**Supplemental Material**

Spatial patterns in summertime surface ozone in the southern Front Range of the Rocky Mountains, USA

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Chart

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**Table S1. A summary of results from A) nightly baseline checks at temporary sites that used the 2BTech model 205, and B) audits of temporary sites by a CDPHE independent QA team at three ozone levels during the 2018 Colorado Springs ozone studya,b,c**

**A.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **BLF** | **CAS** | **MON** | **NAV** | **RAM** |
| **Std. Dev.** | 0.44 | 0.33 | 0.42 | 0.50 | 0.44 |
| **Drift** | 0.20 | 0.27 | 0.61 | -1.0 | -0.81 |

**B.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Target** | **BLF** | **CAS** | **CC** | **MON** | **NAV** | **RAM** |
| **125ppb** | -1.6% | 2.8% | -7.5% | -0.6% | 0.6% | 4.3% |
| **75ppb** | -2.3% | 0.5% | -7.6% | -0.1% | 0.0% | 3.5% |
| **35ppb** | -7.8% | -5.2% | -9.7% | 0.6% | -0.5% | 2.4% |

a Positive values indicate the analyzer responded higher than the target

b Percentages are an average of six points per target  
c Criteria for auditing was 15%, the same for all regulatory equipment

**Table S2. Summary statistics for ozone mole fractions (ppb) during the June – September 2018 special ozone study**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **n** | **Minimum** | **Maximum** | **Mean** | **Std. Dev.** | **Std. Error** | **Variance** |
| **ACA** | 2921 | 1 | 82 | 42 | 17 | 0.3 | 283 |
| **BLF** | 2006 | 19 | 80 | 56 | 9 | 0.2 | 87 |
| **CAS** | 2761 | 9 | 90 | 49 | 12 | 0.2 | 136 |
| **CC** | 2791 | 0 | 78 | 34 | 19 | 0.4 | 343 |
| **MAN** | 2914 | 5 | 85 | 47 | 12 | 0.2 | 145 |
| **MON** | 2737 | 13 | 90 | 53 | 11 | 0.2 | 120 |
| **NAV** | 2642 | 11 | 90 | 53 | 11 | 0.2 | 122 |
| **RAM** | 2766 | 28 | 96 | 60 | 9 | 0.2 | 88 |

**Table S3. Variables used in the GAMs for both MAN and AFA sitesa**

|  |
| --- |
| **Variable** |
| Daily mean relative humidity |
| Daily maximum temperature |
| Geopotential height at 500 hPa |
| Wind quadrant (NE, SE, SW, NW) based on local winds |
| Month |

a In each GAM, all variables above have p-values of < 0.1, except for wind quadrant at AFA, which had a p-value of 0.14.

**Table S4. Training and cross-validation results for MDA8 values at MAN**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **N** | **Avg Residual (ppb)** | **R2** |
| **Training data** | 667 | -7.1 x 10-15 | 0.45 |
| **Cross validation data** | 72 | -1.8 x 10-1 | 0.51 |
| **All data** | 739 | 3.4 x 10-13 | 0.45 |

**Table S5. GAM count and residuals (ppb) for non-smoke and smoke days for MANa**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **Total** |
| **Non-smoke days: Count** | 10 | 31 | 94 | 96 | 80 | 105 | 84 | 500 |
| **Non-smoke days: Mean residual (ppb)** | -1.1 | -1.8 | -2.7 | 1.6 | 1.6 | -0.4 | -2.1 | -0.5 |
| **Smoke days: Count** | 0 | 5 | 12 | 22 | 33 | 0 | 36 | 108 |
| **Smoke days: Mean residual (ppb)** | ND | 1.8 | -0.2 | 3.0 | 4.6 | ND | 6.8 | 4.3 |

a Note that 131 days could not be classified as smoke or non-smoke due to missing HMS or PM**2.5** data. From 2014 until 6/24/2016, PM**2.5** data is only available is every three days, but starting on 6/24/2016, the data are available nearly every day. Thus for 2014 and 2015 the number of days that can be identified as smoke or non-smoke are very limited

**Table S6. Training and cross-validation results for MDA8 values at AFA**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **N** | **Avg Residual (ppb)** | **R2** |
| **Training data** | 671 | 4.4 x 10-13 | 0.40 |
| **Cross-validation data** | 75 | 0.56 | 0.51 |
| **All data** | 746 | 1.9 x 10-13 | 0.42 |

**Table S7. GAM count and residuals (ppb) for non-smoke and smoke days for AFAa**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **Total** |
| **No smoke days: Count** | 10 | 32 | 93 | 98 | 83 | 104 | 85 | 505 |
| **No smoke days: Mean residual (ppb)** | -2.7 | -1.8 | -1.3 | 0.8 | 0.9 | -1.1 | -1.5 | -0.6 |
| **Smoke days: Count** | 0 | 5 | 12 | 22 | 35 | 0 | 36 | 110 |
| **Smoke days: Mean residual (ppb)** | ND | 1.4 | 1.6 | 2.4 | 4.6 | ND | 7.6 | 4.7 |

a Note that 131 days could not be classified as smoke or non-smoke due to missing HMS or PM**2.5** data. From 2014 until 6/24/2016, PM**2.5** data is only available is every three days, but starting on 6/24/2016, the data are available nearly every day. Thus for 2014 and 2015 the number of days that can be identified as smoke or non-smoke are very limited.

**Table S8. High ozone event dates, durations, and peak ozone during the 2018 ozone study**

|  |  |  |
| --- | --- | --- |
| **Date** | **Duration** | **Peak 1-hr Ozone (ppb)** |
| June 12, 2018 | 2:00-16:00 (14 hours) | 85 |
| July 6, 2018 | 6:00-15:00 (9 hours) | 96 |
| July 14, 2018 – July 15, 2018 | 4:00-5:00 (25 hours) | 90 |
| July 18, 2018 – July 19, 2018 | 8:00-2:00 (18 hours) | 85 |
| July 31, 2018 – August 3, 2018 | 7:00-2:00 (67 hours) | 92 |

**Data S1. Hourly ozone data collected for the 2018 CDPHE special study of the Pikes Peak region**