Supplement of Atmos. Chem. Phys., 19, 13973–13987, 2019
https://doi.org/10.5194/acp-19-13973-2019-supplement

Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

Potential regional air quality impacts of cannabis cultivation facilities in Denver, Colorado

Chi-Tsan Wang et al.

Correspondence to: William Vizuete (vizuete@unc.edu)

Table S1. The estimated plant count (*PC)* per cannabis cultivation facility (CCF) in Denver County and outside of Denver.

	PC per CCF			
	Denver County		outside Denver County	
Scenario name	Recreational (233)	Medical (375)	Recreational (500)	Medical (364)
1_EC - 5_DPW	905	905	521	521
6_PC	1,810	1,810	1,042	1,042
7_PC	1,800	3,600	1,800	3,600
8_MAX	1,800	3,600	1,800	3,600

Table S2. License tiers issued by Colorado Department of Revenue (DOR) and the maximum allowed plant count (PC) for recreational and medical cannabis cultivation facility (CCF).

Tier	Recreational CCF	Medical CCF
1	1,800	3,600
2	3,600	6,000
3	6,000	10,200
4	10,200	
5	13,800	

Table S3. All data summed from July 18th, 6 AM LST to, 2 PM LST for grid cells and layers shown in Fig. S6. The base case (BC) scenario column shows the absolute predicted values and the subsequent columns the predicted changes due to emissions from the 3_EC scenario. Percentages in parenthesis are the changes in 3_EC relative to BC. Shown are the **(a)** total amount of VOC and TERP consumed due to oxidation (ppb), the **(b)** total amount of hydroxyl radical (OH) and total peroxyl radicals (TRO_2) that were generated and their sources (ppb), and the **(c)** total amount of Nitrogen Dioxide (NO_2) and NO_x termination products (NO_z) produced and their sources (ppb).

(a)

	BC	3_EC
VOC + OH	22.3	22.6 (+1.26%)
TERP + OH	0.12	0.24 (+100%)
VOC + NO_3	0.03	0.04 (+33.3%)
TERP + NO_3	0.01	0.03 (+200%)
VOC + O_3	0.95	1.01 (+6.32%)
TERP + O_3	0.05	0.12 (+140%)

(b)

	BC	3_EC
OH generation	18.2	18.3 (+0.60%)
from O1D + H2O	7.68	7.69 (+0.13%)
from ALD photolysis	10.5	10.6 (+0.95%)
Peroxyl radical (TRO2) generation	105	107 (+2%)
from VOC initial reactions	31.0	31.4 (+1.29%)
from TERP initial reactions	0.22	0.47 (+114%)

(c)

	BC	3_EC
NO to NO_2	3,121	3,118 (-0.10%)
NO + O_3	3,020	3,016 (-0.13%)
NO + TRO_2	63.4	64.0 (+0.93%)
NO_z generation	22.0	22.2 (+1.00%)
NTR generation	1.33	1.40 (+5.26%)
PAN generation	5.21	5.25 (+0.77%)
PANX generation	1.74	1.79 (+2.87%)
HNO_3 generation	13.7	13.8 (+0.51%)

