

1 **Supporting Information:**
2 **Changes in ozone chemical sensitivity in the U.S. from 2007 to 2016**

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85 Table S1. Modeled anthropogenic NO_x and VOC emissions for 2007 and 2016 simulations.

state	VOC			NO _x		
	2007 (tons)	2016 (tons)	% change (2016-2007)	2007 (tons)	2016 (tons)	% change (2016-2007)
Alabama	410,008	388,485	-5.2%	419636	281698	-32.9%
Arizona	255,738	240,967	-5.8%	323376	183004	-43.4%
Arkansas	308,889	379,139	22.7%	239762	181729	-24.2%
California	1,146,194	1,322,224	15.4%	1008339	531648	-47.3%
Colorado	333,995	276,843	-17.1%	306532	223686	-27.0%
Connecticut	88,514	77,123	-12.9%	100091	54490	-45.6%
Delaware	29,192	18,735	-35.8%	48138	24112	-49.9%
District of Columbia	10,571	8,357	-20.9%	13269	7515	-43.4%
Florida	873,743	674,565	-22.8%	935493	495966	-47.0%
Georgia	636,242	529,453	-16.8%	642853	317161	-50.7%
Idaho	615,961	378,552	-38.5%	99071	89296	-9.9%
Illinois	460,970	380,843	-17.4%	694161	377208	-45.7%
Indiana	327,805	267,135	-18.5%	563814	331265	-41.2%
Iowa	179,029	200,907	12.2%	279672	180458	-35.5%
Kansas	278,501	290,110	4.2%	321857	240720	-25.2%
Kentucky	230,957	347,315	50.4%	417682	237296	-43.2%
Louisiana	481,043	724,381	50.6%	543347	348429	-35.9%
Maine	79,529	56,771	-28.6%	74939	45785	-38.9%
Maryland	158,045	112,581	-28.8%	240267	119404	-50.3%
Massachusetts	172,631	138,330	-19.9%	179821	116785	-35.1%
Michigan	503,108	370,754	-26.3%	606407	327744	-46.0%
Minnesota	397,625	572,937	44.1%	435225	234023	-46.2%
Mississippi	255,017	211,462	-17.1%	263627	150342	-43.0%
Missouri	354,001	472,624	33.5%	478210	323218	-32.4%
Montana	350,865	212,660	-39.4%	155666	105102	-32.5%
Nebraska	102,386	96,488	-5.8%	234450	158917	-32.2%
Nevada	124,489	85,794	-31.1%	110055	71136	-35.4%
New Hampshire	55,397	39,178	-29.3%	54087	33386	-38.3%
New Jersey	238,943	160,792	-32.7%	270176	136539	-49.5%
New Mexico	183,200	302,826	65.3%	220065	179884	-18.3%
New York	503,981	386,431	-23.3%	488560	282666	-42.1%
North Carolina	530,243	540,017	1.8%	470671	274418	-41.7%
North Dakota	55,742	531,851	854.1%	158412	158627	0.1%
Ohio	444,929	373,759	-16.0%	771219	361919	-53.1%
Oklahoma	496,050	572,874	15.5%	426475	324256	-24.0%
Oregon	409,074	468,012	14.4%	186806	127172	-31.9%
Pennsylvania	435,528	513,199	17.8%	642934	409785	-36.3%
Rhode Island	25,122	21,982	-12.5%	22780	21849	-4.1%

South Carolina	271,968	228,420	-16.0%	259348	162372	-37.4%
South Dakota	76,243	141,167	85.2%	76331	54238	-28.9%
Tennessee	313,919	363,226	15.7%	455825	249996	-45.2%
Texas	2,367,214	1,946,787	-17.8%	1651844	1114117	-32.6%
Utah	241,181	211,955	-12.1%	218065	145529	-33.3%
Vermont	29,224	26,846	-8.1%	22380	14043	-37.3%
Virginia	336,864	291,636	-13.4%	408377	238065	-41.7%
Washington	451,071	374,690	-16.9%	341231	217652	-36.2%
West Virginia	105,294	240,617	128.5%	283523	164021	-42.1%
Wisconsin	326,001	229,453	-29.6%	314846	206884	-34.3%
Wyoming	255,149	437,101	71.3%	243837	155264	-36.3%
National	17,317,384	17,240,984	-0.4%	17723555	10832402	-38.9%

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88 **Table S2: Chemical regime determinations based on differences in May-Sep weekend and weekday**
89 **MDA8 O₃ values. “NO_x Lim” (NO_x-limited) or “NO_x Sat” (NO_x-saturated) categorization indicate**
90 **Welch’s t test p-values for mean WE-WD differences of less than 0.05. Double asterisks (**)**
91 **indicate p-values less than 0.01. Italics indicate different categorization between the measured and**
92 **modeled values. Bold indicates different signs for the measured and modeled WE-WD differences.**

Region	Area	Weekend – Weekday Differences (ppb)							
		2007				2016			
		Measured		Modeled		Measured		Modeled	
		mean	category	mean	category	mean	category	mean	category
Northeast	Baltimore	-5.3**	<i>NO_x Lim</i>	-2.3	<i>Mixed</i>	-6.9**	NO _x Lim	-5.2**	NO _x Lim
	Greater Connecticut	-7.2**	<i>NO_x Lim</i>	-1.7	<i>Mixed</i>	-6.2**	NO _x Lim	-3.5	NO _x Lim
	New York	-3.3**	<i>NO_x Lim</i>	1.0	<i>Mixed</i>	-4.6**	NO _x Lim	-2.2**	NO _x Lim
	Philadelphia	-4.1**	<i>NO_x Lim</i>	-0.3	<i>Mixed</i>	-5.0**	NO _x Lim	-3.7**	NO _x Lim
	Washington	-4.8**	<i>NO_x Lim</i>	-1.4	<i>Mixed</i>	-5.3**	NO _x Lim	-3.9**	NO _x Lim
Southeast	Atlanta	-1.6	Mixed	0.3	Mixed	-5.8**	NO _x Lim	-4.9**	NO _x Lim
Ohio Valley	Chicago	-0.5	<i>Mixed</i>	2.6**	<i>NO_x Sat</i>	-1.8**	NO _x Lim	-1.9**	NO _x Lim
	Cincinnati	0.1	Mixed	-0.8	Mixed	-0.3	Mixed	-0.4	Mixed
	Cleveland	-7.7**	NO _x Lim	-4.6**	NO _x Lim	-4.3**	<i>NO_x Lim</i>	-1.7	<i>Mixed</i>
	Columbus	-5.5**	NO _x Lim	-4.2**	NO _x Lim	-3.8**	<i>NO_x Lim</i>	-1.5	<i>Mixed</i>
	Louisville	-0.4	Mixed	1.4	Mixed	-0.5	Mixed	-0.9	Mixed
	St. Louis	-1.4	<i>Mixed</i>	4.6**	<i>NO_x Sat</i>	-2.1	<i>NO_x Lim</i>	-0.7	<i>Mixed</i>
Upper Midwest	Allegan Co, MI	-4.7	Mixed	-1.6	Mixed	-6.1	NO _x Lim	-5.8	NO _x Lim
	Berrien Co, MI	-4.6	Mixed	-2.6	Mixed	-5.2	Mixed	-5.5	Mixed
	Detroit	-5.8**	<i>NO_x Lim</i>	-1.3	<i>Mixed</i>	-3.2**	NO _x Lim	-3.7**	NO _x Lim
	Door Co, WI	-2.9	Mixed	-1.9	Mixed	-1.0	Mixed	-0.1	Mixed
	Manitowoc Co, WI	-1.3	Mixed	0.4	Mixed	-2.1	Mixed	-3.1	Mixed
	Muskegon Co, WI	-6.2	Mixed	-1.1	Mixed	-3.9	Mixed	-4.3	Mixed
	Northern Milwaukee	0.1	Mixed	2.1	Mixed	-2.6	Mixed	-2.5	Mixed
	Sheboygan Co, WI	-1.9	Mixed	0.7	Mixed	-2.7	Mixed	-3.2	Mixed
South	Dallas	-2.2	<i>NO_x Lim</i>	5.0**	<i>NO_x Sat</i>	-3.1**	NO _x Lim	-2.1**	NO _x Lim
	Houston	2.4	NO _x Sat	6.4**	NO _x Sat	-2.3**	NO _x Lim	-7.1**	NO _x Lim
	San Antonio	1.8	Mixed	2.0	Mixed	-3.1	NO _x Lim	-5.2**	NO _x Lim
Southwest	Denver	2.2	NO _x Sat	6.1	NO _x Sat	-1.2	Mixed	-0.5	Mixed
	Dona Ana Co, NM	1.7	<i>Mixed</i>	3.3	<i>NO_x Sat</i>	2.3	<i>Mixed</i>	2.8	<i>NO_x Sat</i>
	Northern Wasatch Front	1.7	NO _x Sat	3.1**	NO _x Sat	-0.4	<i>Mixed</i>	-1.6	<i>NO_x Lim</i>

	Phoenix	-2.6**	NO _x Lim	-1.5	NO _x Lim	-1.1**	NO _x Lim	-0.2	Mixed
	Southern Wasatch Front	0.3	Mixed	2.6	NO _x Sat	-1.2	Mixed	-1.3	Mixed
West	Amador Co, CA	-5.6	NO _x Lim	-5.0	NO _x Lim	-2.9	Mixed	-3.6	Mixed
	Butte Co, CA	-6.5	NO _x Lim	-4.7	Mixed	-5.1**	NO _x Lim	-5.5**	NO _x Lim
	Calaveras Co, CA	-5.2	NO _x Lim	-4.2	Mixed	-2.9	Mixed	-3.3	Mixed
	Imperial Co, CA	-2.3	Mixed	-3.4**	NO _x Lim	-5.1**	NO _x Lim	-6.0**	NO _x Lim
	Kern	0.7	Mixed	-2.3	Mixed	-3.8	Mixed	-2.0	Mixed
	Las Vegas	0.3	Mixed	-0.4	Mixed	-1.2	Mixed	0.4	Mixed
	Los Angeles	11.4**	NO _x Sat	12.2**	NO _x Sat	-1.8	NO _x Lim	1.3	Mixed
	Mariposa Co, CA	0.1	Mixed	-0.9	Mixed	-1.1	Mixed	-1.2	Mixed
	Morongo Band of Mission Indians	1.0	Mixed	4.1	Mixed	-9.4**	NO _x Lim	-5.8**	NO _x Lim
	Nevada Co, CA	-4.7	NO _x Lim	-3.9	NO _x Lim	-5.3	Mixed	-5.9	NO _x Lim
	Riverside	-0.6	Mixed	0.0	Mixed	-6.8**	NO _x Lim	-4.2**	NO _x Lim
	Sacramento	-4.8**	NO _x Lim	-3.6**	NO _x Lim	-2.4**	NO _x Lim	-3.4**	NO _x Lim
	San Bernardino	1.9	Mixed	2.1	NO _x Sat	-6.3**	NO _x Lim	-4.2**	NO _x Lim
	San Diego	4.1**	NO _x Sat	3.2**	NO _x Sat	-0.8	Mixed	1.5	Mixed
	San Francisco	-1.7**	NO _x Lim	-3.7**	NO _x Lim	2.1**	NO _x Sat	2.6**	NO _x Sat
	San Joaquin Valley	-3.1**	NO _x Lim	-3.2**	NO _x Lim	-2.5**	NO _x Lim	-2.5**	NO _x Lim
	San Luis Obispo	-4.4	NO _x Lim	-2.8	NO _x Lim	-2.6	Mixed	-1.0	Mixed
	Sutter Buttes	-6.6**	NO _x Lim	-4.7	NO _x Lim	-3.8	Mixed	-4.7	NO _x Lim
	Tuolumne Co, CA	-3.6	Mixed	-2.8	Mixed	-1.6	Mixed	-2.2	Mixed
	Tuscan Buttes	-6.2	NO _x Lim	-5.0	NO _x Lim	-5.9	NO _x Lim	-4.5	NO _x Lim
Ventura Co, CA	3.8**	NO _x Sat	0.4	Mixed	-3.6**	NO _x Lim	-3.6**	NO _x Lim	

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95 Table S3: Chemical regime determinations based on differences in May-Sep weekend and weekday MDA8 O₃ values at the monitor
 96 with the highest 2016 O₃ design value in each nonattainment area. NO_x Lim or NO_x Sat categorization indicate t test p-values for
 97 mean WE-WD differences of less than 0.05. Double asterisks (**) indicate p-values less than 0.01.

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region	Site number	area	Weekend – Weekday Differences (ppb)							
			2007				2016			
			Measured		Measured		Measured		Measured	
mean	mean	mean	mean	mean	mean	mean	mean			
Northeast	240251001	Baltimore	-5.7	mixed	-1.5	mixed	-6.8	Nox Lim	-6.3	mixed
	90110124	Greater Connecticut	-4.3	mixed	2.1	mixed	-5.8	mixed	-5.7	mixed
	90019003	New York	-4.1	mixed	-0.3	mixed	-6.5	mixed	-2.3	mixed
	421010024	Philadelphia	-4.6	mixed	2.7	mixed	-4.6	mixed	-1.7	mixed
	240338003	Washington	-5.6	mixed	-4.1	mixed	-5.5	Nox Lim	-5.1	mixed
Southeast	131210055	Atlanta	-1.5	mixed	2.9	mixed	-5.8	mixed	-4.0	mixed
Ohio Valley	550590019	Chicago	0.0	mixed	2.5	mixed	-3.9	mixed	-2.5	mixed
	390610006	Cincinnati	1.0	mixed	0.2	mixed	0.3	mixed	0.6	mixed
	390850003	Cleveland	-8.9**	Nox Lim	-1.3	mixed	-5.5	mixed	-1.2	mixed
	390490029	Columbus	-7.5	Nox Lim	-4.2	mixed	-4.5	Nox Lim	-1.8	mixed
	180190008	Louisville	-2.9	mixed	-1.2	mixed	-2.0	mixed	-1.8	mixed
	180431004	Louisville	-0.1	mixed	1.7	mixed	-1.2	mixed	-2.3	mixed
	291831002	St. Louis	-3.7	mixed	4.0	mixed	-3.2	mixed	-1.5	mixed
Upper Midwest	260050003	Allegan Co, MI	-4.7	mixed	-1.6	mixed	-6.1	Nox Lim	-5.8	Nox Lim
	260210014	Berrien Co, MI	-4.6	mixed	-2.6	mixed	-5.2	mixed	-5.5	mixed
	261630019	Detroit	-6.9	mixed	1.3	mixed	-4.8	mixed	-2.9	mixed
	550290004	Door Co, WI	-2.9	mixed	-1.9	mixed	-1.0	mixed	-0.1	mixed
	550710007	Manitowoc Co, WI	-1.3	mixed	0.4	mixed	-2.1	mixed	-3.1	mixed
	261210039	Muskegon Co, MI	-6.2	mixed	-1.1	mixed	-3.9	mixed	-4.3	mixed
	550890009	Northern Milwaukee	-0.3	mixed	1.0	mixed	-2.5	mixed	-3.5	mixed
	551170006	Sheboygan Co, MI	-1.9	mixed	0.7	mixed	-2.7	mixed	-3.2	mixed
South	482010024	Houston	1.4	mixed	6.7	mixed	-3.2	mixed	-7.1	Nox Lim
	480290032	San Antonio	2.7	mixed	3.7	mixed	-3.1	mixed	-5.1	mixed

	481210034	Dallas	-4.8	mixed	5.3	mixed	-5.1	mixed	-3.7	mixed
Southwest	80590011	Denver	1.6	mixed	7.6	Nox Sat	-2.0	mixed	0.6	mixed
	350130022	Dona Ana Co, NM	1.8	mixed	2.1	mixed	2.2	mixed	2.4	mixed
	350130021	Dona Ana Co, NM	1.6	mixed	3.9	mixed	2.3	mixed	3.2	mixed
	490353006	Northern Wasatch Front, UT	3.2	mixed	4.0	mixed	1.1	mixed	-1.3	mixed
	40132005	Phoenix	-5.1	Nox Lim	-2.3	mixed	-1.9	mixed	-3.1	mixed
	40139997	Phoenix	-0.3	mixed	3.1	mixed	-1.4	mixed	1.7	mixed
	490490002	Southern Wasatch Front, UT	1.4	mixed	2.7	mixed	-0.2	mixed	-0.9	mixed
	490471002	Uinta Basin, UT	-1.5	mixed	1.5	mixed	0.1	mixed	-0.3	mixed
West	60050002	Amador Co, CA	-5.6	Nox Lim	-5.0	Nox Lim	-2.9	mixed	-3.6	mixed
	60070007	Butte Co, CA	-6.5	Nox Lim	-4.7	mixed	-6.0	Nox Lim	-5.7	Nox Lim
	60090001	Calaveras Co, CA	-5.2	Nox Lim	-4.2	mixed	-2.9	mixed	-3.3	mixed
	60250005	Imperial Co, CA	-1.6	mixed	-4.6	mixed	-3.2	mixed	-5.8	Nox Lim
	60290011	Kern Co, CA	0.7	mixed	-2.3	mixed	-3.8	mixed	-2.0	mixed
	320030075	Las Vegas	0.5	mixed	-1.1	mixed	-2.2	mixed	-0.6	mixed
	60658001	Los Angeles	9.0**	Nox Sat	16.4**	Nox Sat	-3.4	mixed	1.4	mixed
	60376012	Los Angeles	8.9	Nox Sat	6.0	mixed	-7.1	Nox Lim	-4.1	mixed
	60430003	Mariposa Co, CA	-1.6	mixed	-1.4	mixed	0.1	mixed	-0.4	mixed
	60650012	Morongo Band of Mission Indians	0.1	mixed	5.2	Nox Sat	-10.7**	Nox Lim	-5.7	Nox Lim
	60570005	Nevada Co, CA	-5.7	mixed	-3.9	mixed	-5.3	mixed	-5.9	Nox Lim
	60655001	Riverside Co, CA	2.2	mixed	0.1	mixed	-9.5**	Nox Lim	-5.5	Nox Lim
	60170010	Sacramento	-5.5	mixed	-4.1	mixed	-5.3	mixed	-4.7	mixed
	60731006	San Diego Co, CA	4.1	mixed	-0.6	mixed	-4.3	mixed	-1.2	mixed
	60010007	San Francisco Bay Area	-1.9	mixed	-4.0	mixed	0.8	mixed	3.7	mixed
	60194001	San Joaquin Valley	-2.3	mixed	-4.3	mixed	-6.5	Nox Lim	-4.3	mixed
	60798005	San Luis Obispo	-4.7	mixed	-2.7	mixed	-2.2	mixed	-1.4	mixed
	61010004	Sutter Buttes	-6.6	Nox Lim	-4.7	Nox Lim	-3.8	mixed	-4.7	Nox Lim
	61090005	Tuolumne Co, CA	-3.6	mixed	-2.8	mixed	-1.6	mixed	-2.2	mixed
	61030004	Tuscan Buttes, CA	-6.2	Nox Lim	-5.0	Nox Lim	-5.9	Nox Lim	-4.5	Nox Lim
61112002	Ventura Co, CA	6.8	Nox Sat	0.8	mixed	-5.2	Nox Lim	-4.7	mixed	

101 Table S4. Ypsilanti monitor MDA8 from the top 9 high days modeled in the 2007 simulation,
 102 these same days projected to 2016 values using the 2007 HDDM sensitivities and assuming 2016
 103 emission levels (0.55 NO_x and 0.75 VOC of 2007 emissions), and the top 9 high days modeled in
 104 the 2016 simulation. Averages across each set of 9 days are shown in bold italics in the bottom
 105 row.

