

NEW MEXICO OZONE ATTAINMENT INITIATIVE

2028 VOC and NOx Sensitivity OSAT Ozone Source Apportionment Modeling and Draft Final Air Quality Technical Support Document

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NM OAI Study Webinar

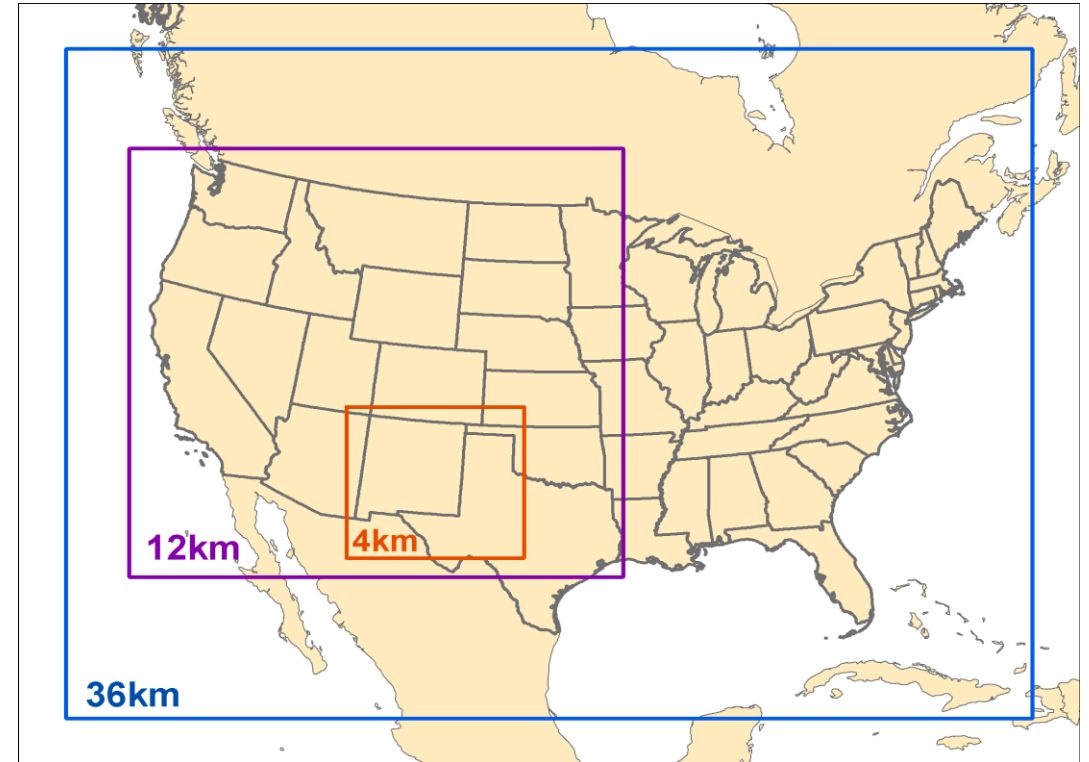
April 21, 2021

2028 VOC/NOX SENSITIVITY OSAT OZONE SOURCE APPORTIONMENT

- 01** CAMx Ozone Source Apportionment Tools and Differences Between OSAT and APCA
- 02** Highlights of 2028 Source Sector APCA Ozone Source Apportionment Modeling (presented at April 2, 2021 Webinar)
- 03** 2028 VOC/NOx Sensitivity OSAT Ozone Source Apportionment Modeling Results
- 04** Draft Final Air Quality Technical Support Document (AQTSD)

CAMX 2014 NM OAI STUDY MODEL CONFIGURATION

- Episode: May-August 2014
 - 16-day spin-up before first high ozone day in NM
 - 68 ppb on May 17
- 36/12/4-km Modeling Domains
 - 36/12-km domains same as WRAP Regional Haze
 - New 4-km New Mexico domain
- Boundary Conditions (BC) WRAP 2014 GEOS-Chem
- Four Meteorological Diagnostic Sensitivity tests
 - Selected WRF/NAM with Kv=CMAQ
- WRAP 2014v2 base year emissions
 - EPA NEI2014v2 w/ western state updates
- WRAP 2028OTBa2 for future year w/ 2014 actual fires and new 2028 NM O&G