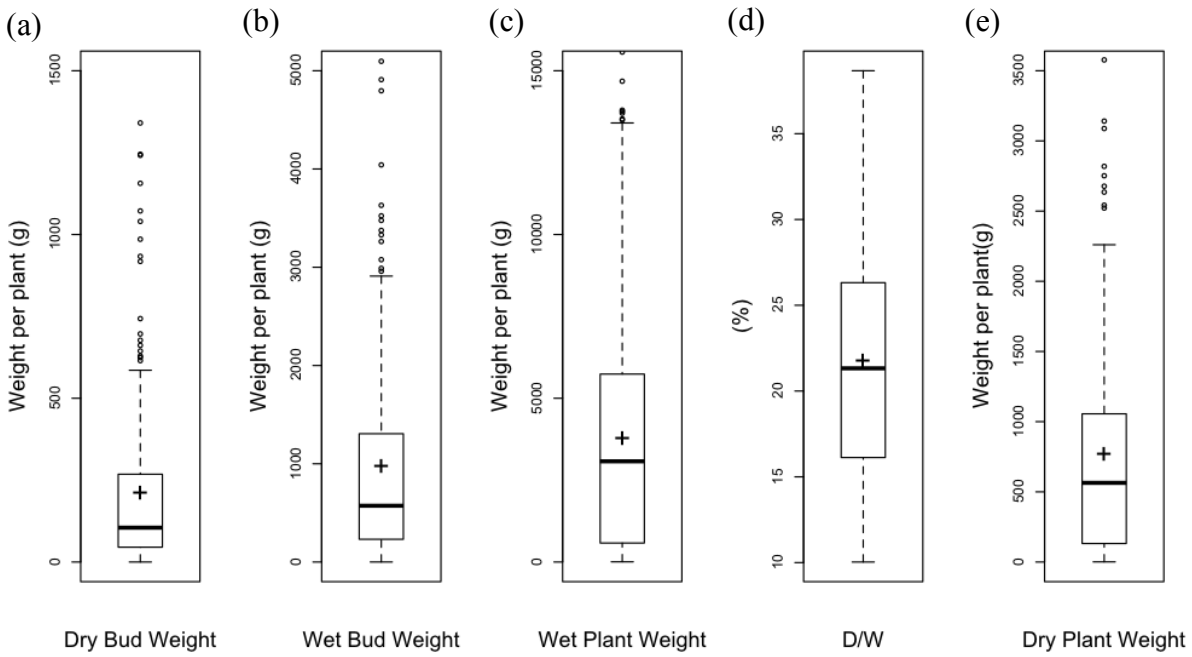

Figure S1. From cannabis cultivation facilities a box and whisker plot of the reported (N = 18,257) **(a)** dry bud weight, **(b)** wet bud weight, and **(c)** wet plant weight from the Liquor and Cannabis Board (LCB) database maintained by the state of Washington for August-October 2017. Also shown is the **(d)** estimated ratio of dry bud to wet bud weight (D/W) per plant and the **(e)** dry plant weight calculated by multiplying D/W ratio and the wet plant weight. The black cross in each box indicates the average.