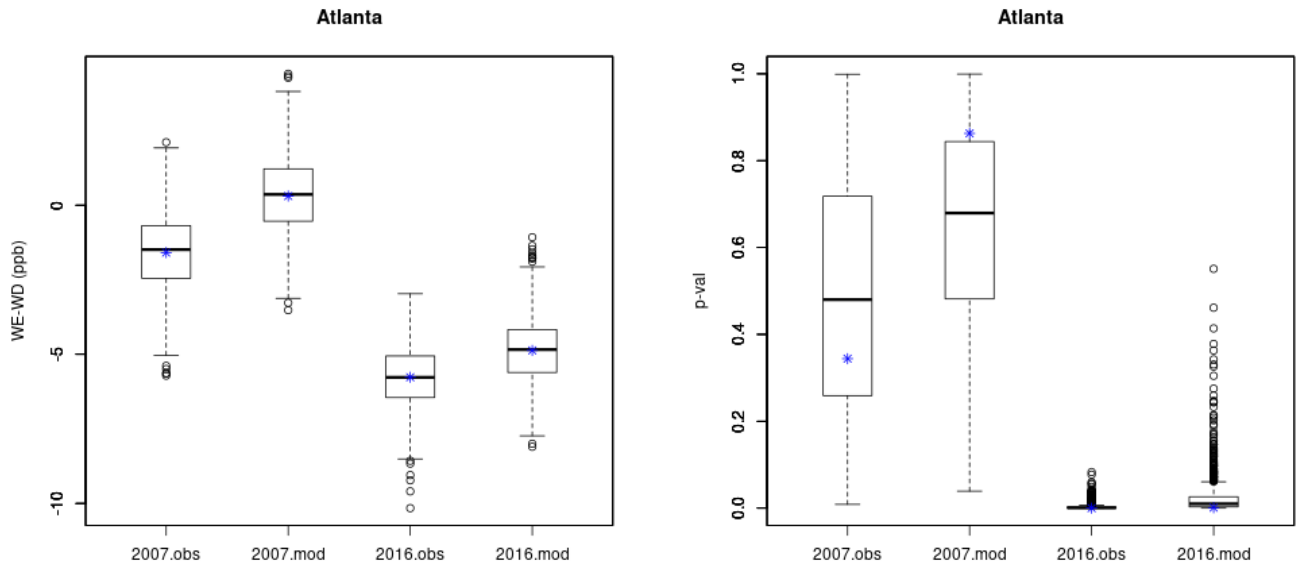
Modeled 2007	Projected 2016	Modeled 2016
79.68	73.01	77.14
79.43	71.81	71.92
79.21	79.67	71.13
77.72	69.15	65.65
75.43	65.54	63.67
72.64	73.39	63.19
72.63	70.90	62.38
70.55	65.32	62.03
70.05	71.68	61.61
<i>75.26</i>	<i>71.16</i>	<i>66.52</i>

106

107

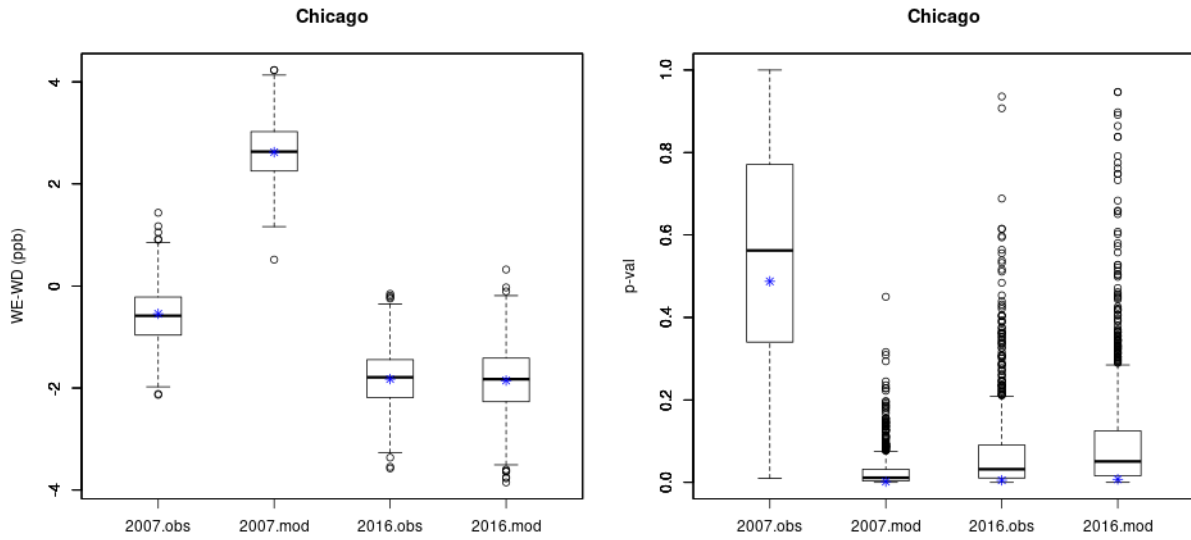
108 **Monte Carlo DOW Analysis Testing**

109 To investigate the sensitivity of our DOW analysis results to the observations used, we
110 performed Monte Carlo analyses for four of the most populated non-attainment areas in our
111 study: Atlanta, Chicago, Houston, and Los Angeles. For each area, 1000 Monte Carlo
112 simulations were performed. For each case, weekday values were randomly sampled without
113 replacement and the Welch's t-test comparison was re-run for the weekend vs. re-sampled
114 weekday values. This was repeated 100 times and the distributions of p-values and WE-WD
115 differences were recorded. Blue stars indicate values from the original analysis that includes all
116 weekday data.



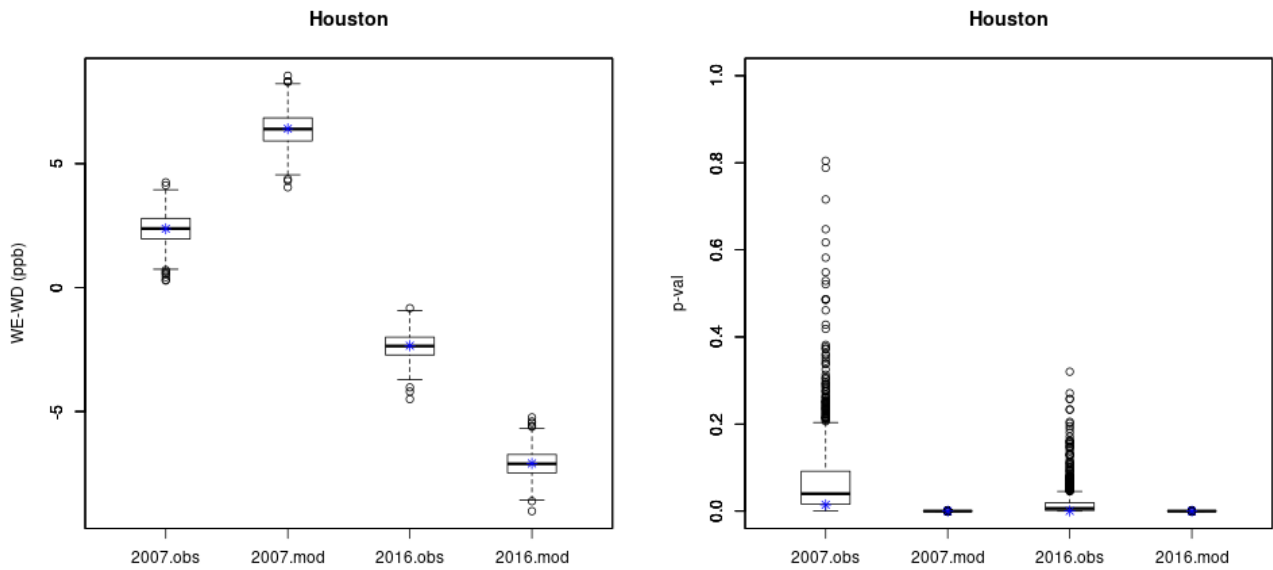
117
118

119 Figure S1. Monte Carlo results to randomize observations selected in DOW analysis – Atlanta.
120 For 2007, both the modeled and observed distributions have insignificant p-values and ranges of
121 WE-WD differences that cross 0. For 2016, both the modeled and observed distributions have
122 consistently negative WE-WD differences and mostly significant p-values (there are some outlier
123 insignificant p-values in the modeled dataset).



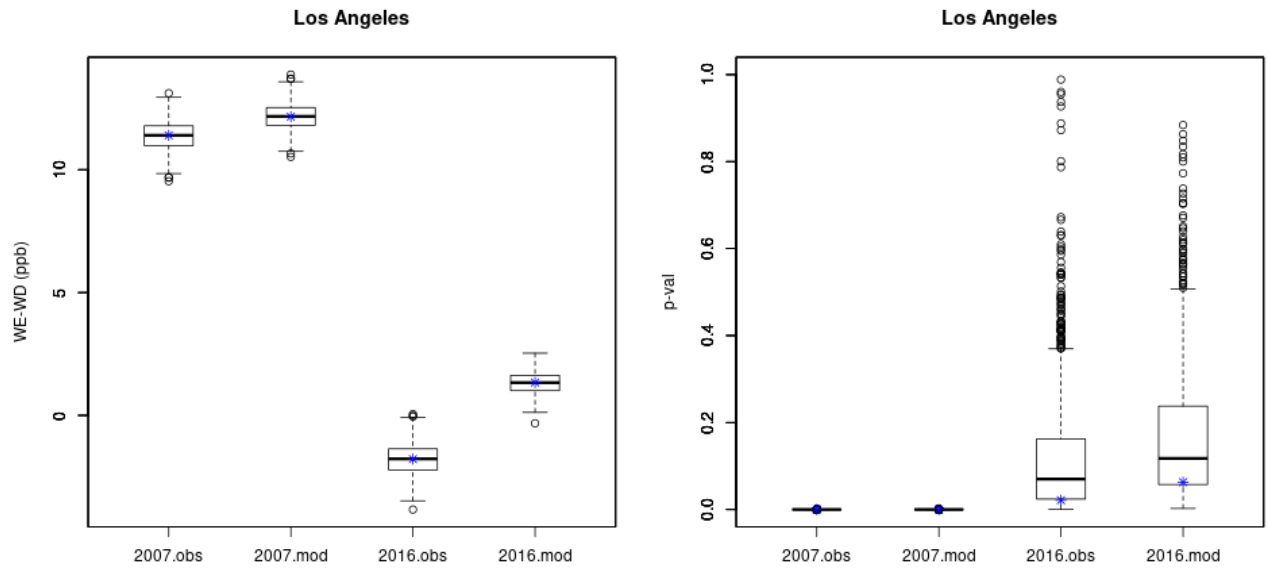
124

125 Figure S2. Monte Carlo results to randomize observations selected in DOW analysis – Chicago.
 126 For 2007, the observations have insignificant p-values and ranges of WE-WD differences that
 127 cross 0. Modeled values for 2007 have mostly significant p-values and consistently positive WE-
 128 WD differences. In 2016, both the modeled and observed values have consistently negative WE-
 129 WD differences and generally significant p-values, although the non-outlier range for the p-
 130 values goes up to 0.2 for the observations and 0.3 for the model.



131

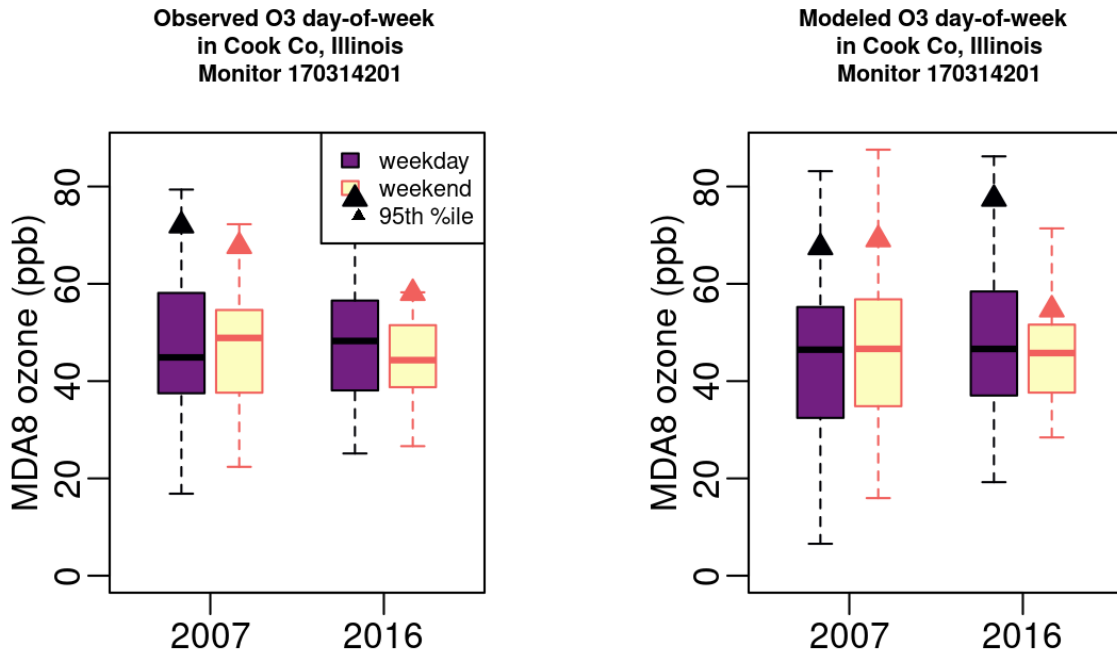
132 Figure S3. Monte Carlo results to randomize observations selected in DOW analysis – Houston.
 133 In 2007, both the modeled and observed distributions have generally significant p-values and
 134 positive WE-WD differences. Observed p-values have a wider range and WE-WD differences
 135 are less positive. In 2016, both the modeled and observed distributions have consistently
 136 negative WE-WD differences and mostly significant p-values (there are some insignificant
 137 outlier p-values in the 2016 observational dataset).



138

139 Figure S4. Monte Carlo results to randomize observations selected in DOW analysis – Los
 140 Angeles. In 2007, both the modeled and observed distributions have significant p-values and
 141 consistently positive WE-WD differences. In 2016, both the modeled and observed distributions
 142 have ranges of WE-WD differences that cross 0 and mostly insignificant p-values (original 2016
 143 observational p-value was less than 0.05 but above 0.01).

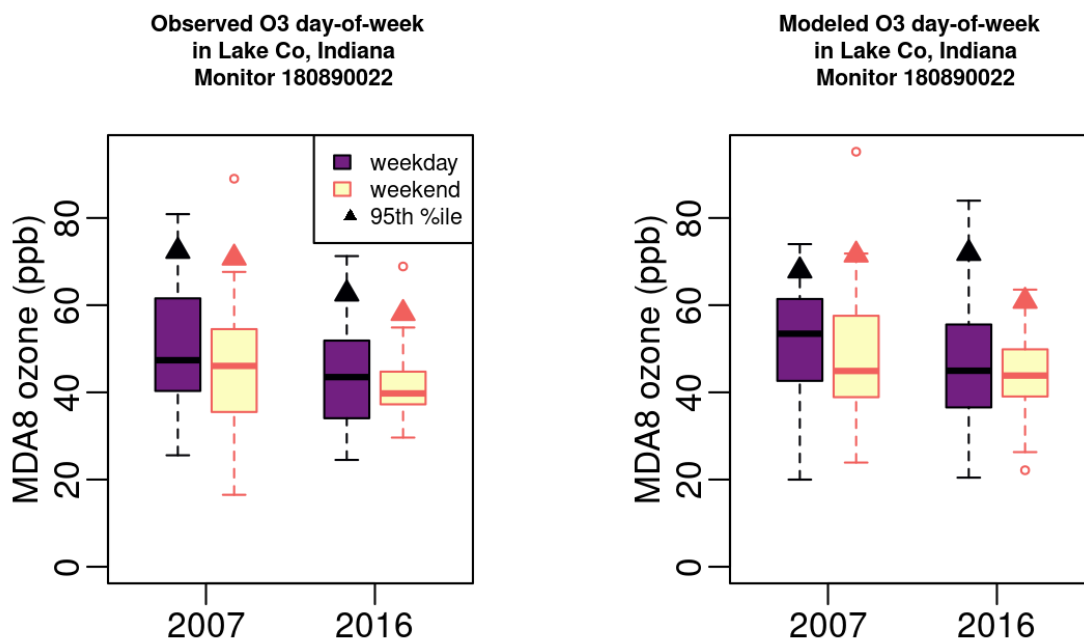
144



145

146 Figure S5. May-September weekday versus weekend MDA8 O3 at the Northbrook, IL monitor
 147 (170314201) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 148 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 149 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 150 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 151 statistically different distributions on weekends versus weekdays are outlined in bold.