CAMX OZONE SOURCE APPORTIONMENT TOOLS

- **Ozone Source Apportionment Technology (OSAT)**
 - OSAT uses tagged species/reactive tracers to calculate contributions of VOC and NO_x emissions from user-defined Source Groups to ozone concentrations that are VOC sensitive (O₃V) and ozone concentrations that are NO_x sensitive (O₃N)
 - Accounting system that operates in parallel to host model extracting ozone source apportionment information
 - User-defined Source Groups can be Source Regions and/or Source Categories and includes all sources (including BCs) of ozone (e.g., on-road mobile sources from New Mexico)
 - When ozone is formed, OSAT determines whether ozone formation is more sensitive to VOC or NO_x emissions and allocates it to Source Group's ozone tracers (O₃V or O₃N) based on the relative contribution of the more sensitive ozone precursor (VOC or NO_x)
- 10 Reactive Tracers used for each Source Group
 - V_i = VOC emissions
 - NIT_i = Nitric oxide (NO) & nitrous acid (HONO) emissions
 - RGN_i = Nitrogen dioxide (NO₂), nitrate radical (NO₃) and dinitrogen pentoxide (N₂O₅)
 - TPN_i = Peroxyl acetyl nitrate (PAN), analogues of PAN and peroxy nitric acid (PNA)
 - NTR_i = Organic nitrates (RNO₃)
 - $HN3_i$ = Gaseous nitric acid (HNO₃)
 - $O3N_i$ = Ozone formed under NO_x-limited conditions from N_i
 - $O3V_i$ = Ozone formed under VOC-limited conditions from V_i
 - OON_i = Odd-oxygen in NO₂ formed from $O3N_i$
 - OOV_i = Odd-oxygen in NO₂ formed from $O3V_i$

CAMX OZONE SOURCE APPORTIONMENT TOOLS

- **Anthropogenic Precursor Culpability Assessment (APCA)**

- APCA differs from OSAT in that it only allocates ozone formed to the Natural (e.g., biogenic) Source Groups when it is due to Natural VOC reacting with Natural NO_x
 - For example, ozone formed due to biogenic VOC reacting with anthropogenic NO_x under VOC emissions sensitive conditions, a case OSAT assigns to Natural Source Group O3V, APCA redirects ozone formed to anthropogenic Source Group O3N
- APCA provides more control strategy relevant information and is used in ozone contribution assessments, while OSAT provides information on whether ozone formation is more sensitive to VOC or NO_x emissions
 - APCA used in EPA's Cross State Air Pollution Rule (CSAPR) to identify when an upwind state's anthropogenic emissions contributes significantly to nonattainment in a downwind state
 - APCA also used in NMED OAI Study 2028 Local Source APCA ozone source apportionment modeling
- If analyzing whether ozone formation is more sensitive to VOC or NO_x emissions, then OSAT source apportionment or a sensitivity method (e.g., DDM/HDDM or Brute Force) must be used
 - NM OAI Study 2028 VOC/NO_x sensitivity OSAT ozone source apportionment modeling

CAMX 2028 O&G CS SOURCE SECTOR APCA OZONE SA

• Definition of Source Groups

○ Boundary Conditions (BCs) from WRAP 2014 GEOS-Chem runs:

- BC_{Intl} - International anthropogenic emissions
- BC_{USA} - U.S. anthropogenic emissions
- $BC_{Natural}$ - Natural sources
- BC_{Top} - BC above the top of domain

