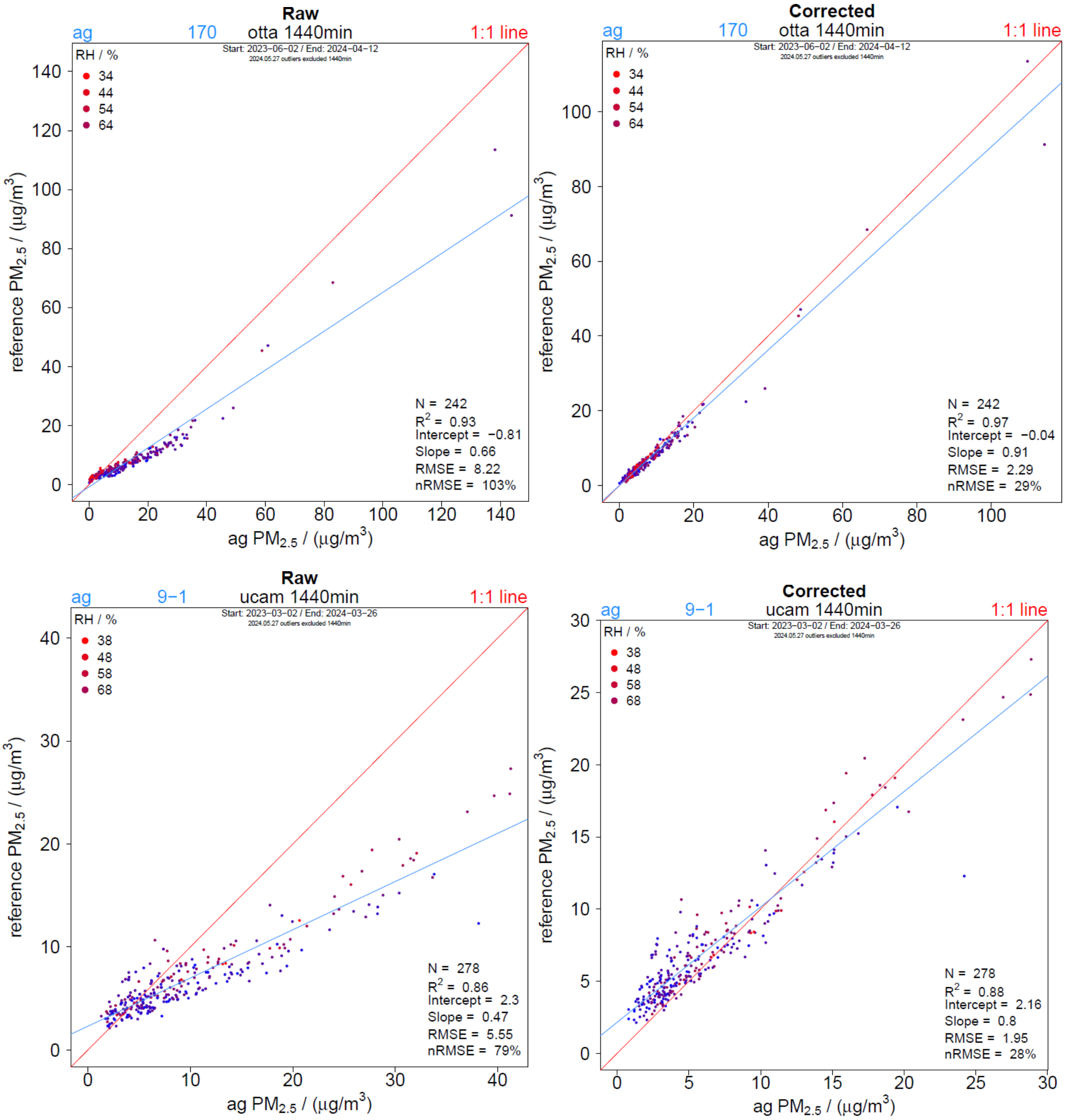

Corrected
ag
ee4
edm1 1440min
1:1 line
Start: 2023-01-02 / End: 2024-03-01
2024.05.27 outliers excluded 1440min
RH / %
30
40
50
60
N = 251
R^2 = 0.97
Intercept = 2.13
Slope = 0.78
RMSE = 5.68
nRMSE = 39%
reference $PM_{2.5}$ / (µg/m^3)
ag $PM_{2.5}$ / (µg/m^3)
0
50
100
150