152

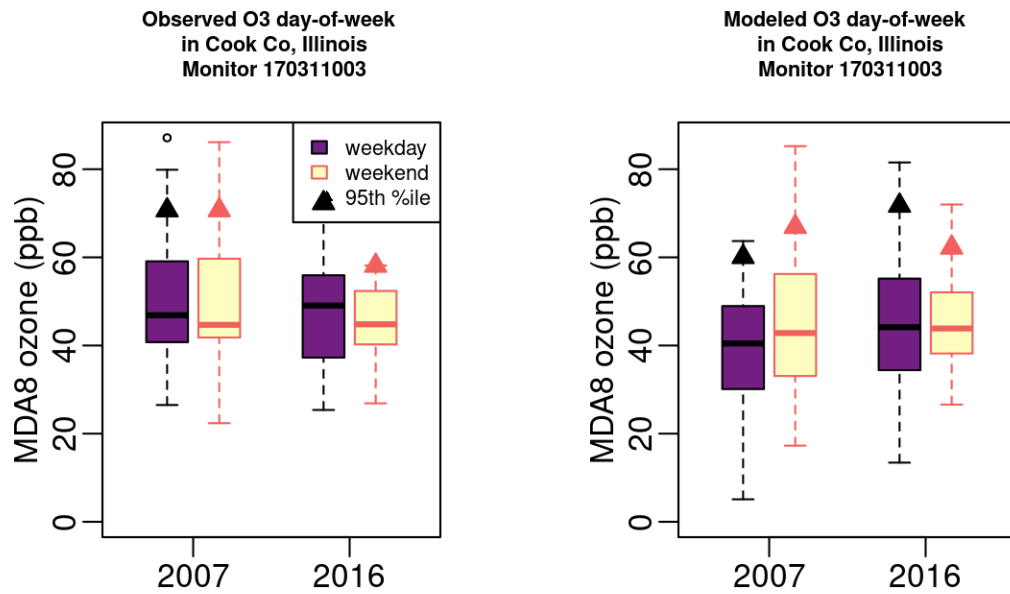


153

154 Figure S6. May-September weekday versus weekend MDA8 O3 at the Gary, IN monitor
 155 (180890022) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 156 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 157 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 158 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 159 statistically different distributions on weekends versus weekdays are outlined in bold.

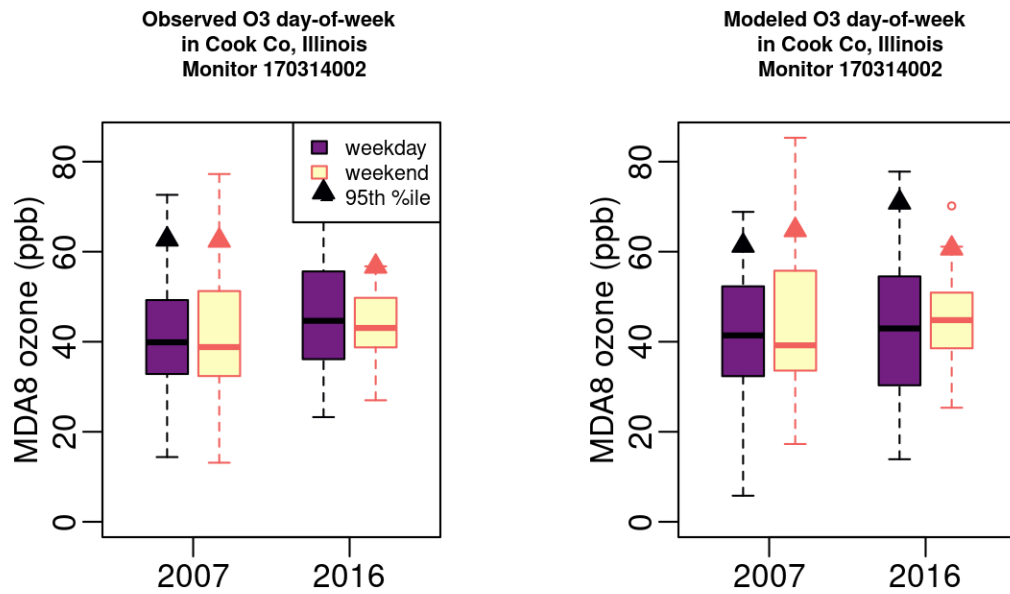
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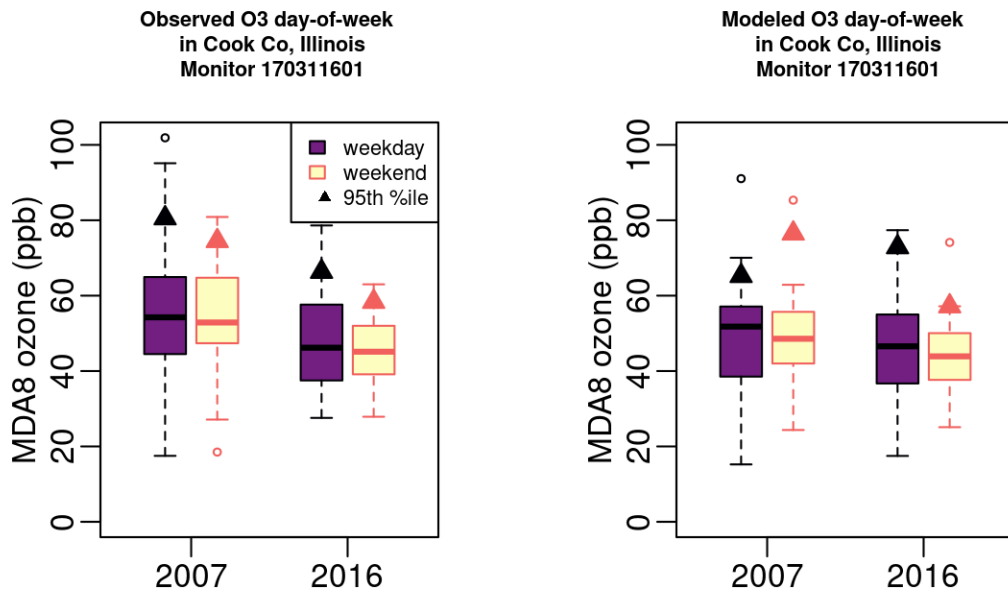
162

163 Figure S7. May-September weekday versus weekend MDA8 O₃ concentrations at the monitor
 164 located southeast of O'Hare International airport (170311003) for 2007 and 2016 based on
 165 monitored values (left panel) and modeled values in grid cells containing monitor location (right
 166 panel). Boxes represent the 25th-75th percentile, horizontal lines represent median values,
 167 whiskers extend to $1.5 \times$ the interquartile range, dots show outlier values and triangles represent
 168 95th percentile values. Boxplot pairs that have statistically different distributions on weekends
 169 versus weekdays are outlined in bold.



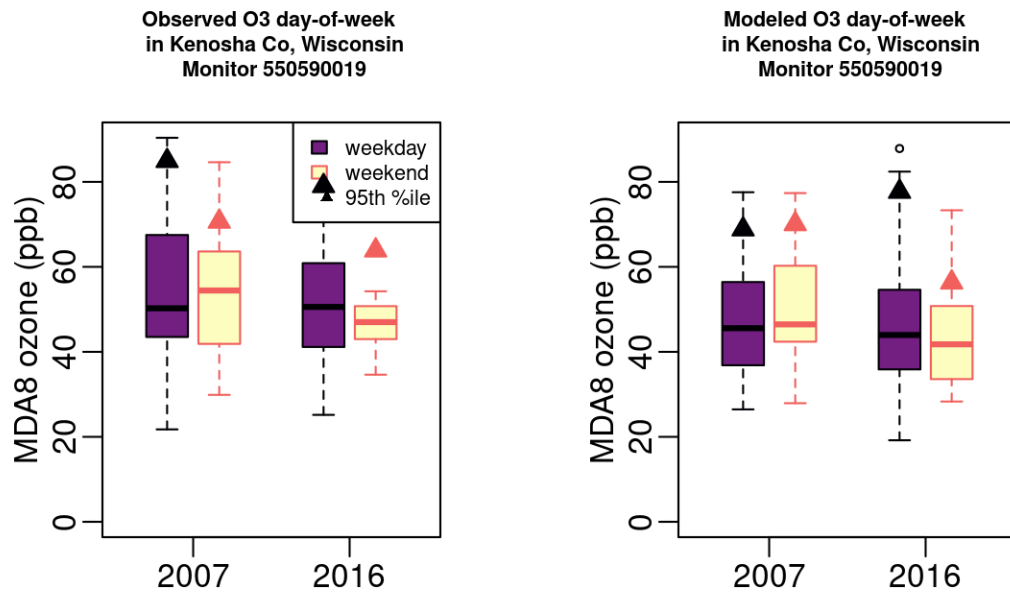
170

171 Figure S8. May-September weekday versus weekend MDA8 O3 at the Cicero, IL monitor
 172 (170314002) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 173 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 174 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 175 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 176 statistically different distributions on weekends versus weekdays are outlined in bold.



177

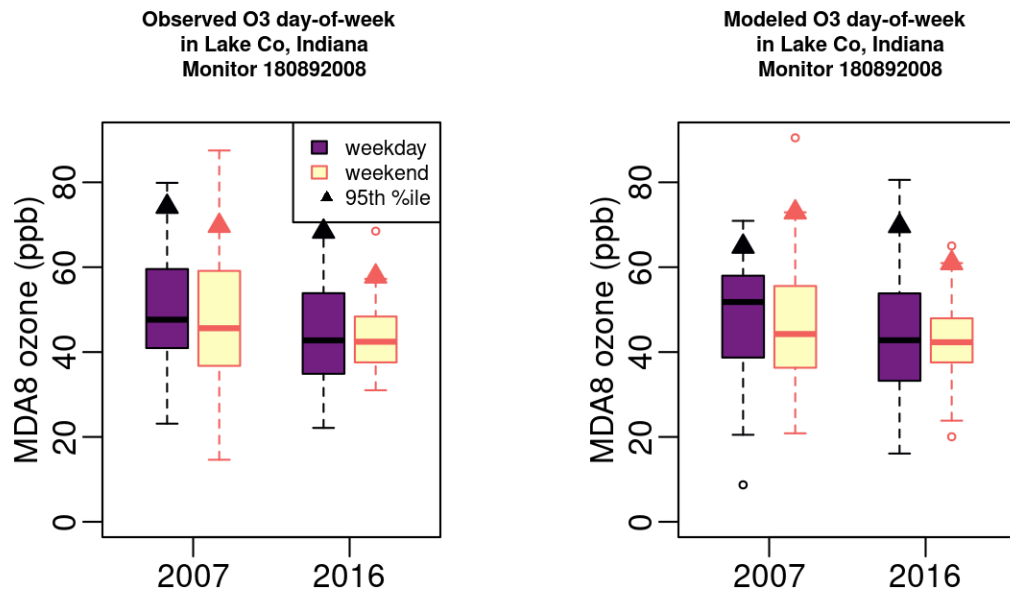
178 Figure S9. May-September weekday versus weekend MDA8 O3 at the Lemont, IL monitor
 179 (170311601) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 180 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 181 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 182 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 183 statistically different distributions on weekends versus weekdays are outlined in bold.



184

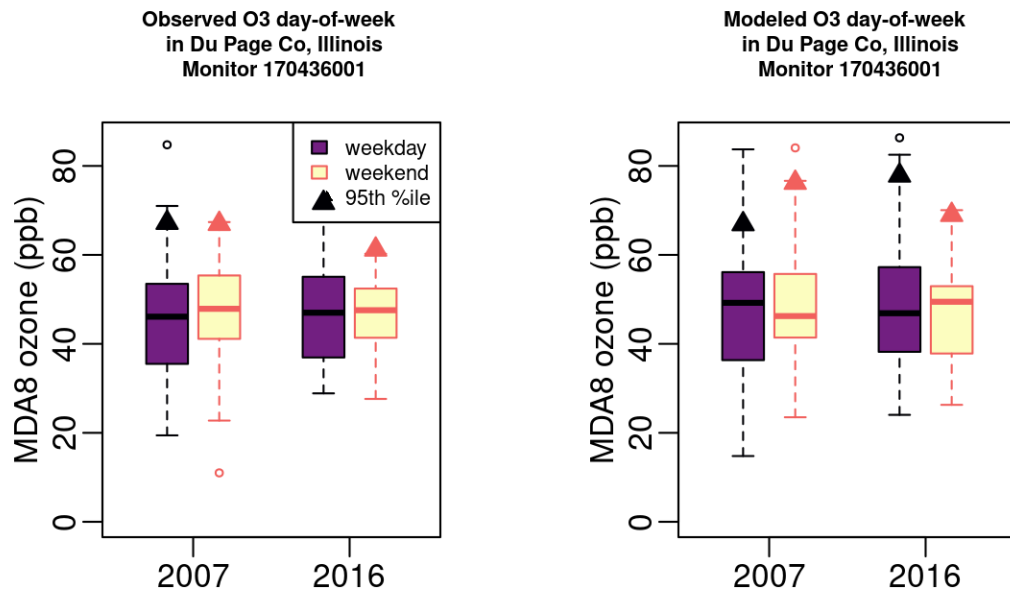
185 Figure S10. May-September weekday versus weekend MDA8 O3 at the Kenosha, WI monitor
 186 (550590019) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 187 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 188 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 189 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 190 statistically different distributions on weekends versus weekdays are outlined in bold.

191



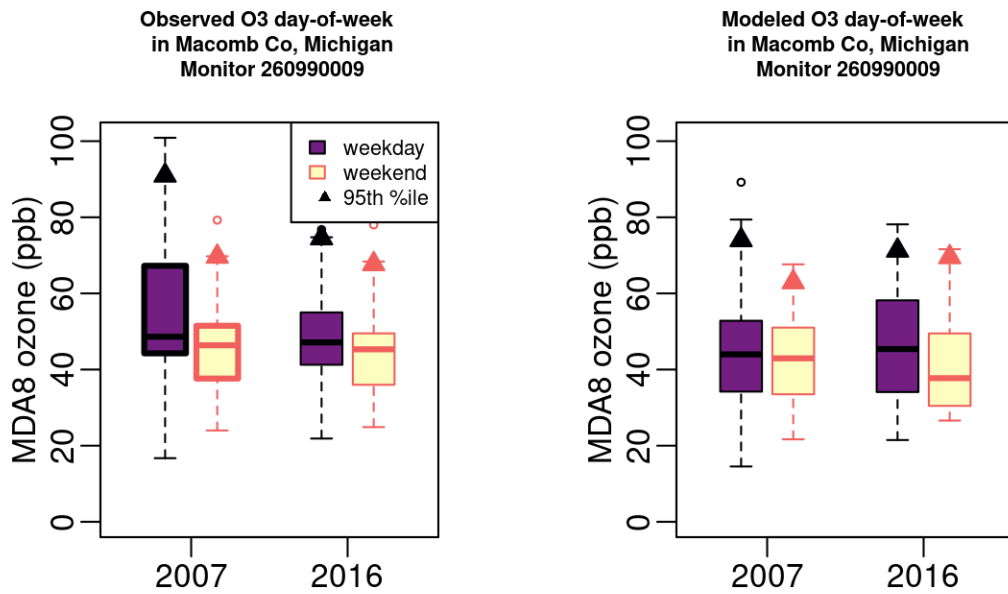
192

193 Figure S11. May-September weekday versus weekend MDA8 O₃ at the Hammond, IN monitor
 194 (180892008) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 195 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 196 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 197 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 198 statistically different distributions on weekends versus weekdays are outlined in bold.



199

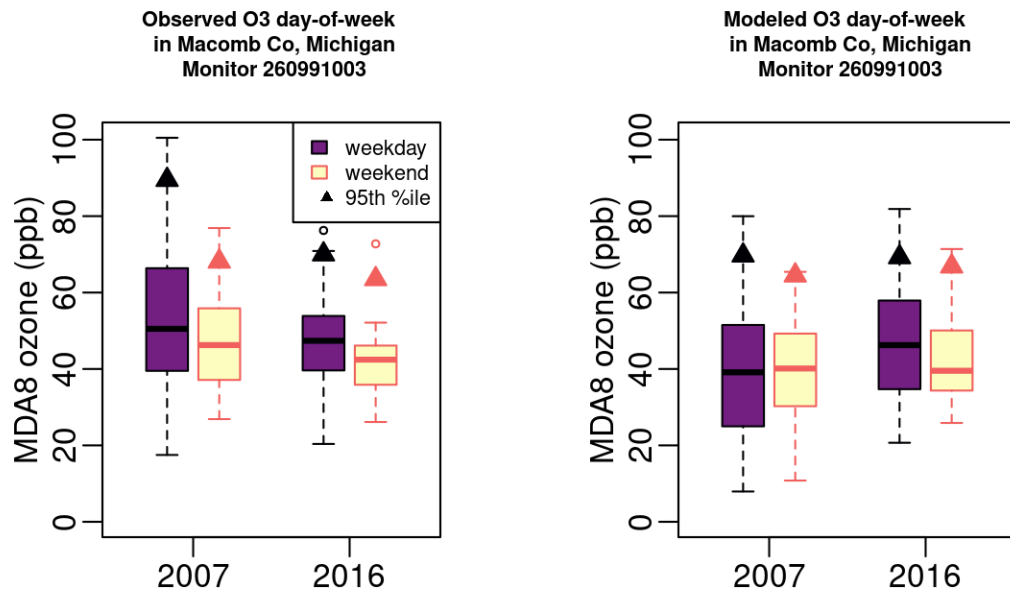
200 Figure S12. May-September weekday versus weekend MDA8 O₃ at the Morton Arboretum
 201 monitor (170436001) for 2007 and 2016 based on monitored values (left panel) and modeled
 202 values in grid cells containing monitor location (right panel). Boxes represent the 25th-75th
 203 percentile, horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile
 204 range, dots show outlier values and triangles represent 95th percentile values. Boxplot pairs that
 205 have statistically different distributions on weekends versus weekdays are outlined in bold.