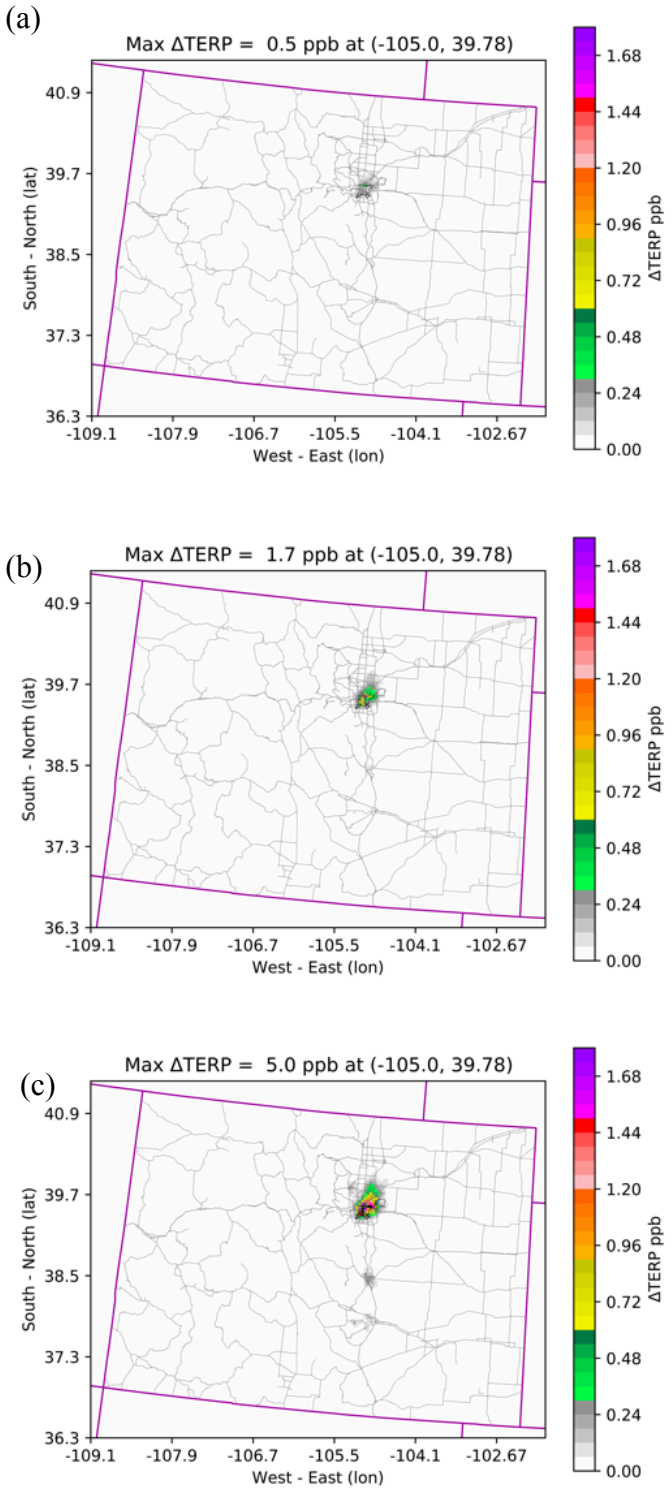

Figure S2. The maximum hourly change in predicted TERP concentrations (ppbv) across the 4 km × 4 km domain over the entire 90 days simulation for the **(a)** 1_EC, **(b)** 5_DPW, and **(c)** 3_EC scenarios.