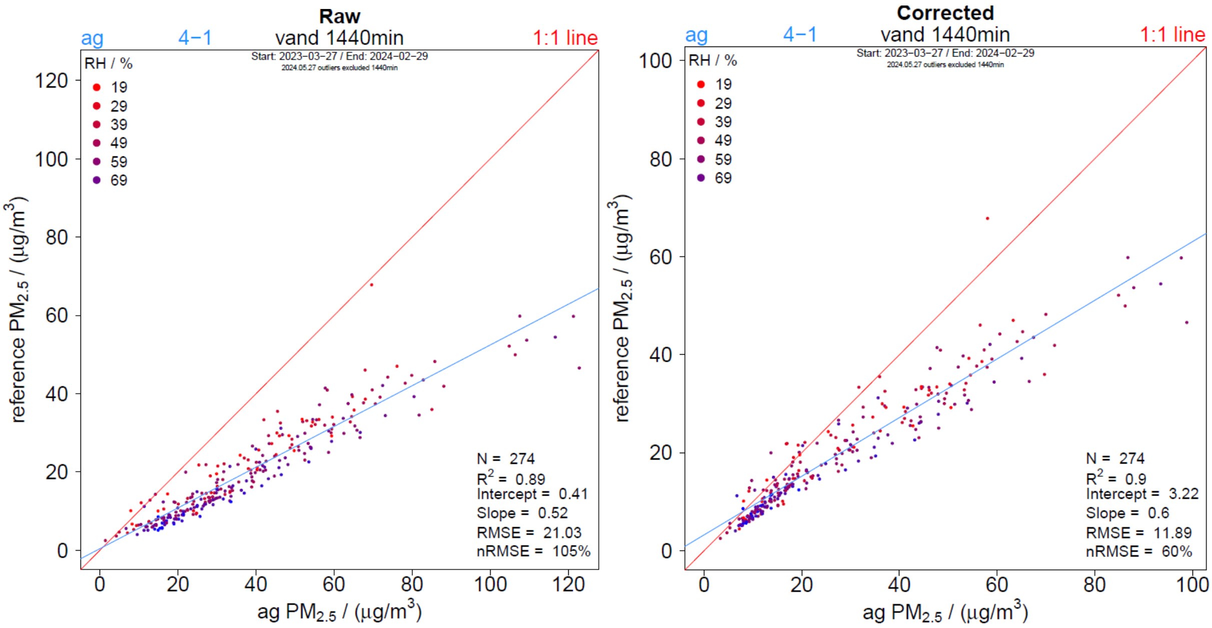

Raw
ag
le58
empa 1440min
1:1 line
Start: 2023-12-01 / End: 2024-01-31
2024.05.27 outliers excluded 1440min
RH / %
50
60
N = 46
R^2 = 0.93
Intercept = −0.86
Slope = 0.51
RMSE = 13.06
nRMSE = 142%
reference $PM_{2.5}$ / (µg/m^3)
ag $PM_{2.5}$ / (µg/m^3)
0
10
20
30
40
50


Corrected
ag
e58
empa 1440min
1:1 line
Start: 2023-12-01 / End: 2024-01-31
2024.05.27 outliers excluded 1440min
RH / %
50
60
N = 46
R^2 = 0.98
Intercept = 0.28
Slope = 0.72
RMSE = 4.64
nRMSE = 50%
reference $PM_{2.5}$ / (µg/m^3)
ag $PM_{2.5}$ / (µg/m^3)
0
10
20
30
40