206

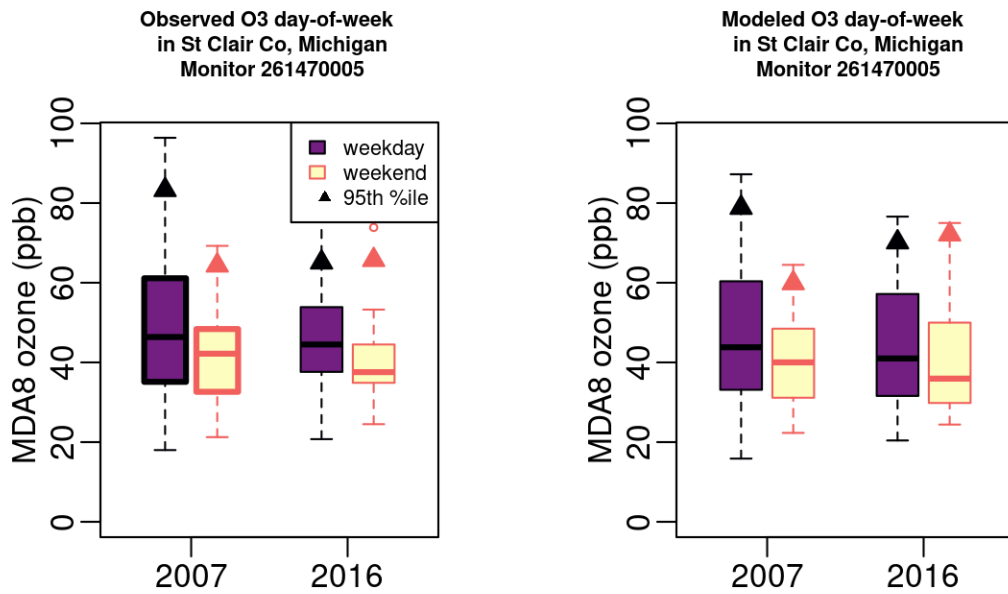
207

208 Figure S13. May-September weekday versus weekend MDA8 O3 at the New Haven monitor
 209 (260990009) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 210 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 211 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 212 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 213 statistically different distributions on weekends versus weekdays are outlined in bold.



214

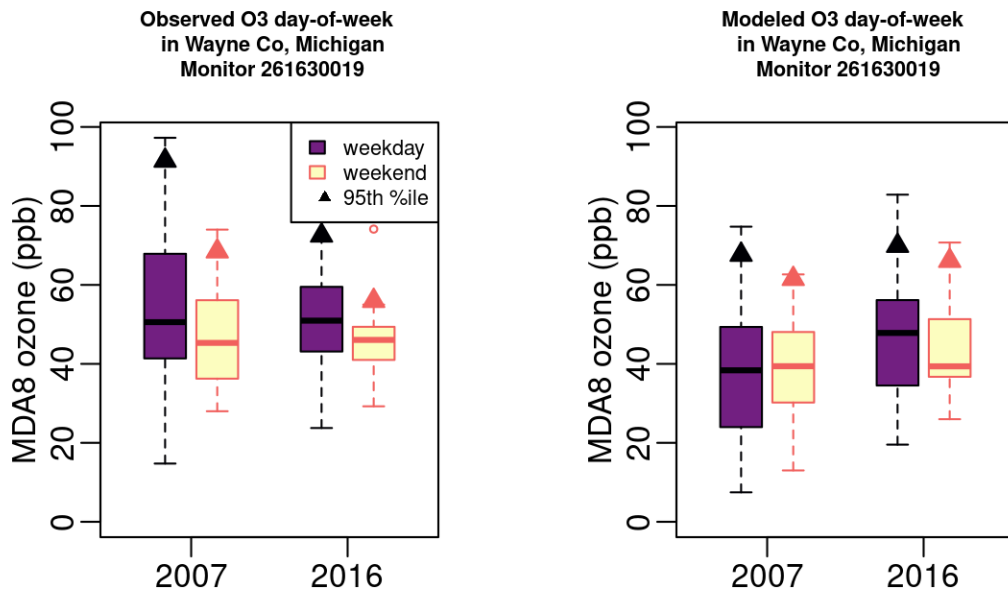
215 Figure S14. May-September weekday versus weekend MDA8 O₃ at the Warren, MI monitor
 216 (260991003) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 217 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 218 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 219 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 220 statistically different distributions on weekends versus weekdays are outlined in bold.



221

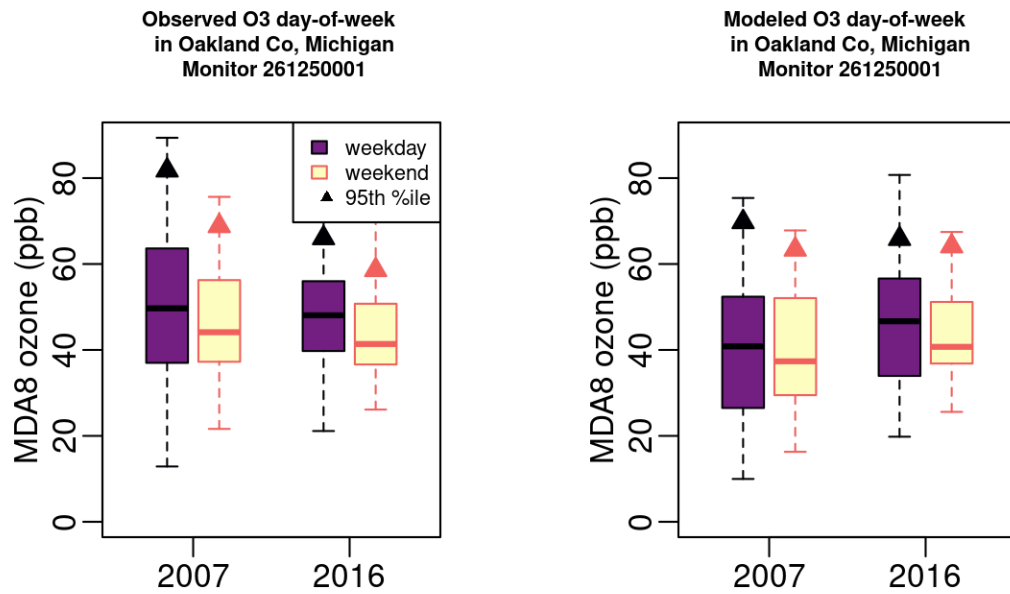
222 Figure S15. May-September weekday versus weekend MDA8 O₃ at the Port Huron monitor
 223 (261470005) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 224 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 225 horizontal lines represent median values, whiskers extend to 1.5 × the interquartile range, dots
 226 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 227 statistically different distributions on weekends versus weekdays are outlined in bold

228



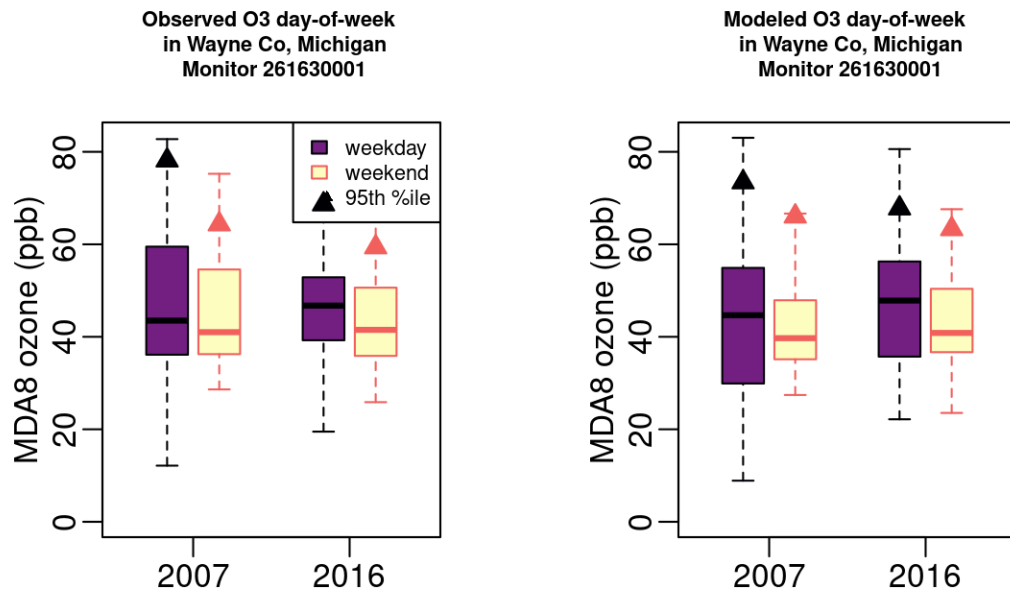
229

230 Figure S16. May-September weekday versus weekend MDA8 O₃ at the East 7 Mile, MI monitor
 231 (261630019) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 232 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 233 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 234 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 235 statistically different distributions on weekends versus weekdays are outlined in bold.



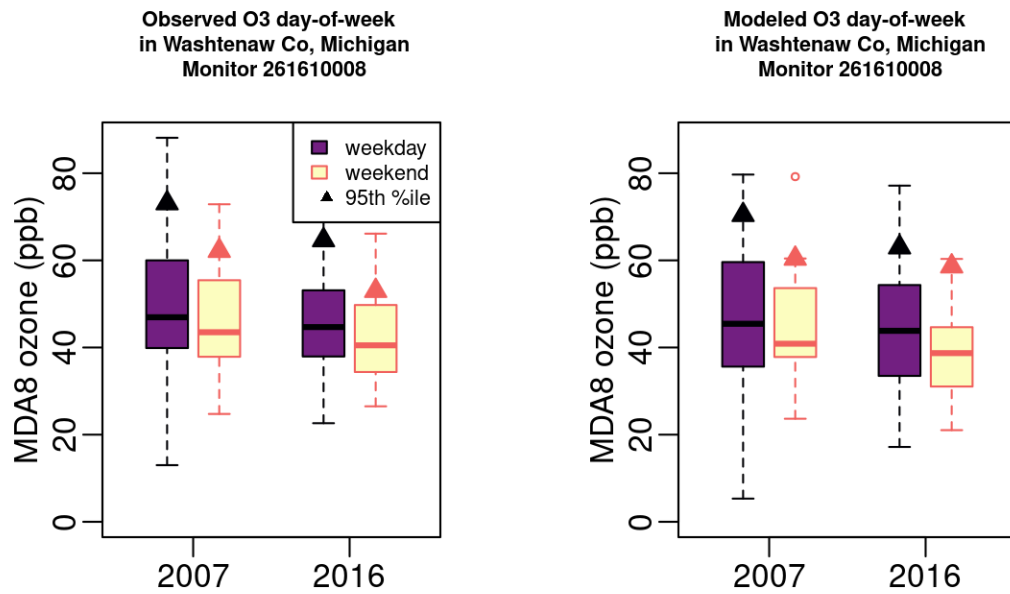
236

237 Figure S17. May-September weekday versus weekend MDA8 O3 at the Oak Park, MI monitor
 238 (261250001) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 239 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 240 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 241 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 242 statistically different distributions on weekends versus weekdays are outlined in bold.



243

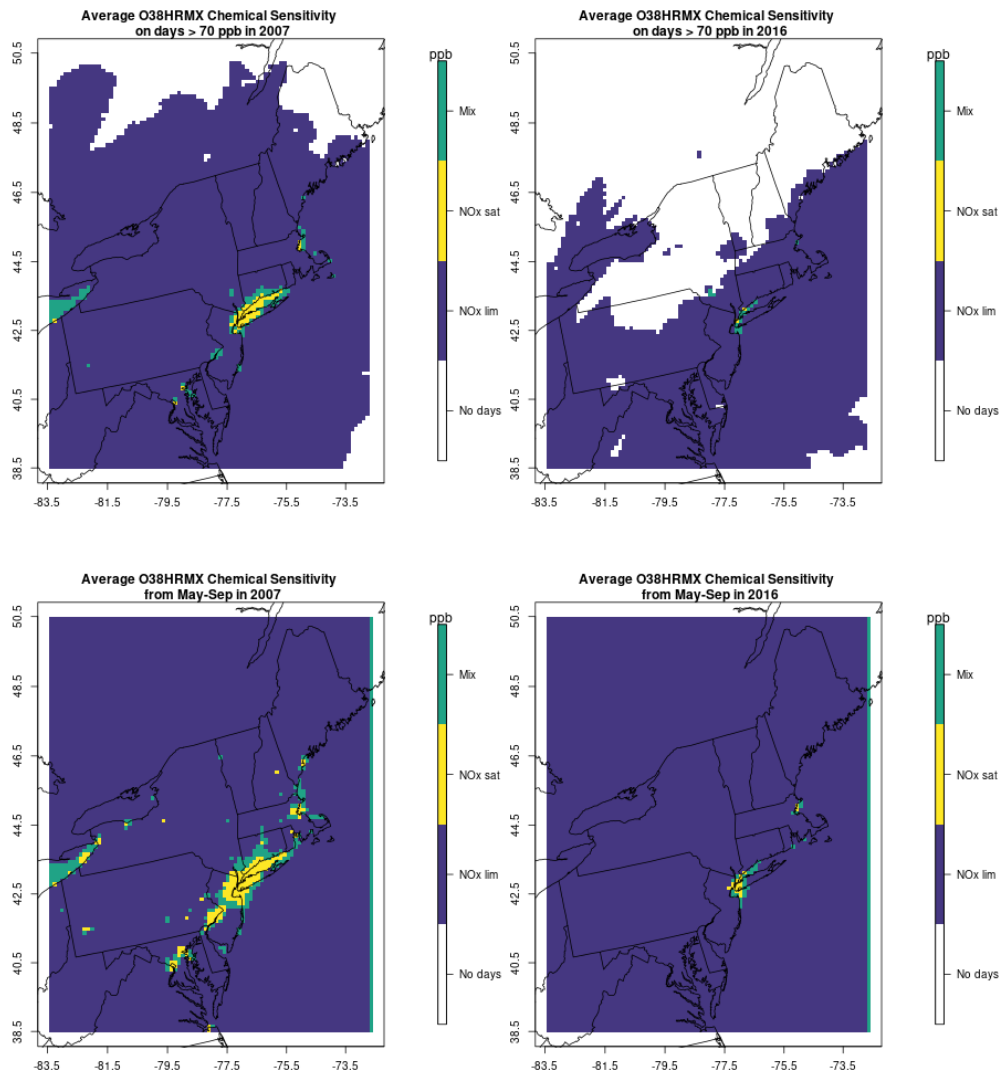
244 Figure S18. May-September weekday versus weekend MDA8 O₃ at the Allen Park, MI monitor
 245 (261630001) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 246 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 247 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 248 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 249 statistically different distributions on weekends versus weekdays are outlined in bold.



250

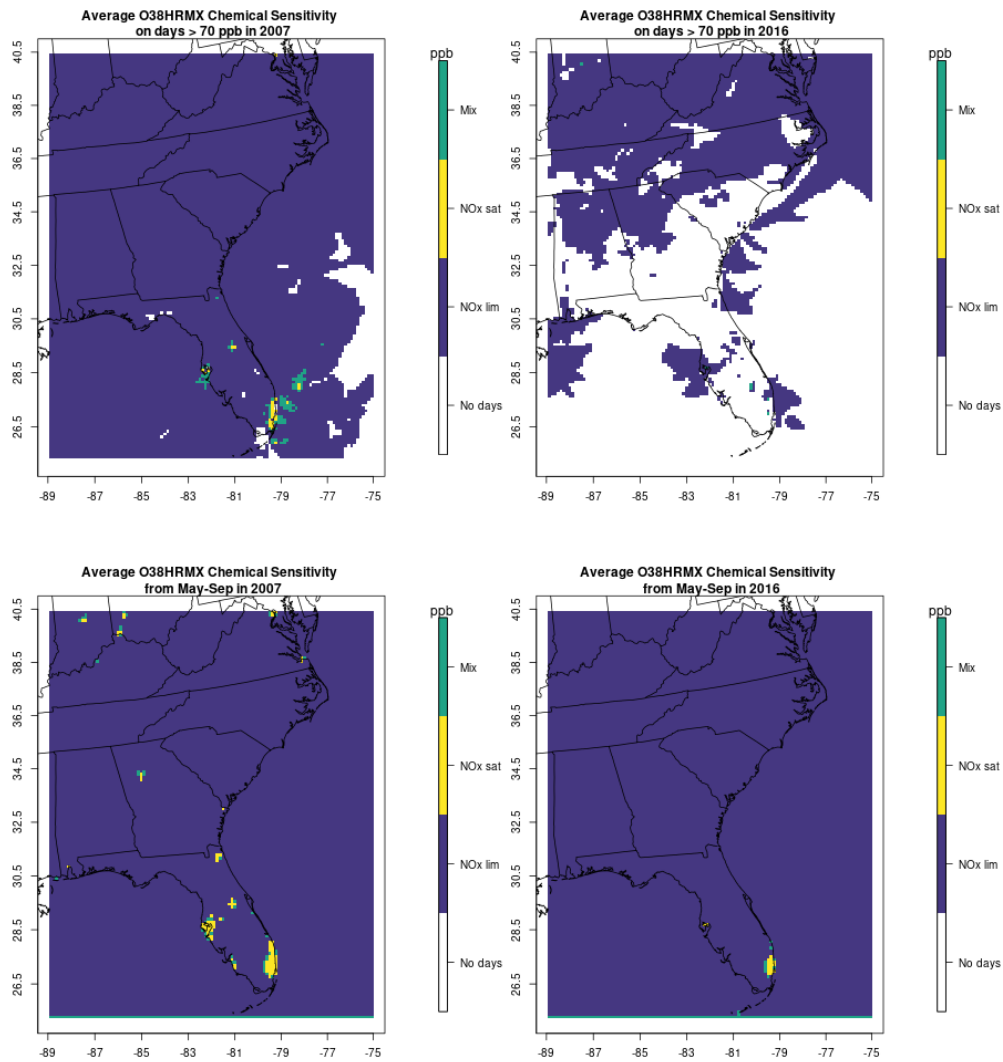
251 Figure S19. May-September weekday versus weekend MDA8 O₃ at the Ypsilanti, MI monitor
 252 (261610008) for 2007 and 2016 based on monitored values (left panel) and modeled values in
 253 grid cells containing monitor location (right panel). Boxes represent the 25th-75th percentile,
 254 horizontal lines represent median values, whiskers extend to $1.5 \times$ the interquartile range, dots
 255 show outlier values and triangles represent 95th percentile values. Boxplot pairs that have
 256 statistically different distributions on weekends versus weekdays are outlined in bold.