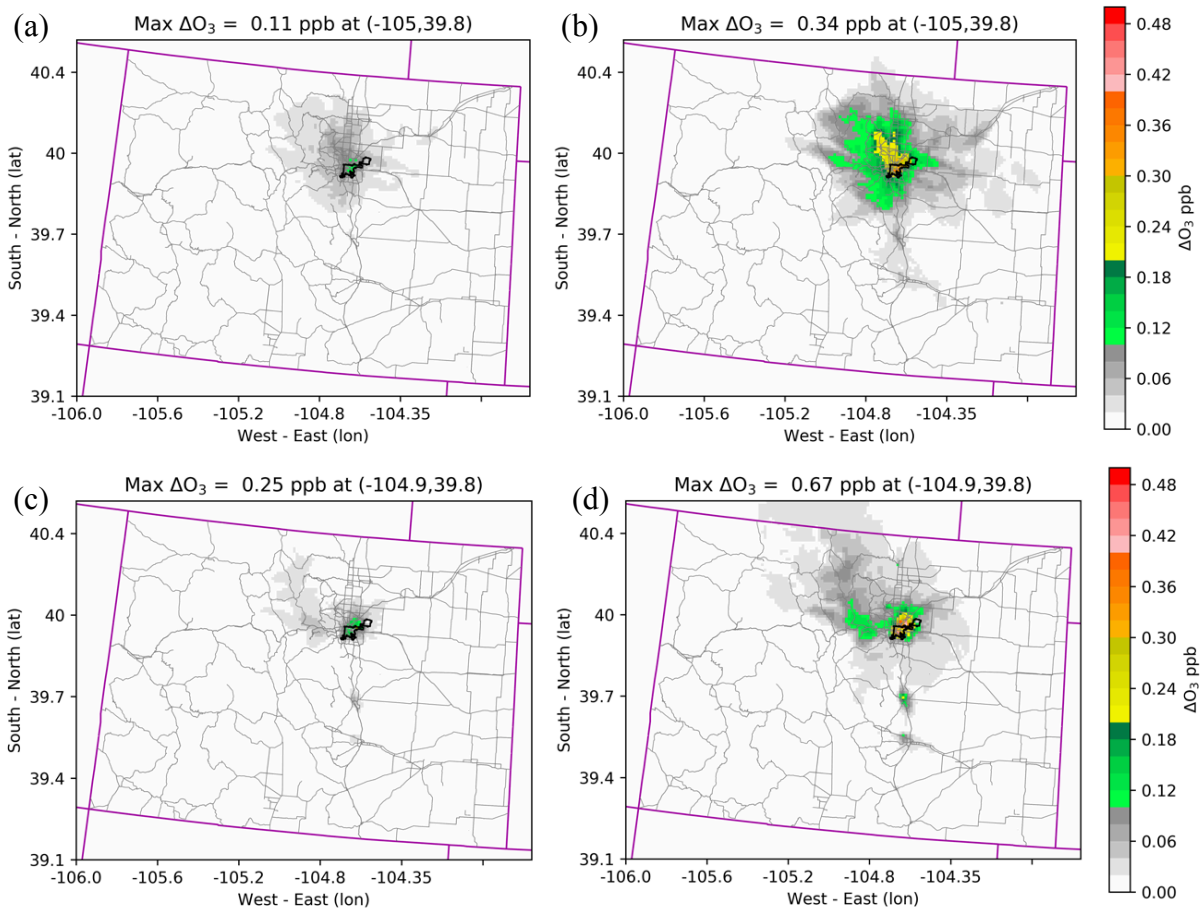

Figure S3. The predicted changes in hourly ozone concentrations for the 4 km × 4 km domain during the daytime (6 AM – 6 PM LST) for all 90 days of the simulation for the **(a)** 5_DPW, **(b)** 3_EC scenarios. The nighttime (6 PM – 6 AM LST) results are for the **(c)** 5_DPW, **(d)** 3_EC scenarios. Black regions within each map indicate changes in ozone concentration greater than 0.5 ppb. The grey lines indicate major highways and black lines outline Denver County**.**