Raw
ag
04−1
lon1 1440min
1:1 line
Start: 2023−05−01 / End: 2024−03−31
2024.05.27 outliers excluded 1440min
RH / %
31
41
51
61
N = 264
R2 = 0.82
Intercept = 5.23
Slope = 0.46
RMSE = 4.83
nRMSE = 45%
reference PM2.5 / (µg/m3)
ag PM2.5 / (µg/m3)
Corrected
ag
04−1
lon1 1440min
1:1 line
Start: 2023−05−01 / End: 2024−03−31
2024.05.27 outliers excluded 1440min
RH / %
31
41
51
61
N = 264
R2 = 0.86
Intercept = 5.02
Slope = 0.75
RMSE = 3.69
nRMSE = 34%
reference PM2.5 / (µg/m3)
ag PM2.5 / (µg/m3)
Raw
ag
2−1
lon2 1440min
1:1 line
Start: 2023−05−01 / End: 2024−03−31
2024.05.27 outliers excluded 1440min
RH / %
34
44
54
64
N = 235
R2 = 0.87
Intercept = 1.99
Slope = 0.47
RMSE = 5.66
nRMSE = 86%
reference PM2.5 / (µg/m3)
ag PM2.5 / (µg/m3)
Corrected
ag
2−1
lon2 1440min
1:1 line
Start: 2023−05−01 / End: 2024−03−31
2024.05.27 outliers excluded 1440min
RH / %
34
44
54
64
N = 235
R2 = 0.88
Intercept = 1.91
Slope = 0.72
RMSE = 2.09
nRMSE = 32%
reference PM2.5 / (µg/m3)
ag PM2.5 / (µg/m3)


Raw
ag
170
otta 1440min
1:1 line
Start: 2023-06-02 / End: 2024-04-12
2024.05.27 outliers excluded 1440min
RH / %
34
44
54
64
N = 242
R^2 = 0.93
Intercept = −0.81
Slope = 0.66
RMSE = 8.22
nRMSE = 103%
reference $PM_{2.5}$ / ($\mu g/m^3$)
ag $PM_{2.5}$ / ($\mu g/m^3$)
Corrected
ag
170
otta 1440min
1:1 line
Start: 2023-06-02 / End: 2024-04-12
2024.05.27 outliers excluded 1440min
RH / %
34
44
54
64
N = 242
R^2 = 0.97
Intercept = −0.04
Slope = 0.91
RMSE = 2.29
nRMSE = 29%
reference $PM_{2.5}$ / ($\mu g/m^3$)
ag $PM_{2.5}$ / ($\mu g/m^3$)
Raw
ag
9−1
ucam 1440min
1:1 line
Start: 2023-03-02 / End: 2024-03-26
2024.05.27 outliers excluded 1440min
RH / %
38
48
58
68
N = 278
R^2 = 0.86
Intercept = 2.3
Slope = 0.47
RMSE = 5.55
nRMSE = 79%
reference $PM_{2.5}$ / ($\mu g/m^3$)
ag $PM_{2.5}$ / ($\mu g/m^3$)
Corrected
ag
9−1
ucam 1440min
1:1 line
Start: 2023-03-02 / End: 2024-03-26
2024.05.27 outliers excluded 1440min
RH / %
38
48
58
68
N = 278
R^2 = 0.88
Intercept = 2.16
Slope = 0.8
RMSE = 1.95
nRMSE = 28%
reference $PM_{2.5}$ / ($\mu g/m^3$)
ag $PM_{2.5}$ / ($\mu g/m^3$)


Raw
ag
4−1
vand 1440min
1:1 line
Start: 2023−03−27 / End: 2024−02−29
RH / %
19
29
39
49
59
69
reference PM2.5 / (µg/m3)
ag PM2.5 / (µg/m3)
N = 274
R2 = 0.89
Intercept = 0.41
Slope = 0.52
RMSE = 21.03
nRMSE = 105%
Corrected
ag
4−1
vand 1440min
1:1 line
Start: 2023−03−27 / End: 2024−02−29
RH / %
19
29
39
49
59
69
reference PM2.5 / (µg/m3)
ag PM2.5 / (µg/m3)
N = 274
R2 = 0.9
Intercept = 3.22
Slope = 0.6
RMSE = 11.89
nRMSE = 60%

A detailed overview of correlation parameters per location for daily raw (top) and corrected (bottom) PM2.5 data from AirGradient. The ‘mean’ refers to the reference data.