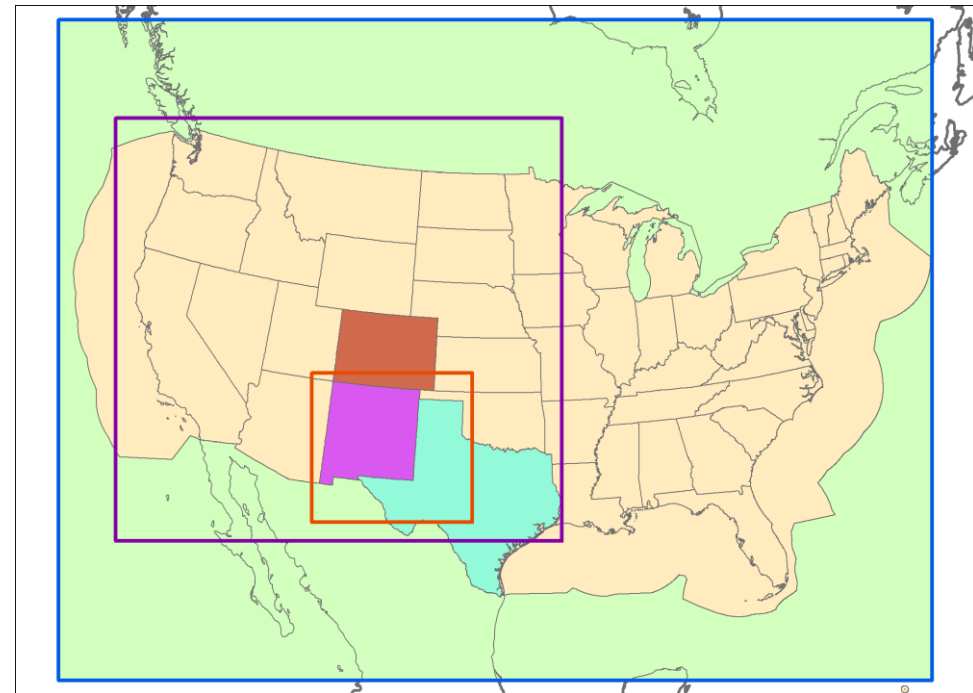
○ Source Categories (9):

1. Natural (biogenic, lightning NO_x, etc.);
2. Fires (WF, Rx, Ag, other);
3. Oil and gas point sources (surrogate for midstream);
4. Oil and gas non-point sources (surrogate for upstream);
5. EGU point;
6. Non-EGU point;
7. On-road mobile;
8. Non-road mobile; and
9. Remainder anthropogenic.

○ Source Regions (5):

- New Mexico
- Texas
- Colorado
- Remainder U.S.
- International (Mex, Can, CMV > 200 nmi)

○ 50 Source Groups ($50 = 5 \times 9 + 5$)