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258

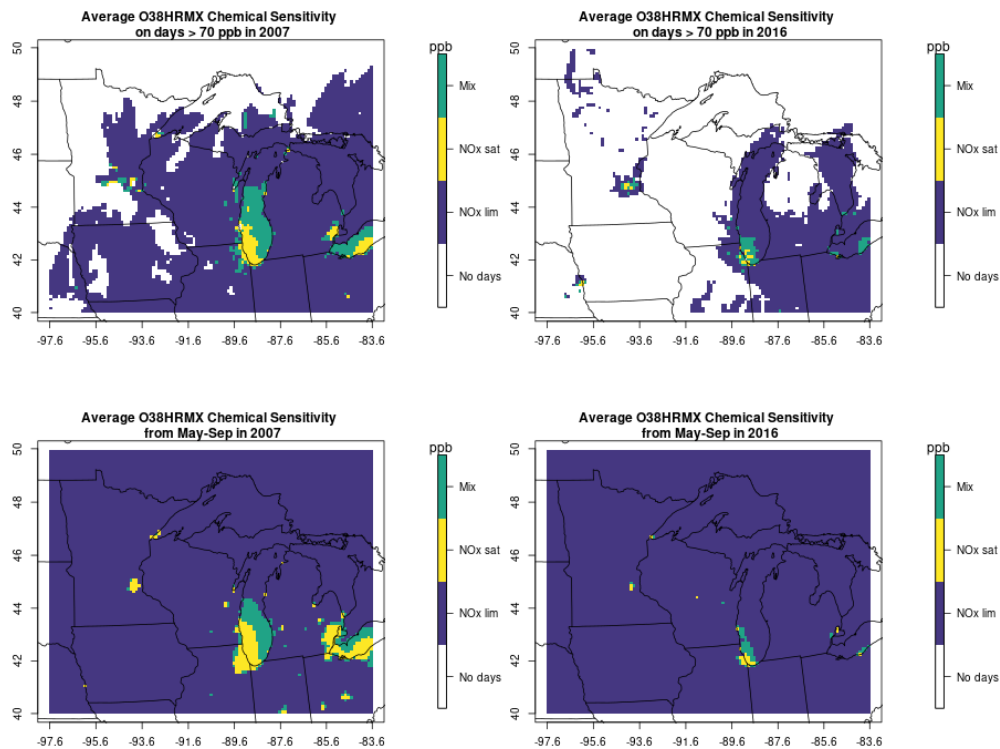
259 Figure S20: Northeast model-predicted average O₃ chemical formation regime on days with
 260 MDA8 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left
 261 panels) and 2016 (right panels)



262

263 Figure S21: Southeast model-predicted average O₃ chemical formation regime on days with
 264 MDA8 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left
 265 panels) and 2016 (right panels)

266



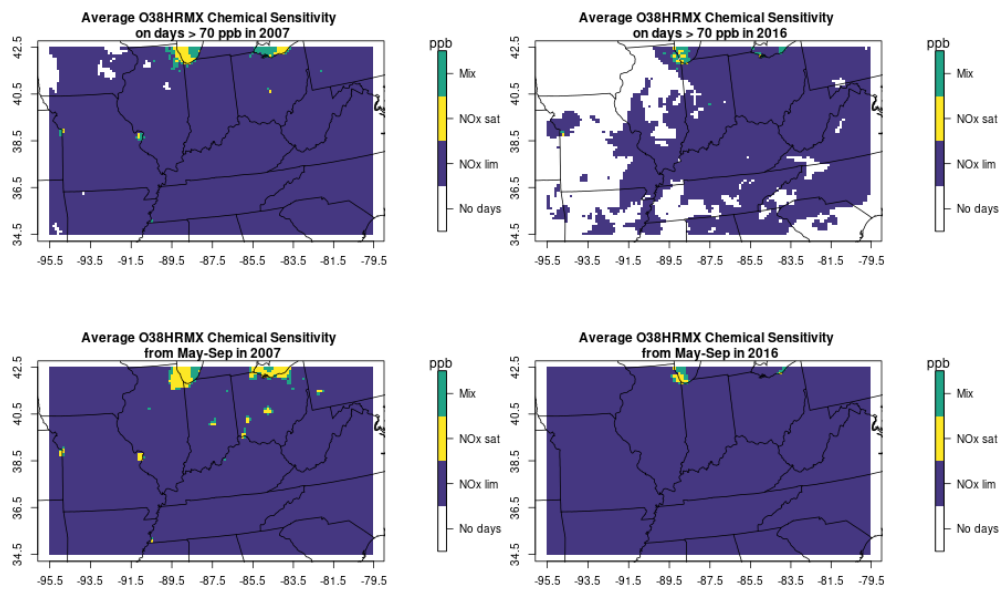
267

268 Figure S22: Upper Midwest model-predicted average O₃ chemical formation regime on days
 269 with MDA8 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left
 270 panels) and 2016 (right panels)

271

272

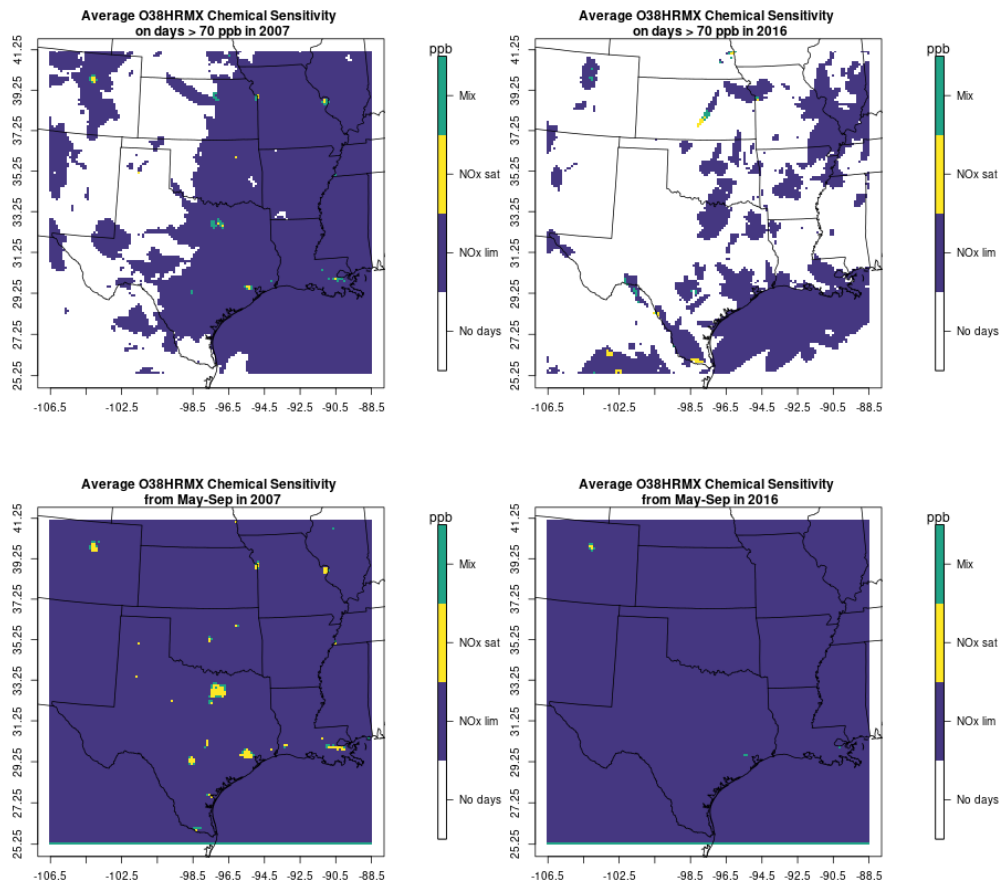
273



274

275 Figure S23: Ohio River Valley model-predicted average O₃ chemical formation regime on days
276 with MDA8 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left
277 panels) and 2016 (right panels)

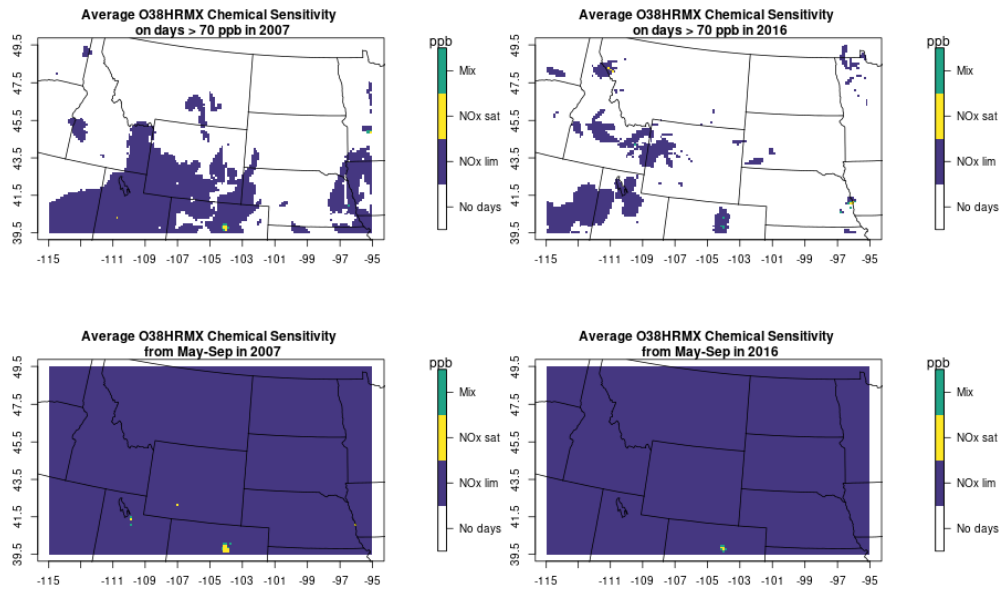
278



279

280 Figure S24: South model-predicted average O₃ chemical formation regime on days with MDA8
 281 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left panels) and
 282 2016 (right panels)

283



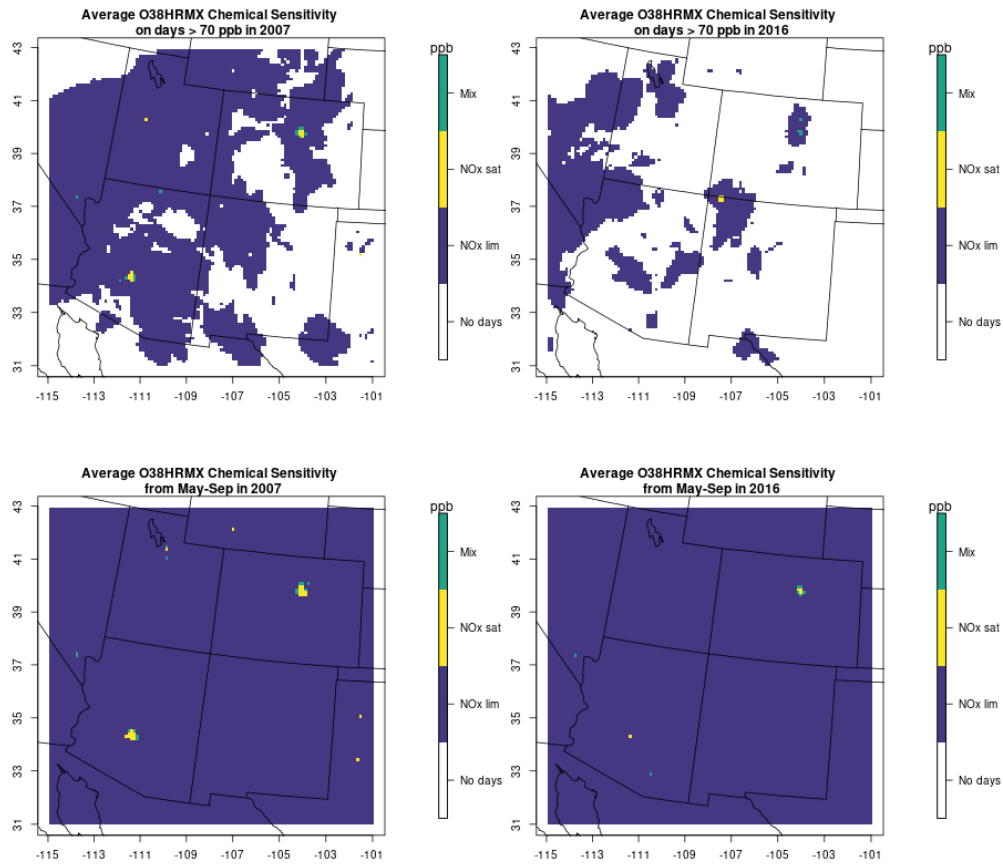
284

285 Figure S25: Northern Rockies and Plains model-predicted average O₃ chemical formation regime
 286 on days with MDA8 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in
 287 2007 (left panels) and 2016 (right panels)

288

289

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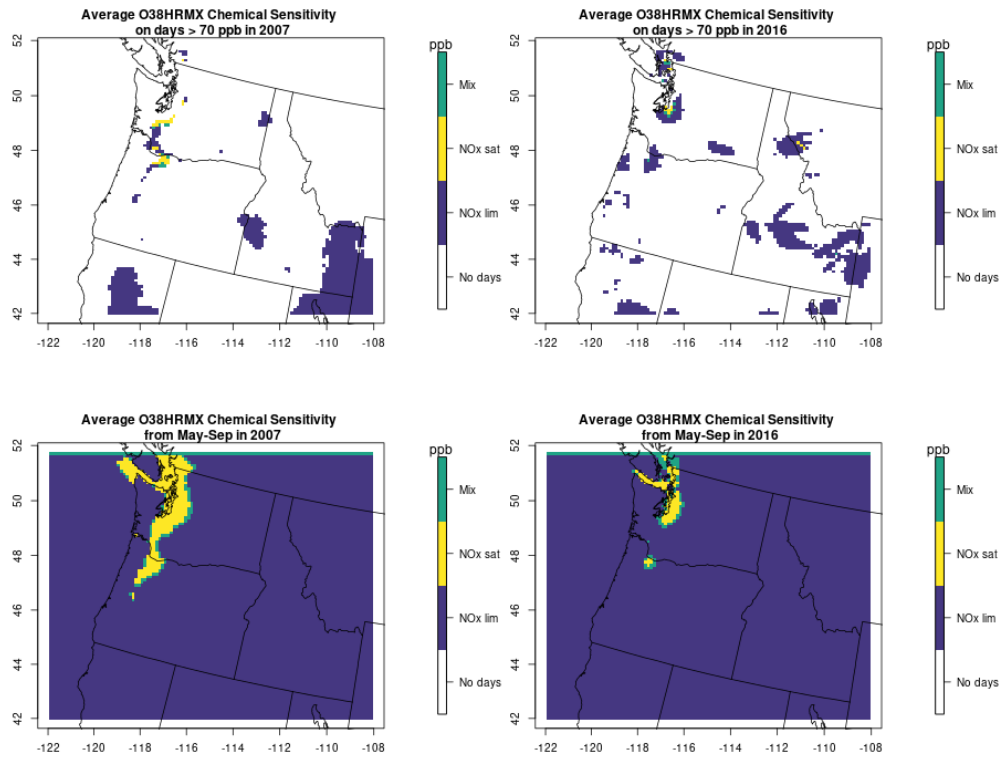


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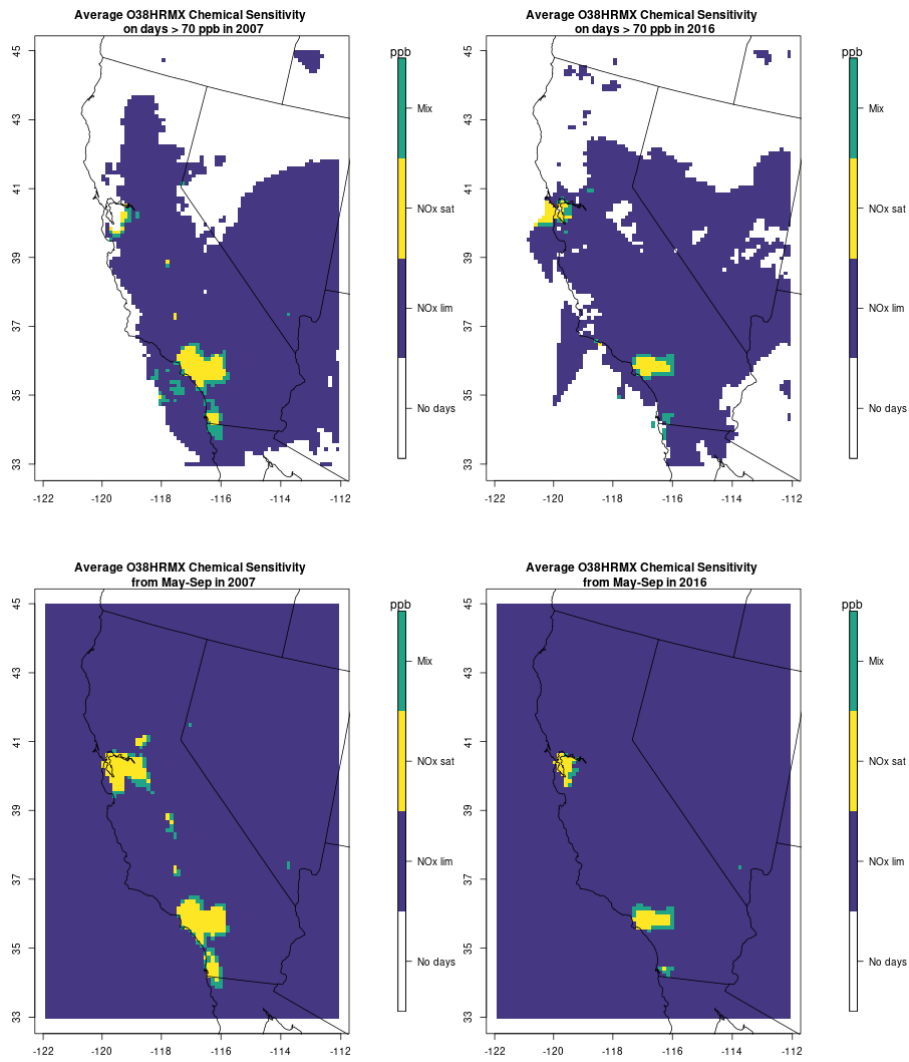
293 Figure S26: Southwest model-predicted average O₃ chemical formation regime on days with
 294 MDA8 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left
 295 panels) and 2016 (right panels)