City	**N**	**R^2**	**Intercept / (μg/m³)**	**Slope**	**MAE / (μg/m³)**	**RMSE / (μg/m³)**	**Mean / (μg/m³)**	**nRMSE / %**
Raw								
Anacortes	316	0.86	2.24	0.435	3.105	5.15	5.945	87
Chennai	150	0.97	-2.757	0.757	11.607	12.823	24.53	52
Edmonton 1	251	0.97	0.99	0.61	8.22	13.17	14.72	89
Dübendorf	138	0.933	-0.62	0.55	8.88	11.073	9.19	120
London 1	1056	0.815	5.185	0.452	3.558	5.112	10.77	47
London 2	1050	0.85	1.953	0.442	4.268	6.312	6.555	96
Ottawa	481	0.93	-0.855	0.66	5.84	8.36	8.105	103
Cambridge	1668	0.868	2.31	0.485	3.475	5.19	7.04	74
Vanderbijlpark	1649	0.892	0.47	0.528	17.193	20.548	20.028	103
Average	*6759*	*0.899*	*0.991*	*0.547*	*7.350*	*9.749*	*11.876*	*86*
Corrected								
Anacortes	316	0.905	2.23	0.685	1.385	2.015	5.945	34
Chennai	150	0.98	3.863	0.843	2.777	3.58	24.53	15
Edmonton 1	251	0.97	2.13	0.78	2.88	5.68	14.72	39
Dübendorf	138	0.977	0.3	0.81	2.05	2.987	9.19	32
London 1	1056	0.857	5.065	0.73	3.215	3.625	10.77	34
London 2	1050	0.86	1.98	0.685	1.587	2.348	6.555	36
Ottawa	481	0.97	0.01	0.905	1.21	2.335	8.105	29
Cambridge	1668	0.888	1.873	0.833	1.38	1.853	7.04	26
Vanderbijlpark	1649	0.903	3.29	0.605	8.105	11.535	20.028	58
Average	*6759*	*0.923*	*2.305*	*0.764*	*2.732*	*3.995*	*11.876*	*34*

A summary of correlation parameters for every individual outdoor AirGradient sensor that was used for the analysis discussed in this blog. It reveals information about reproducibility. Top: raw data. Bottom: corrected data. The ‘mean’ refers to the reference data.