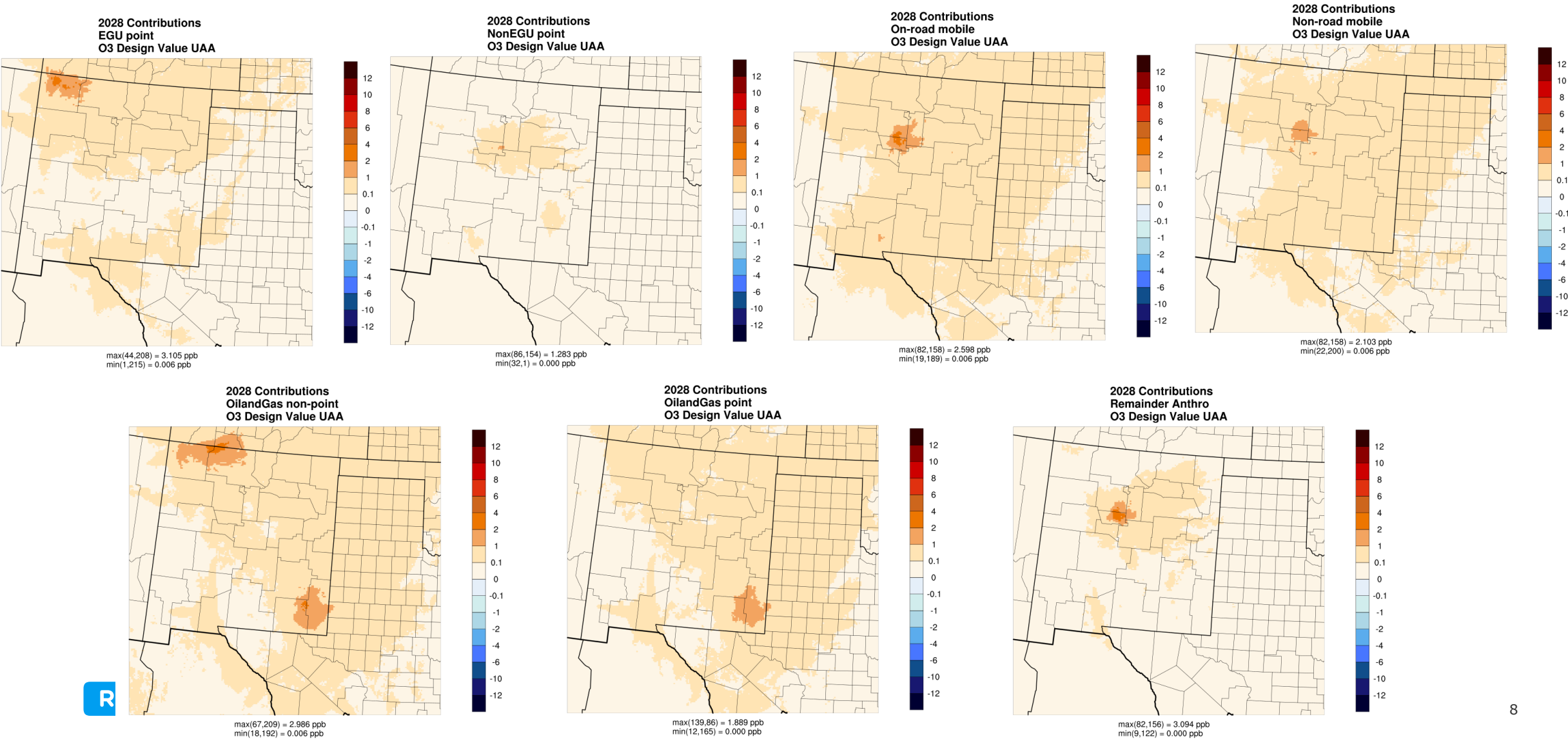
REDUCTIONS 2028 OZONE DVFS NEW MEXICO SOURCE SECTORS

- 2028 ozone DVF Reductions from New Mexico Source Sectors

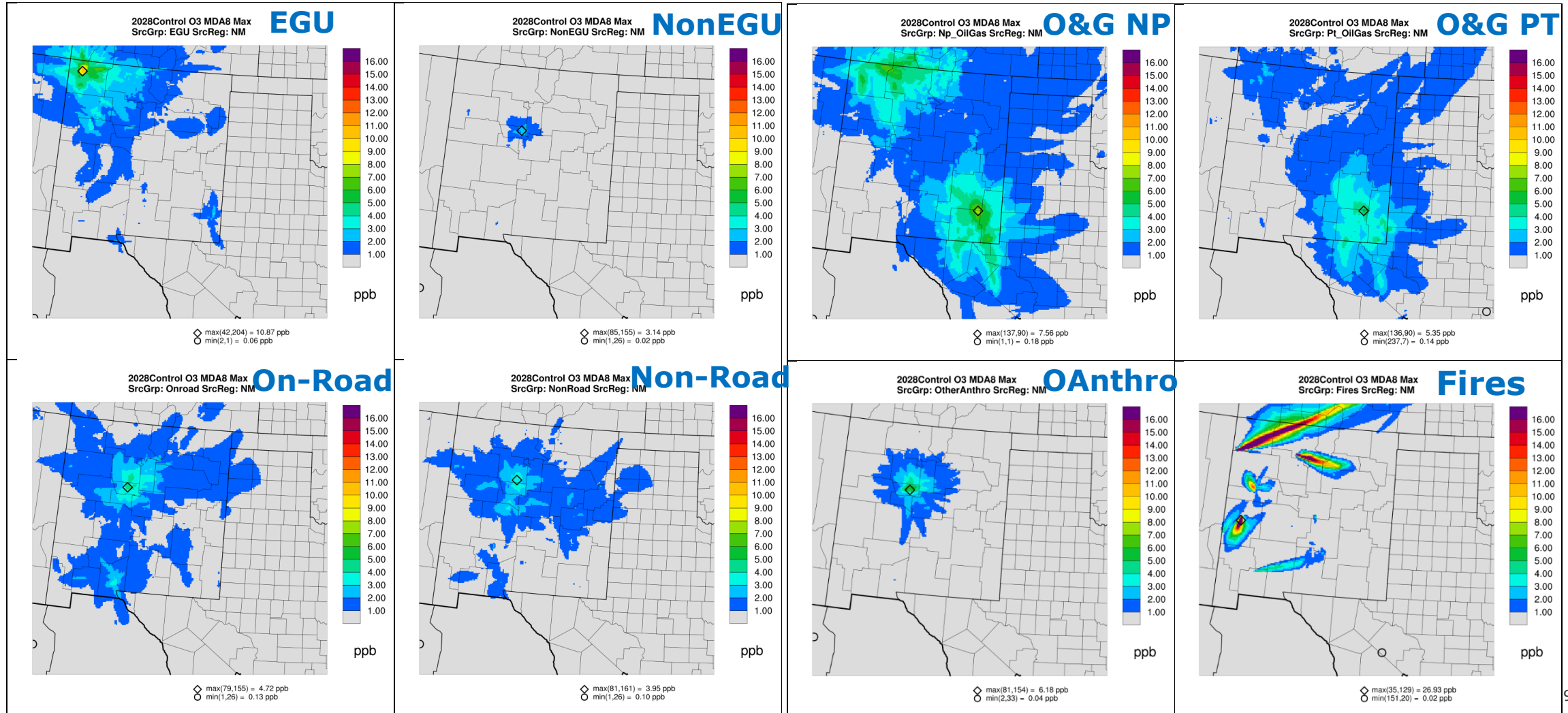
- O&G Point: -0.1 to -0.9 ppb
- O&G Non-Pt: -0.1 to -2.1 ppb
- EGU Point: 0.0 to -3.1 ppb
- Non-EGU Pt: 0.0 to -1.1 ppb
- On-Road: -0.1 to -2.7 ppb
- Non-Road: -0.1 to -1.9 ppb
- Other Anthro: 0.0 to -3.6 ppb