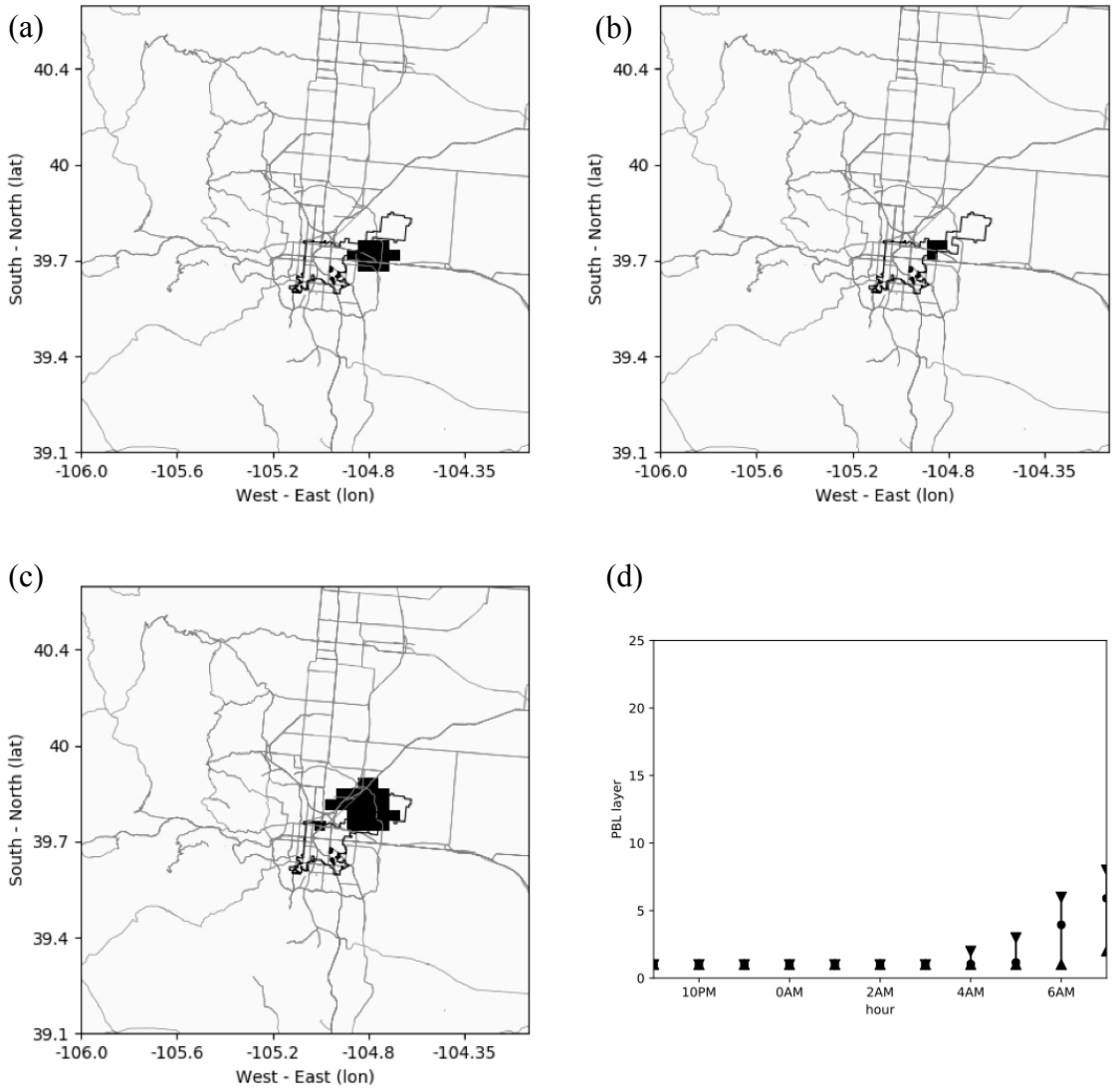

Figure S4. Horizontal grid cells used for process analysis at **(a)** July 27th, 9 PM LST, and July 28th at **(b)** 0 AM LST (i.e. midnight), **(c)** 3 AM LST. Also shown are the **(d)** range of vertical layers used for process analysis for July 27th, 9:00 PM to July 28th, 6:00 AM LST where the black circle is the average layer height.

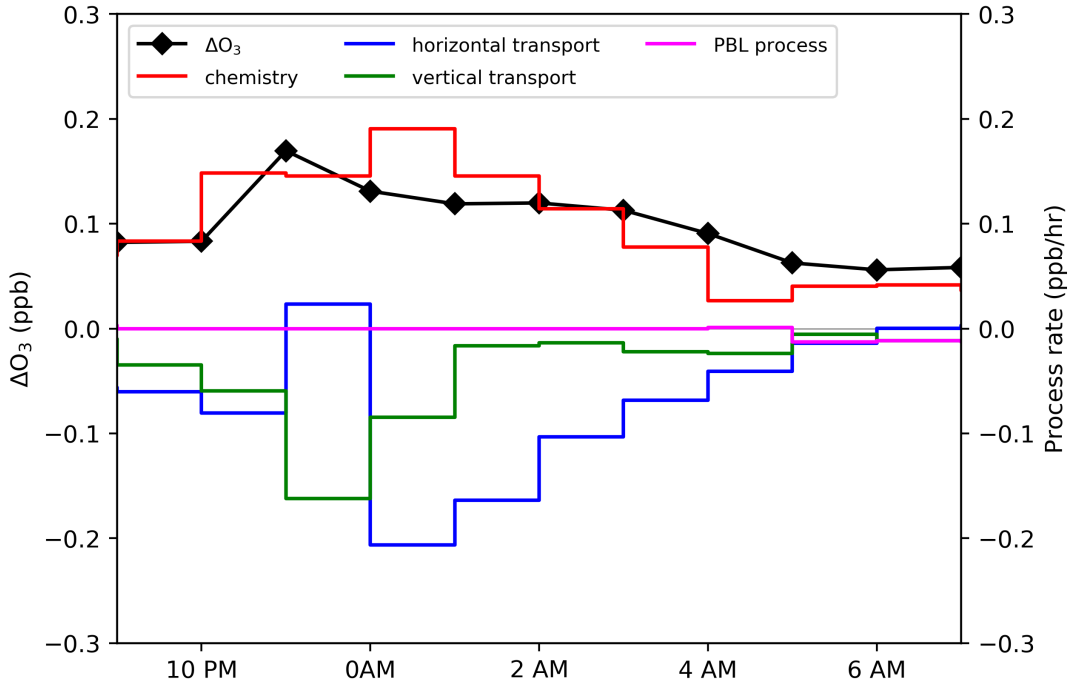

Figure S5. The changes using scenario 3_EC minus BC in chemical and physical processes that impact ozone. The hourly changes in ozone concentrations (ppb) are shown in black diamonds with changes in rates (ppb/hr) due to chemistry (red), horizontal transport (blue), vertical transport (green), and planet boundary layer (PBL) change process (magenta).