296



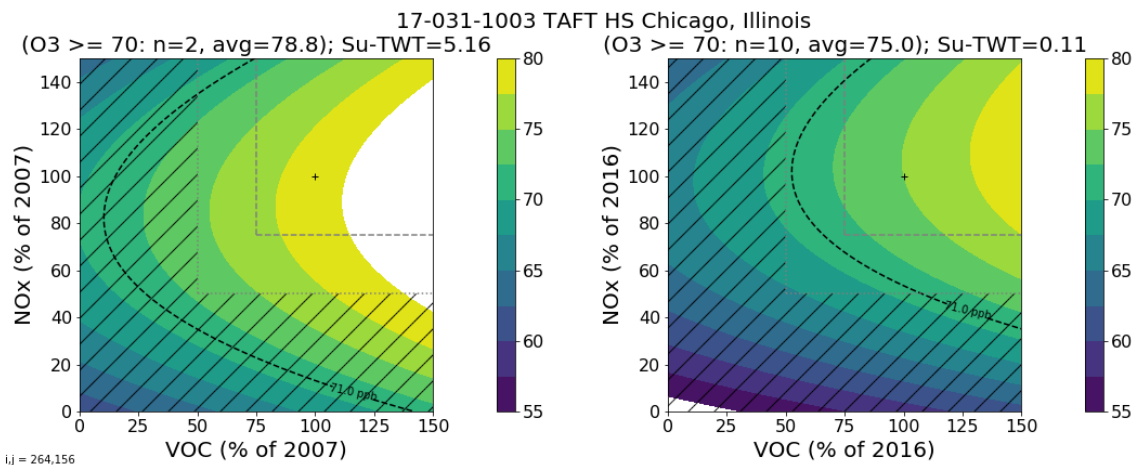
297

298 Figure S27: Northwest model-predicted average O₃ chemical formation regime on days with
 299 MDA8 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left
 300 panels) and 2016 (right panels)

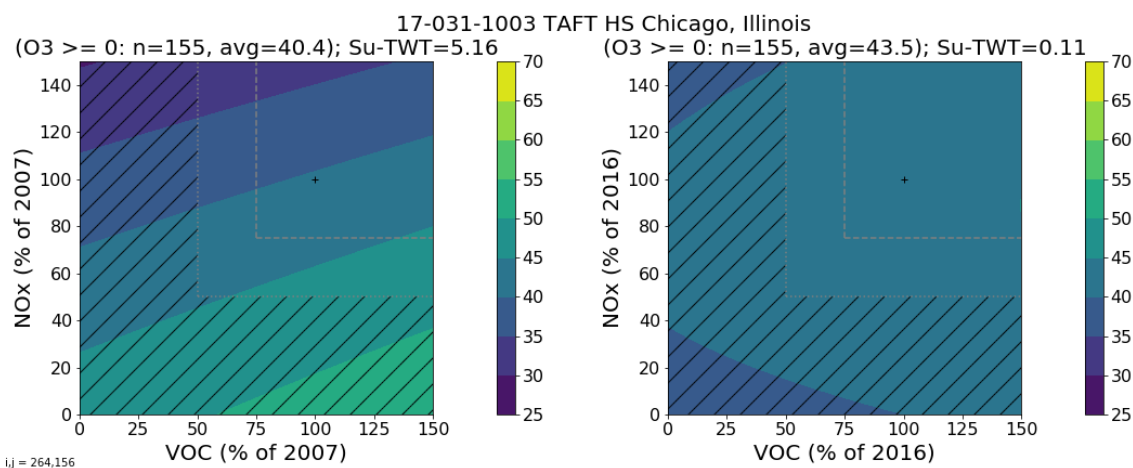


301
 302 Figure S28: West model-predicted average O₃ chemical formation regime on days with MDA8
 303 O₃ > 70 ppb (top panels) and across all May-Sep days (bottom panels) in 2007 (left panels) and
 304 2016 (right panels)

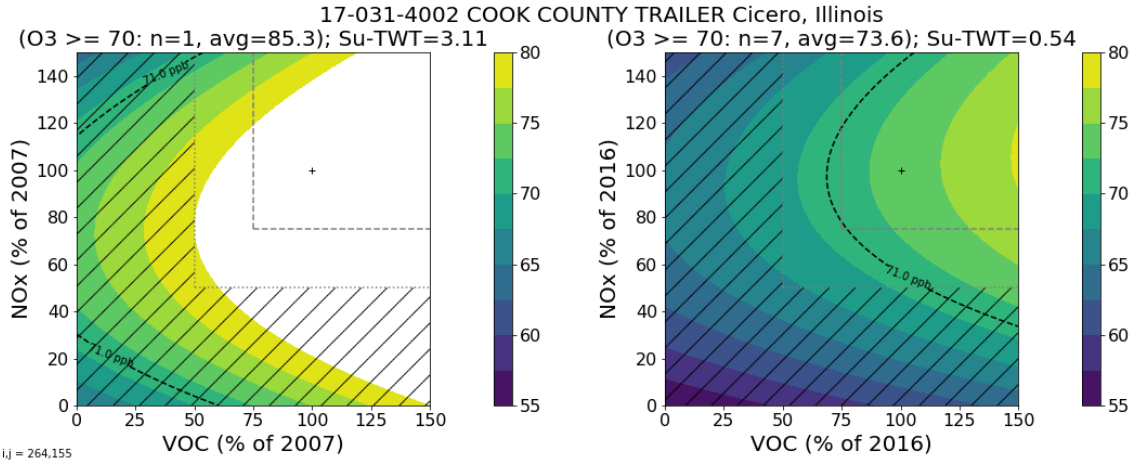
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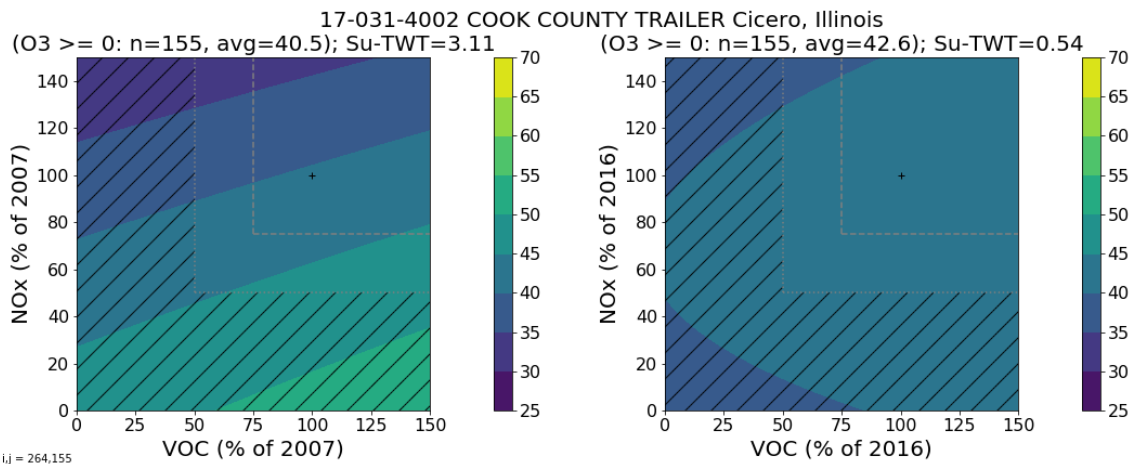
306



307 Figure S29. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 (O₃>0)
308 (bottom) and high MDA8 (O₃>70) (top) for the monitor located southeast of O’Hare
309 International airport. Dashed lines are shown at 50% and 75% of original emissions, and
310 hatching covers the area where large emission reductions (of 50-100%) are outside the domain of
311 expected HDDM accuracy. The dotted curved line depicts locations in the Ozone isopleth space
312 that match 71 ppb MDA8 O₃, below which the site would not be modeling exceedances of the
313 2015 ozone NAAQS.

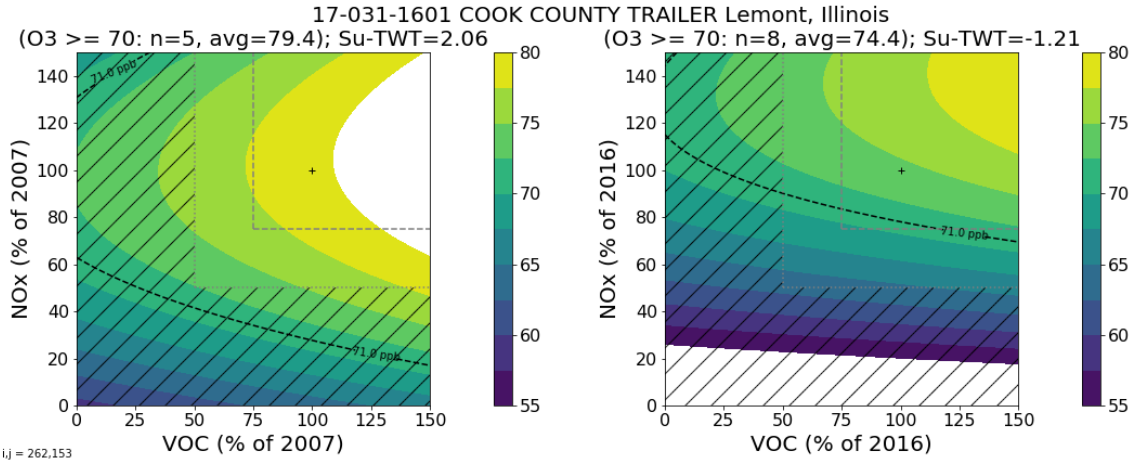


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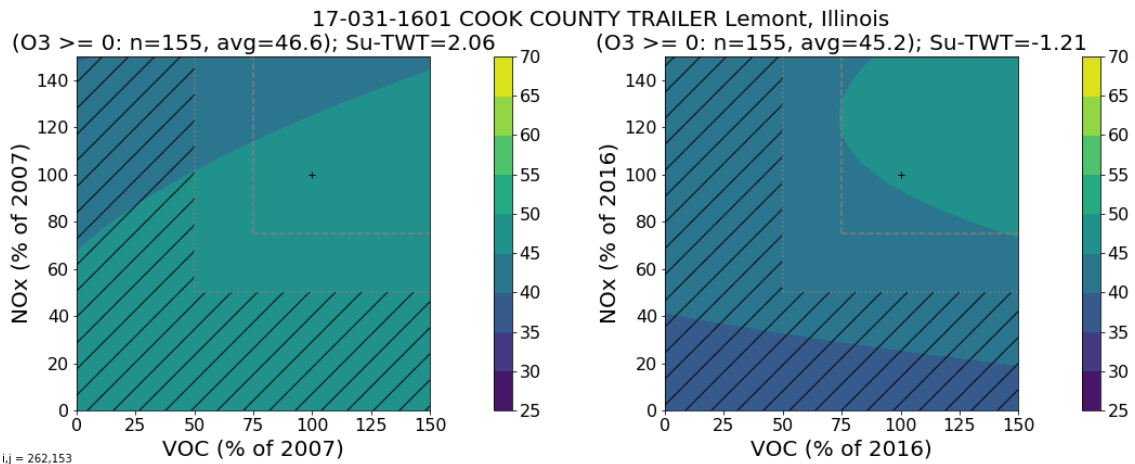


315

316 Figure S30. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 (O3>0)
317 (bottom) and high MDA8 (O3>70) (top) for the Cicero, IL monitor. Dashed lines are shown at
318 50% and 75% of original emissions, and hatching covers the area where large emission
319 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
320 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O₃, below
321 which the site would not be modeling exceedances of the 2015 ozone NAAQS.



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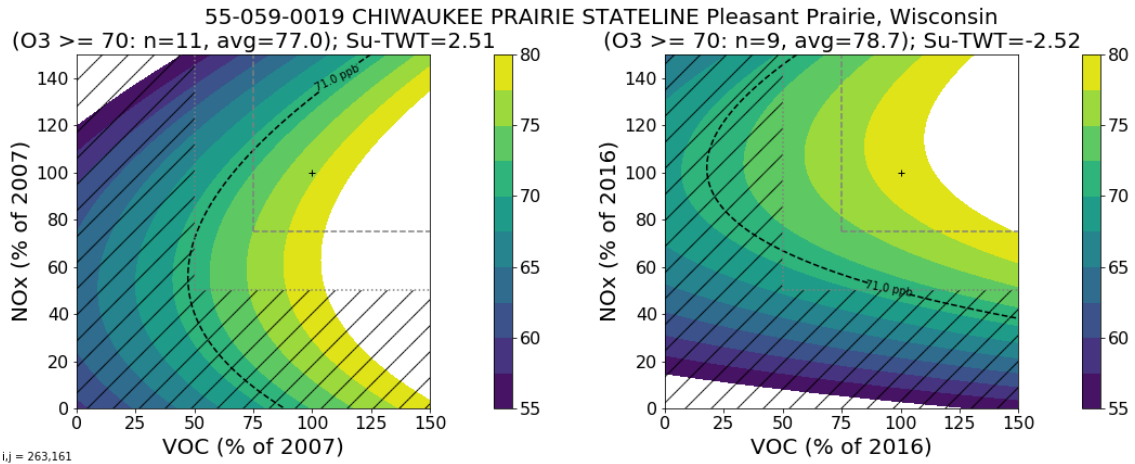


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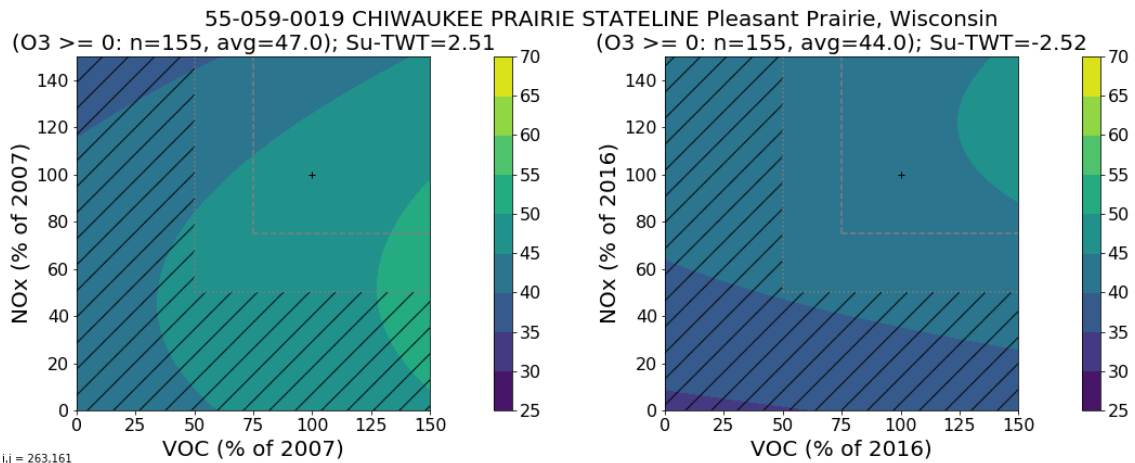
324 Figure S31. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 (O3>0)
325 (bottom) and high MDA8 (O3>70) (top) for the Lemont, IL monitor. Dashed lines are shown at
326 50% and 75% of original emissions, and hatching covers the area where large emission
327 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
328 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O₃, below
329 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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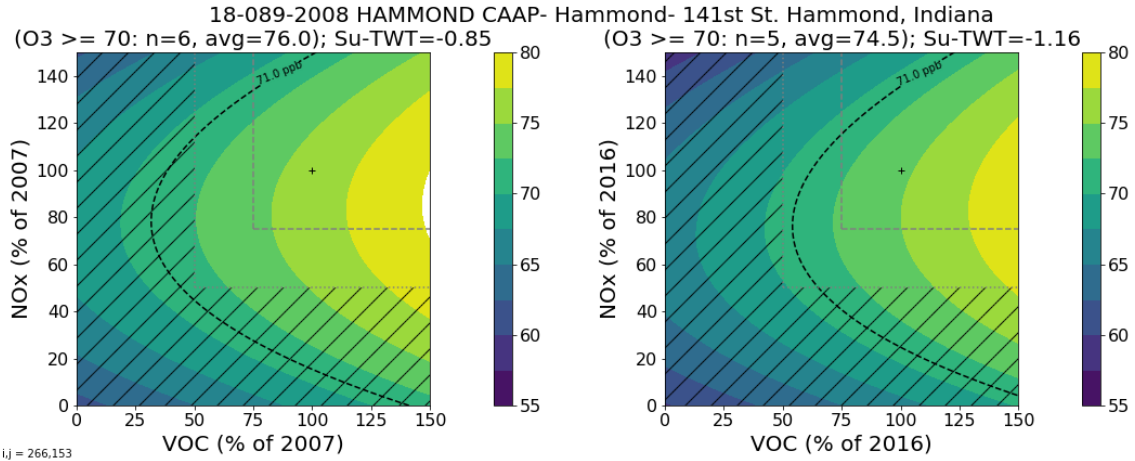
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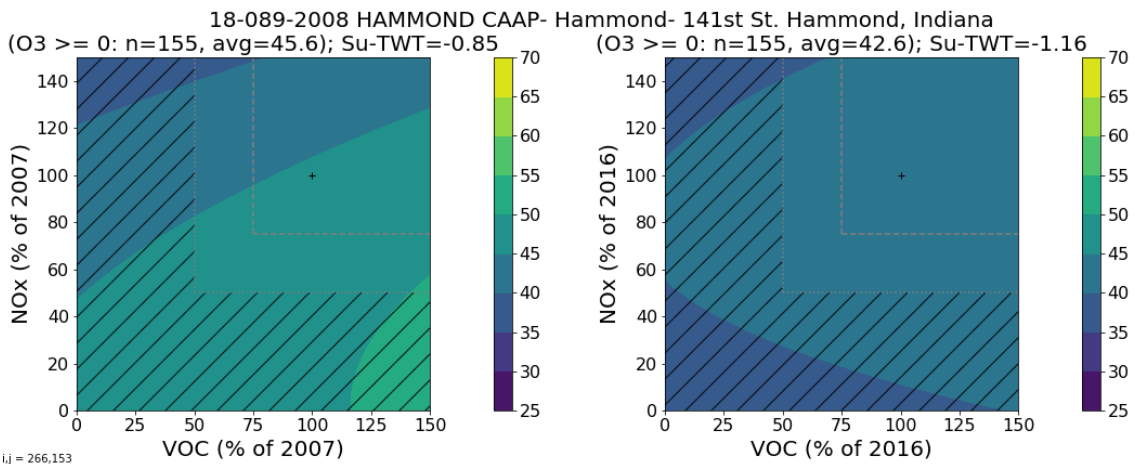
333