Raw									
Location	**Sensor ID**	**N**	**R^2**	**Intercept / (μg/m³)**	**Slope**	**MAE / (μg/m³)**	**RMSE / (μg/m³)**	**Mean / (μg/m³)**	**nRMSE / %**
anac	xxxxxxxxxaa8	122	0.9	2.16	0.46	3.22	5.59	6.34	88
anac	xxxxxxxxx2d8	194	0.82	2.32	0.41	2.99	4.71	5.55	85
chen	xxxxxxxxxe2c	50	0.97	-2.25	0.75	11.25	12.58	24.53	51
chen	xxxxxxxxx460	50	0.97	-2.82	0.76	11.62	12.81	24.53	52
chen	xxxxxxxxxf40	50	0.97	-3.2	0.76	11.95	13.08	24.53	53
edm1	xxxxxxxxxee4	251	0.97	0.99	0.61	8.22	13.17	14.72	89
empa	xxxxxxxxxe58	46	0.93	-0.86	0.51	10.56	13.06	9.19	142
empa	xxxxxxxxxf48	46	0.93	-0.5	0.57	8.03	10.05	9.19	109
empa	xxxxxxxxxb20	46	0.94	-0.5	0.57	8.05	10.11	9.19	110
lon1	xxxxxx4-1	264	0.82	5.23	0.46	3.41	4.83	10.77	45
lon1	xxxxxx4-2	264	0.82	5.08	0.45	3.66	5.37	10.77	50
lon1	xxxxxx6-1	264	0.8	5.22	0.44	3.77	5.42	10.77	50
lon1	xxxxxx6-2	264	0.82	5.21	0.46	3.39	4.83	10.77	45
lon2	xxxx2-1	235	0.87	1.99	0.47	3.67	5.66	6.55	86
lon2	xxxx2-2	235	0.86	1.46	0.45	4.95	6.87	6.55	105
lon2	xxxxxx3-1	290	0.84	2.2	0.44	3.84	5.79	6.56	88
lon2	xxxxxx3-2	290	0.83	2.16	0.41	4.61	6.93	6.56	106
otta	xxxxxxxxx170	242	0.93	-0.81	0.66	5.73	8.22	7.99	103
otta	xxxxxxxxx118	239	0.93	-0.9	0.66	5.95	8.5	8.22	103
ucam	xxxxxxx0-1	278	0.87	2.22	0.47	3.87	5.73	7.04	81
ucam	xxxxxxx0-2	278	0.87	2.28	0.49	3.27	4.93	7.04	70
ucam	xxxxxxx5-1	278	0.88	2.63	0.54	2.47	3.73	7.04	53
ucam	xxxxxxx5-2	278	0.86	2.18	0.47	3.72	5.54	7.04	79
ucam	xxxxxx9-1	278	0.86	2.3	0.47	3.72	5.55	7.04	79
ucam	xxxxxx9-2	278	0.87	2.25	0.47	3.8	5.66	7.04	80
vand	xxxxxxxx5-1	276	0.9	0.24	0.56	15.64	18.62	20.05	93
vand	xxxxxxxx5-2	274	0.89	0.24	0.51	19.09	22.61	20	113
vand	xxxxxx4-1	274	0.89	0.41	0.52	17.64	21.03	19.96	105
vand	xxxxxx4-2	276	0.89	0.54	0.54	15.91	19.11	20.09	95
vand	xxxxxx5-1	275	0.88	0.68	0.52	17.49	21.03	20.05	105
vand	xxxxxx5-2	274	0.9	0.71	0.52	17.39	20.89	20.02	104
Corrected									
Location	**Sensor ID**	**N**	**R^2**	**Intercept / (μg/m³)**	**Slope**	**MAE / (μg/m³)**	**RMSE / (μg/m³)**	**Mean / (μg/m³)**	**nRMSE / %**
anac	xxxxxxxxxaa8	122	0.92	2.25	0.69	1.44	2.25	6.34	35
anac	xxxxxxxxx2d8	194	0.89	2.21	0.68	1.33	1.78	5.55	32
chen	xxxxxxxxxe2c	50	0.98	4.12	0.84	2.89	3.68	24.53	15
chen	xxxxxxxxx460	50	0.98	3.76	0.84	2.73	3.54	24.53	14
chen	xxxxxxxxxf40	50	0.98	3.71	0.85	2.71	3.52	24.53	14
edm1	xxxxxxxxxee4	251	0.97	2.13	0.78	2.88	5.68	14.72	39
empa	xxxxxxxxxe58	46	0.98	0.28	0.72	3.3	4.64	9.19	50
empa	xxxxxxxxxf48	46	0.97	0.23	0.87	1.4	2.09	9.19	23
empa	xxxxxxxxxb20	46	0.98	0.39	0.84	1.45	2.23	9.19	24
lon1	xxxxxx4-1	264	0.86	5.02	0.75	3.32	3.69	10.77	34
lon1	xxxxxx4-2	264	0.86	5.09	0.71	3.07	3.52	10.77	33
lon1	xxxxxx6-1	264	0.85	5.09	0.71	3.1	3.56	10.77	33
lon1	xxxxxx6-2	264	0.86	5.06	0.75	3.37	3.73	10.77	35
lon2	xxxx2-1	235	0.88	1.91	0.72	1.4	2.09	6.55	32
lon2	xxxx2-2	235	0.87	1.68	0.68	1.61	2.41	6.55	37
lon2	xxxxxx3-1	290	0.85	2.16	0.71	1.55	2.19	6.56	33
lon2	xxxxxx3-2	290	0.84	2.17	0.63	1.79	2.7	6.56	41
otta	xxxxxxxxx170	242	0.97	-0.04	0.91	1.18	2.29	7.99	29
otta	xxxxxxxxx118	239	0.97	0.06	0.9	1.24	2.38	8.22	29
ucam	xxxxxxx0-1	278	0.89	1.74	0.79	1.26	1.75	7.04	25
ucam	xxxxxxx0-2	278	0.89	1.83	0.86	1.33	1.79	7.04	25
ucam	xxxxxxx5-1	278	0.89	1.84	0.95	1.63	2.07	7.04	29
ucam	xxxxxxx5-2	278	0.89	1.67	0.81	1.23	1.72	7.04	24
ucam	xxxxxx9-1	278	0.88	2.16	0.8	1.47	1.95	7.04	28
ucam	xxxxxx9-2	278	0.89	2	0.79	1.36	1.84	7.04	26
vand	xxxxxxxx5-1	276	0.91	3.21	0.64	6.91	9.97	20.05	50
vand	xxxxxxxx5-2	274	0.9	3.07	0.58	9.51	13.12	20	66
vand	xxxxxx4-1	274	0.9	3.22	0.6	8.43	11.89	19.96	60
vand	xxxxxx4-2	276	0.9	3.45	0.63	7.04	10.32	20.09	51
vand	xxxxxx5-1	275	0.9	3.38	0.59	8.43	12	20.05	60
vand	xxxxxx5-2	274	0.91	3.41	0.59	8.31	11.91	20.02	59