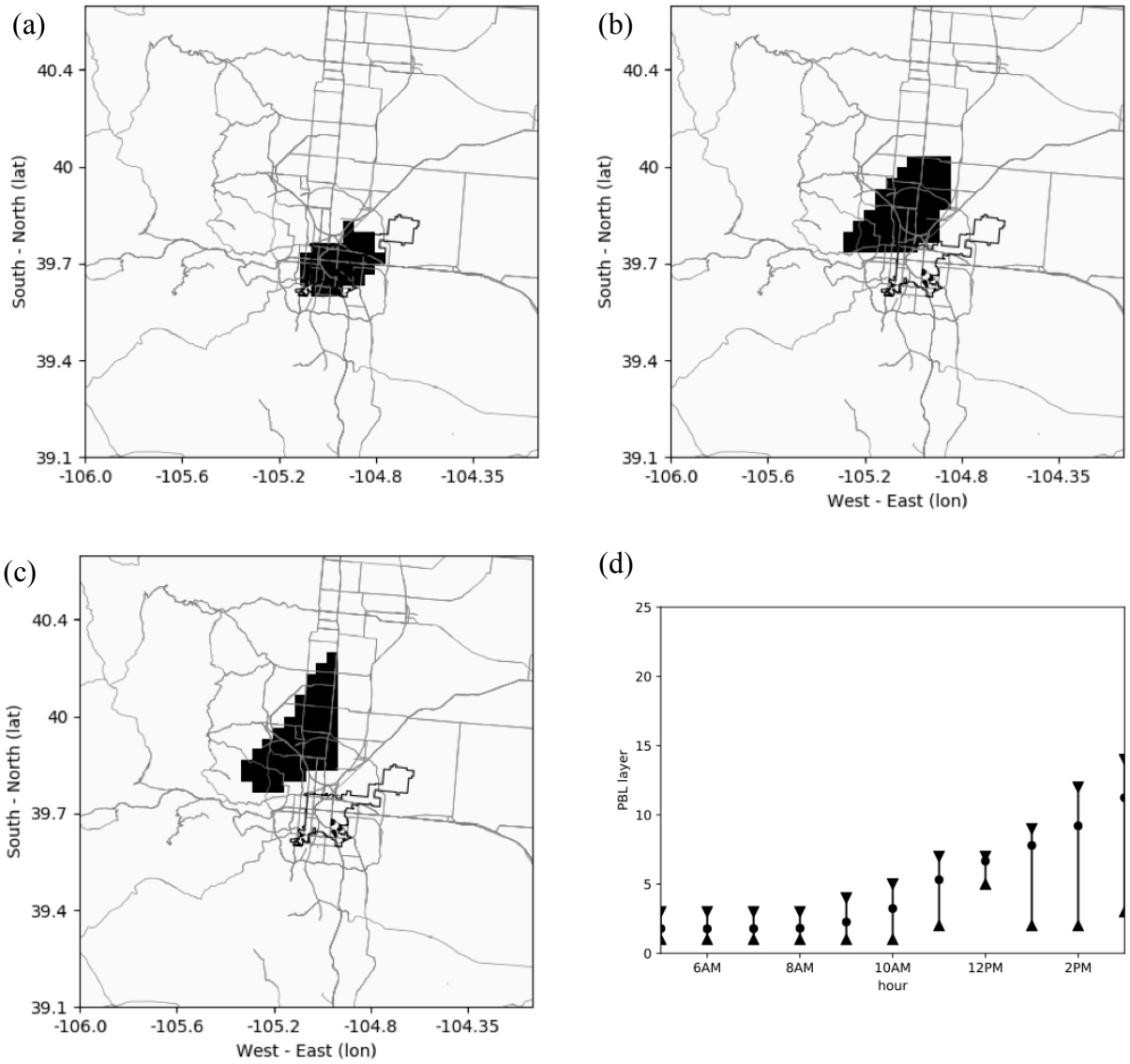

Figure S6. Horizontal grid cells used for process analysis on July 18th at **(a)** 9 AM LST, **(b)** 12 PM LST (i.e. noon), and **(c)** 2 PM LST. Also shown are the **(d)** range of vertical layers used for process analysis for 6AM-2PM LST where the black circle is the average layer height.

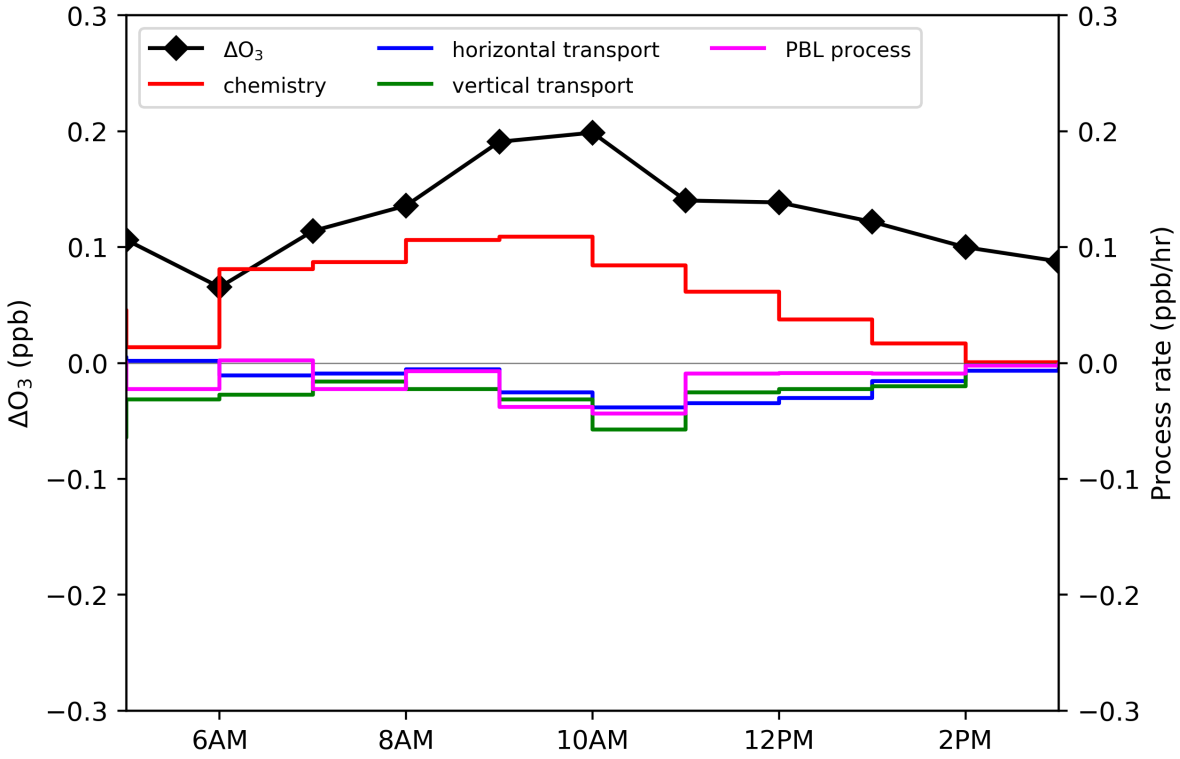

Figure S7. The changes using scenario 3_EC minus BC in chemical and physical processes that impact ozone. The hourly changes in ozone concentrations (ppb) are shown in black diamonds with changes in rates (ppb/hr) due to chemistry (red), horizontal transport (blue), vertical transport (green), and planet boundary layer (PBL) change process (magenta).