334 Figure S32. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 ($O_3 > 0$)
335 (bottom) and high MDA8 ($O_3 > 70$) (top) for the Kenosha, WI monitor. Dashed lines are shown
336 at 50% and 75% of original emissions, and hatching covers the area where large emission
337 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
338 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O_3 , below
339 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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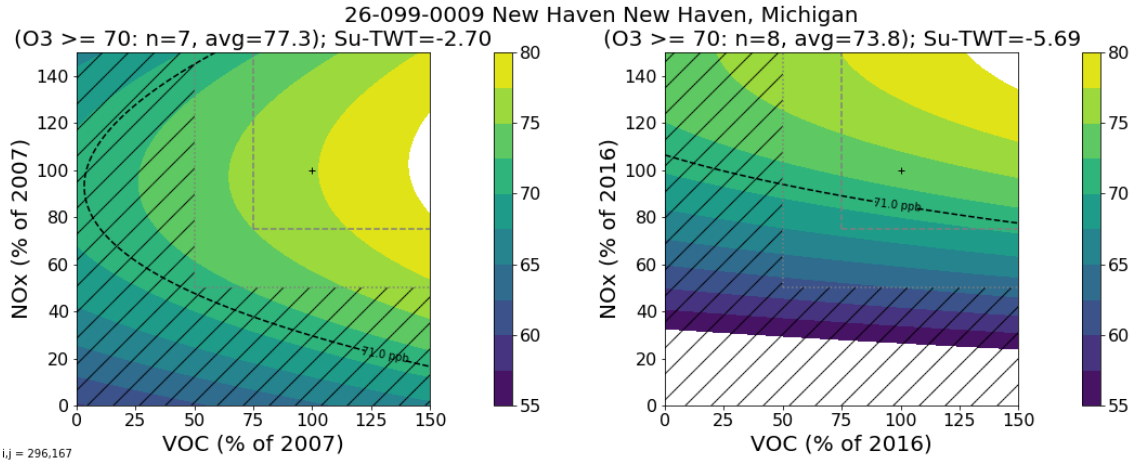
343 Figure S33. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 ($O_3 > 0$)
 344 (bottom) and high MDA8 ($O_3 > 70$) (top) for the Hammond, IN monitor. Dashed lines are shown
 345 at 50% and 75% of original emissions, and hatching covers the area where large emission
 346 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
 347 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O_3 , below
 348 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

349

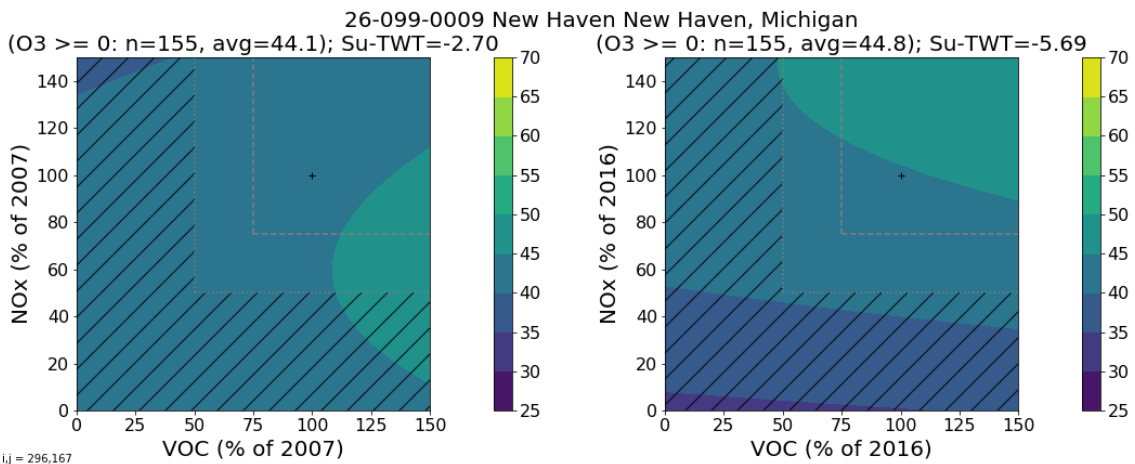
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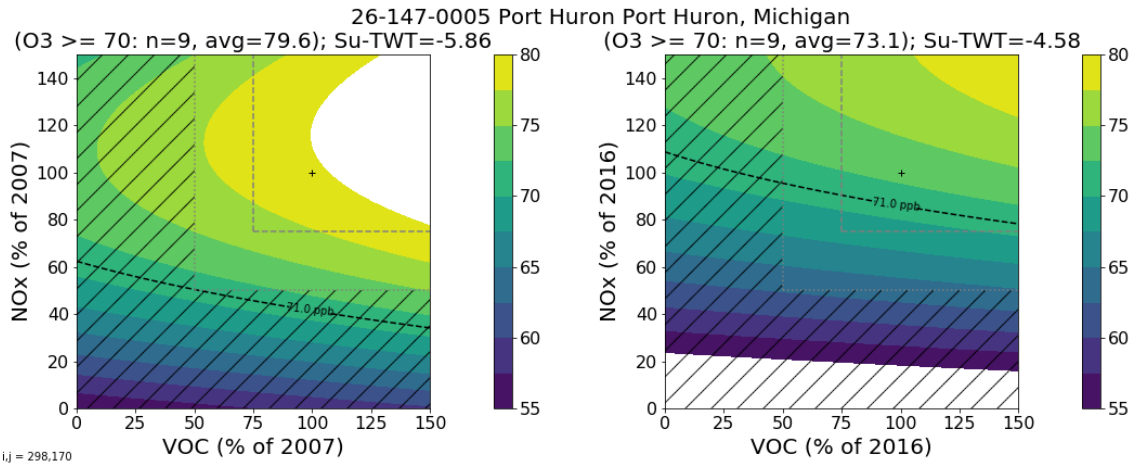


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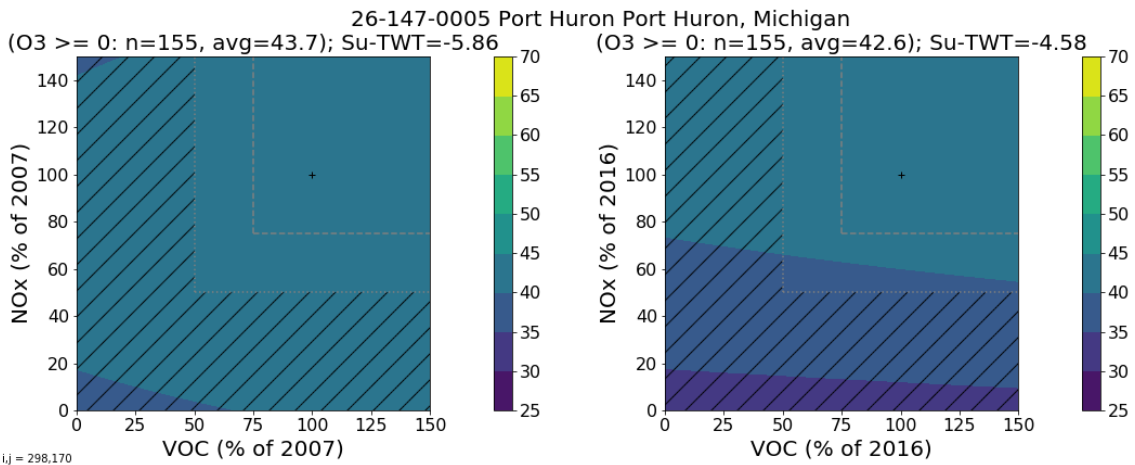
355 Figure S34. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 (O3>0)
356 (bottom) and high MDA8 (O3>70) (top) for the New Haven, MI monitor. Dashed lines are
357 shown at 50% and 75% of original emissions, and hatching covers the area where large emission
358 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
359 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O₃, below
360 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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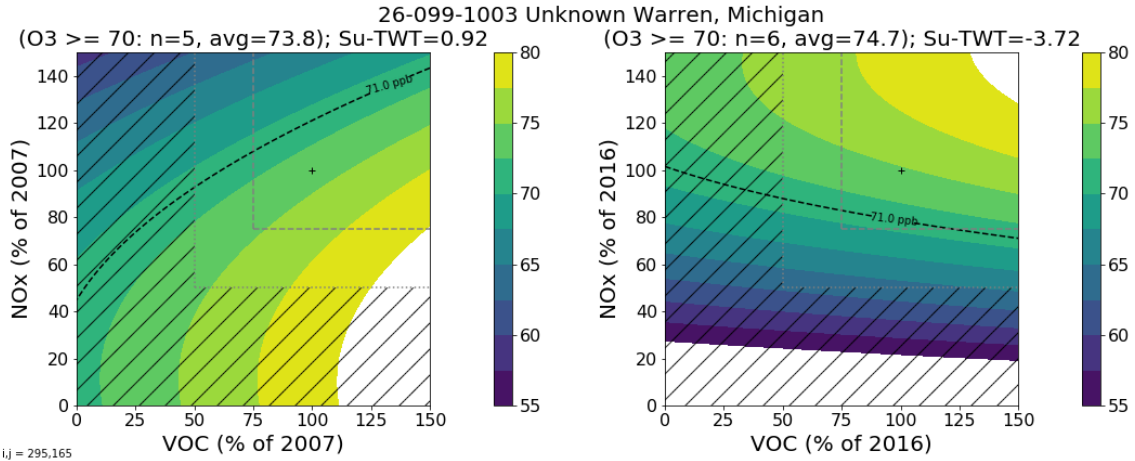


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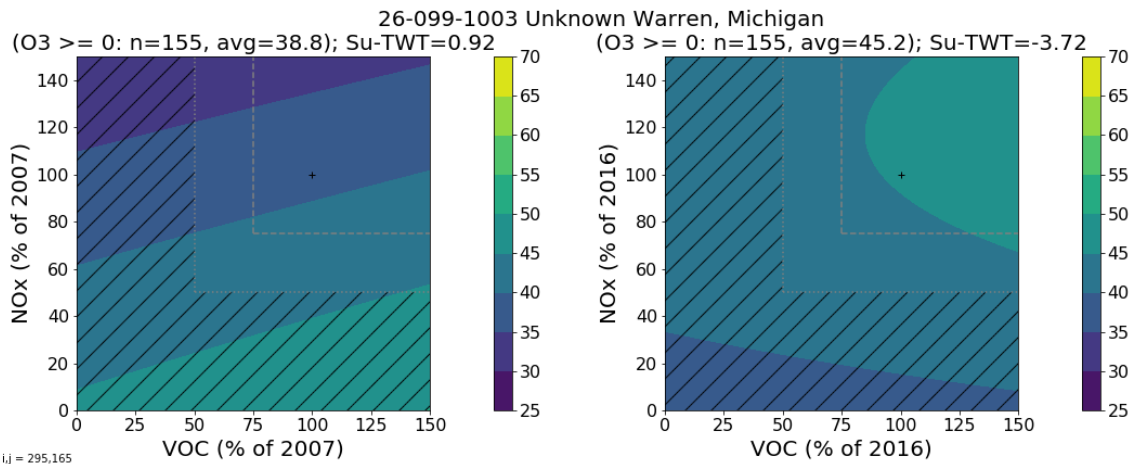
365 Figure S35. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 ($O_3 > 0$)
 366 (bottom) and high MDA8 ($O_3 > 70$) (top) for the Port Huron, MI monitor. Dashed lines are
 367 shown at 50% and 75% of original emissions, and hatching covers the area where large emission
 368 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
 369 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O_3 , below
 370 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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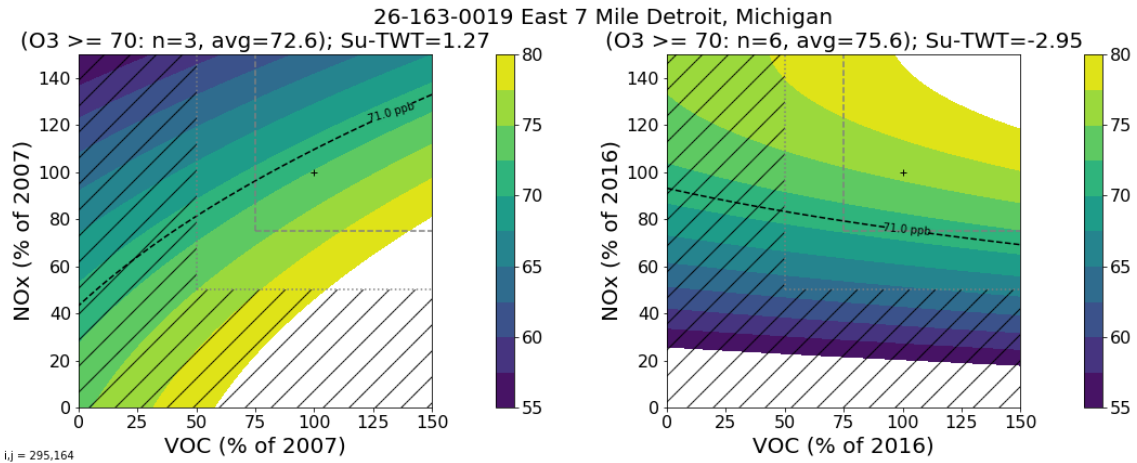
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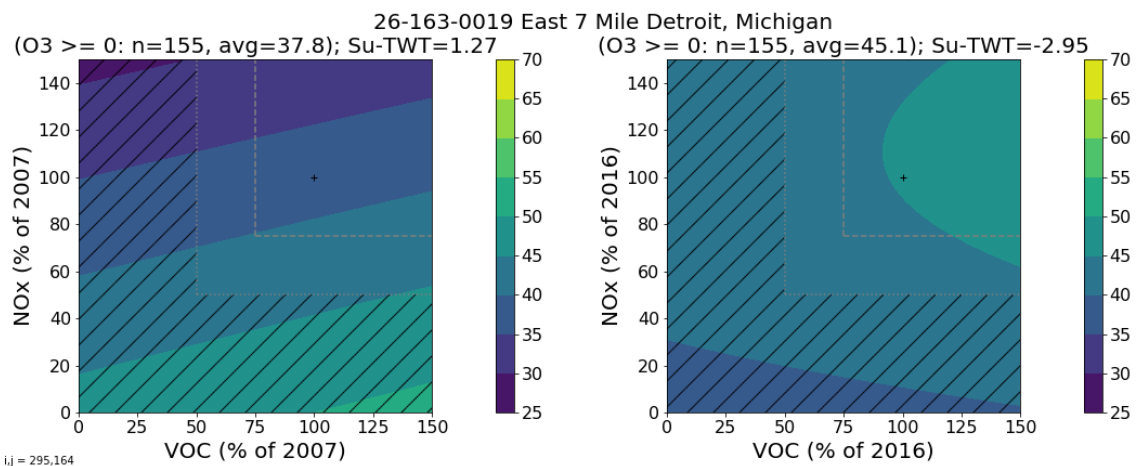
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376 Figure S36. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 ($O_3 > 0$)
 377 (bottom) and high MDA8 ($O_3 > 70$) (top) for the Warren, MI monitor. Dashed lines are shown at
 378 50% and 75% of original emissions, and hatching covers the area where large emission
 379 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
 380 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O_3 , below
 381 which the site would not be modeling exceedances of the 2015 ozone NAAQS.



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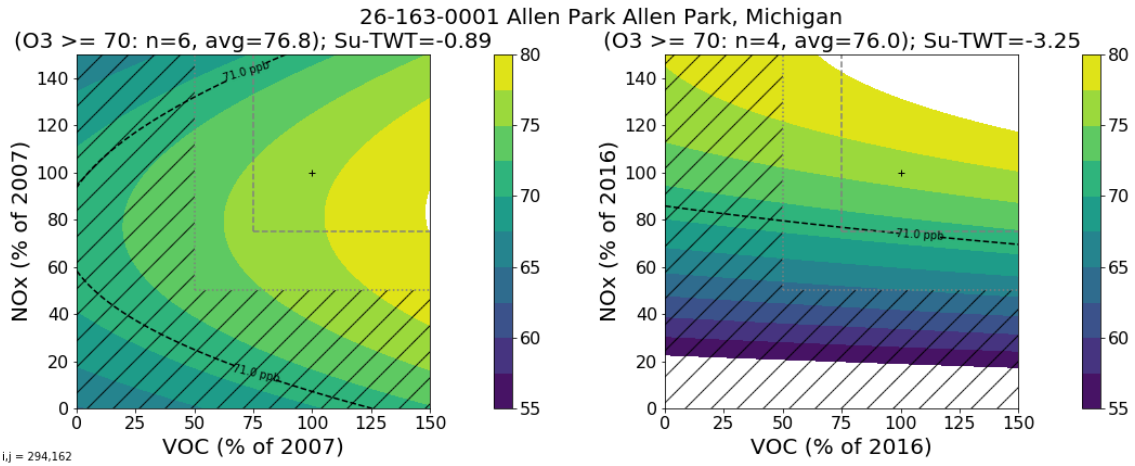


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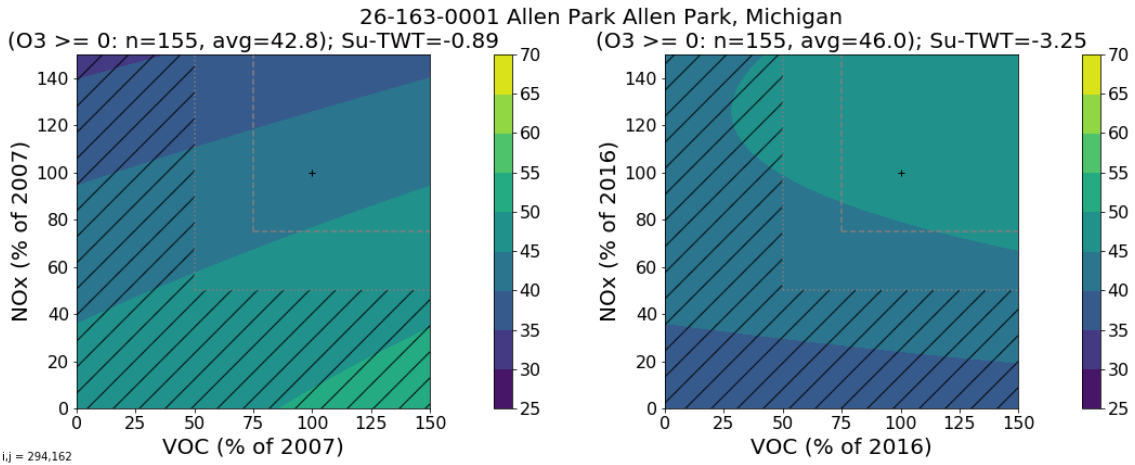
384 Figure S37. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 (O3>0)
385 (bottom) and high MDA8 (O3>70) (top) for the East 7 Mile, MI monitor. Dashed lines are
386 shown at 50% and 75% of original emissions, and hatching covers the area where large emission
387 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
388 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O₃, below
389 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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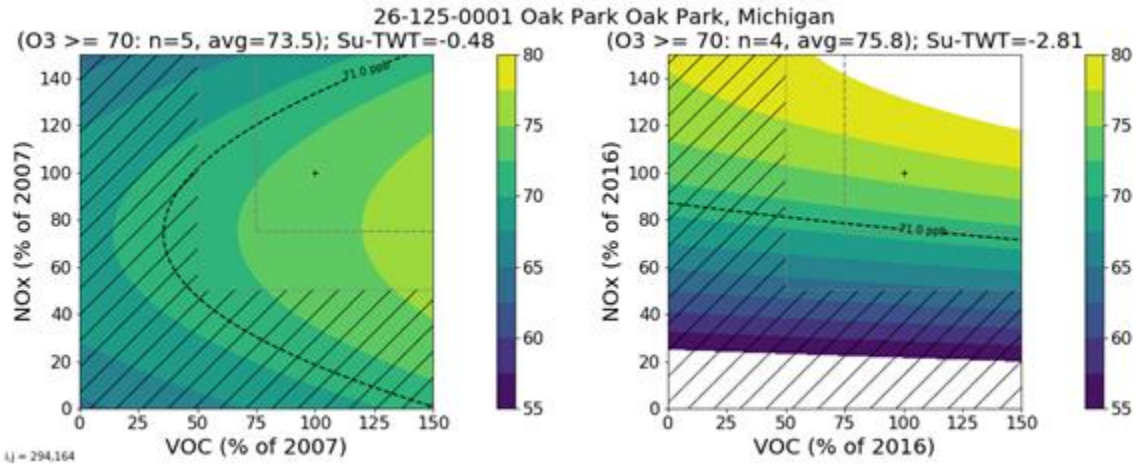


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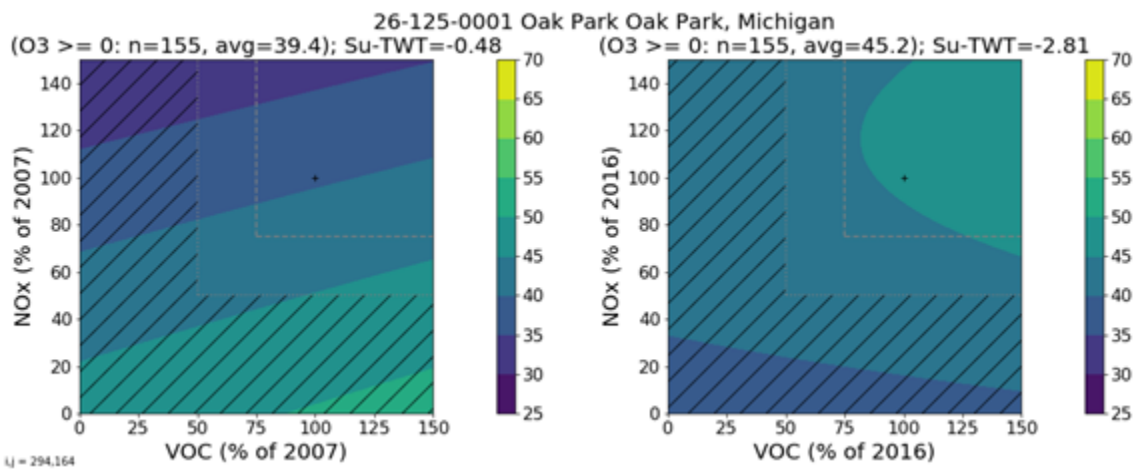
394

395 Figure S38. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 (O3>0)
396 (bottom) and high MDA8 (O3>70) (top) for the Allen Park, MI monitor. Dashed lines are
397 shown at 50% and 75% of original emissions, and hatching covers the area where large emission
398 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
399 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O3, below
400 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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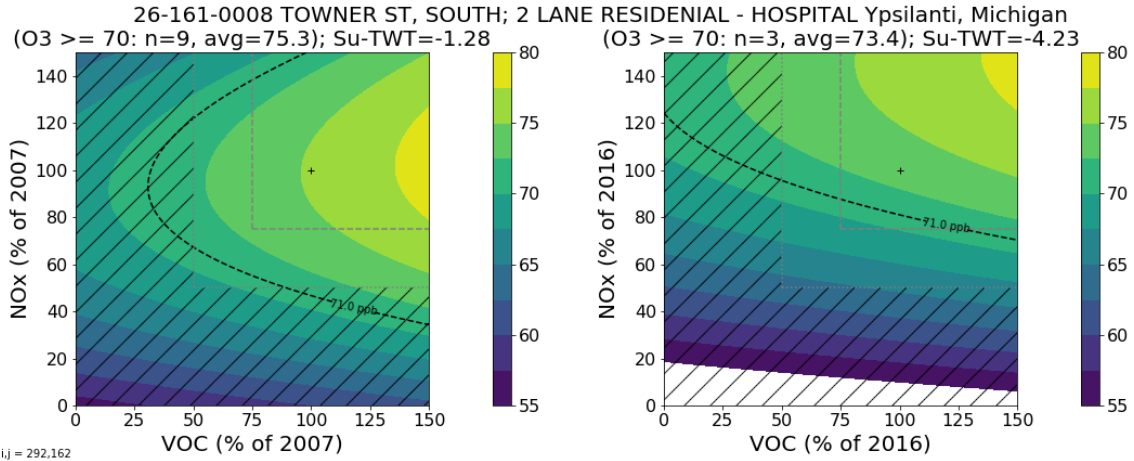


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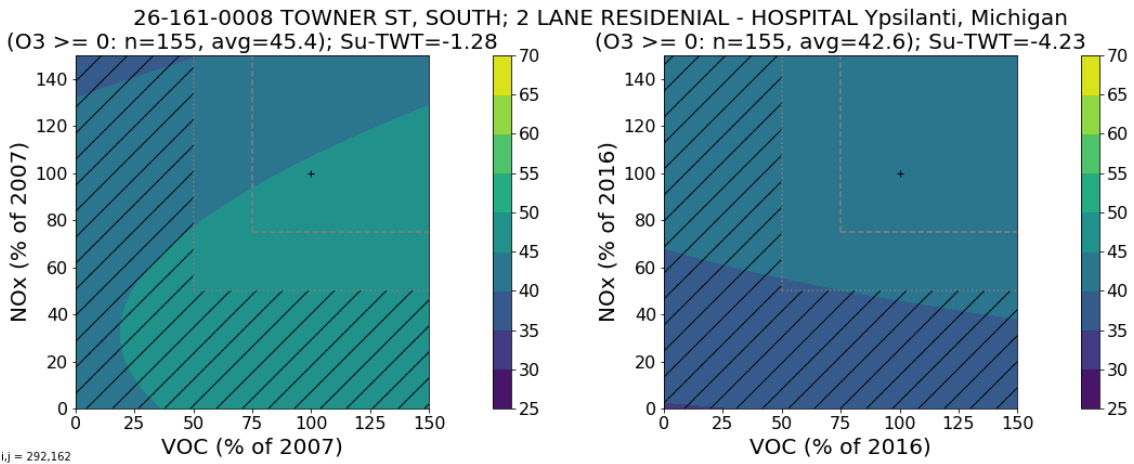
404

405 Figure S39. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 ($O_3 > 0$)
 406 (bottom) and high MDA8 ($O_3 > 70$) (top) for the Oak Park, MI monitor. Dashed lines are shown
 407 at 50% and 75% of original emissions, and hatching covers the area where large emission
 408 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
 409 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O_3 , below
 410 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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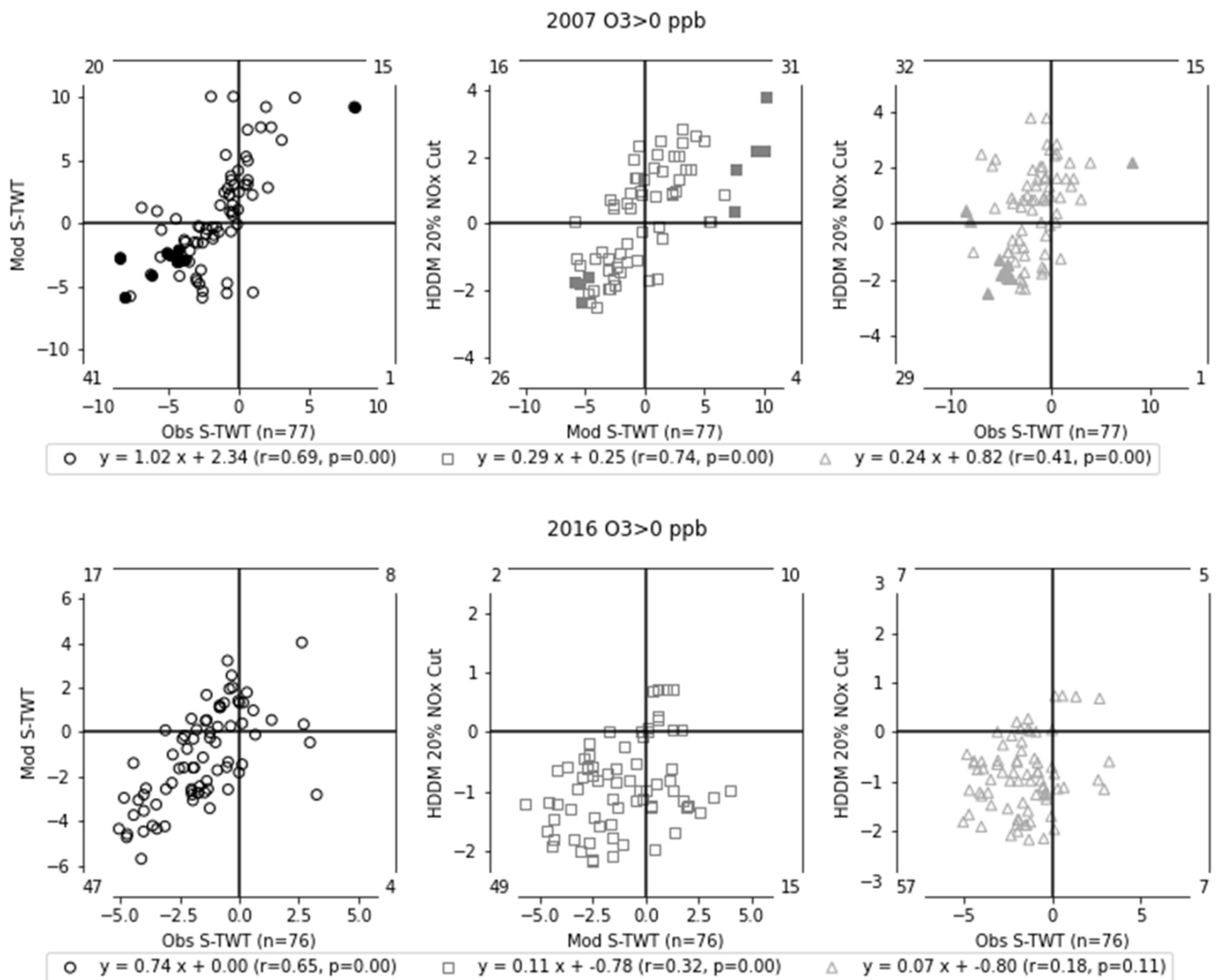


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414 Figure S40. Ozone isopleth diagrams in 2007 (left) and 2016 (right) for all MDA8 ($O_3 > 0$)
 415 (bottom) and high MDA8 ($O_3 > 70$) (top) for the Ypsilanti, MI monitor. Dashed lines are shown
 416 at 50% and 75% of original emissions, and hatching covers the area where large emission
 417 reductions (of 50-100%) are outside the domain of expected HDDM accuracy. The dotted
 418 curved line depicts locations in the Ozone isopleth space that match 71 ppb MDA8 O_3 , below
 419 which the site would not be modeling exceedances of the 2015 ozone NAAQS.

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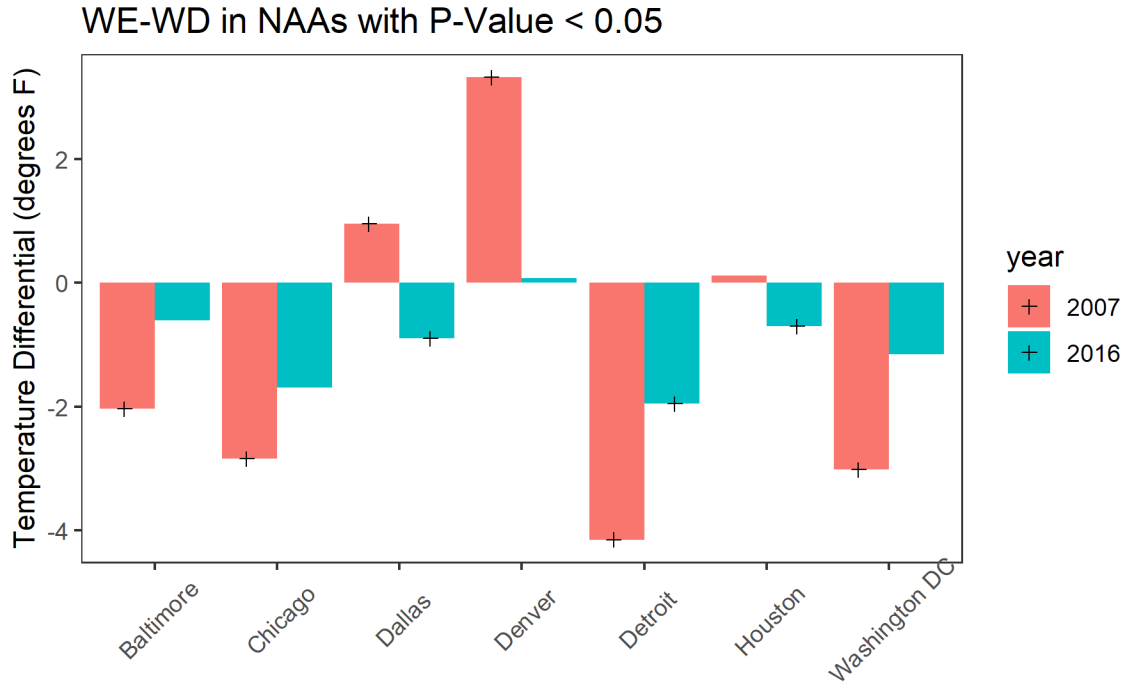


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425 Figure S41. Comparison of (left) modeled vs. observed WE-WD differential, (middle) ozone
426 response to a 20% NO_x cut calculated with the HDDM sensitivities vs. modeled WE-WD
427 differential, and (right) ozone response to a 20% NO_x cut calculated with the HDDM
428 sensitivities vs. observed WE-WD differential for (top) 2007 and (bottom) 2016.

429



430

431 Figure S42. Non-attainment area (NAA) WE-WD temperature differentials from the AQS
 432 network with p-value < 0.05 in either 2007 or 2016. Crosses indicate significant p-value for that
 433 year.