AQS_ID	Site_ID	DVC	DVF	O&GPT	O&GNP	EGU	NonEGU	OnRoad	NonRoad	OAnth
350010023	NORTE	66.3	60.7	-0.2	-0.3	-0.5	-1.0	-2.7	-2.0	-3.6
350010024	SEHGS	68.0	62.0	-0.2	-0.3	-0.5	-1.1	-2.5	-1.9	-3.2
350010029	STHVA	66.0	60.5	-0.3	-0.5	-0.5	-1.0	-2.2	-1.7	-2.4
350010032	WSTSD	67.0	62.1	-0.2	-0.4	-0.4	-0.4	-1.6	-1.2	-1.8
350011012	FTHIL	65.0	58.8	-0.2	-0.3	-0.5	-0.7	-2.5	-2.0	-3.0
350130008	UNION	66.3	59.8	-0.2	-0.2	-0.7	0.0	-0.5	-0.3	-0.1
350130017	SPARK	67.0	61.8	-0.2	-0.2	-0.9	0.0	-0.4	-0.2	-0.2
350130020	CHAPA	67.0	62.2	-0.1	-0.1	-0.3	0.0	-0.2	-0.1	-0.1
350130021	DSVIE	72.0	66.8	-0.2	-0.3	-0.9	-0.1	-0.5	-0.3	-0.2
350130022	TERES	71.3	66.0	-0.3	-0.3	-0.7	-0.1	-0.5	-0.3	-0.2
350130023	SOLAN	65.0	60.2	-0.2	-0.2	-0.2	-0.2	-1.2	-0.7	-0.3
350151005	CARLS	69.0	66.4	-0.5	-0.5	-0.2	-0.1	-0.3	-0.2	-0.1
350171003	GRANT	62.0	58.9	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
350250008	HOBBS	66.0	63.3	-0.9	-1.1	-0.2	0.0	-0.3	-0.2	-0.1
350290003	DEAIR	66.0	62.5	-0.2	-0.1	-0.2	0.0	-0.6	-0.4	0.0
350390026	COYOT	64.0	60.0	-0.2	-0.5	-0.5	0.0	-0.2	-0.1	0.0
350431001	BERNA	64.0	58.1	-0.1	-0.2	-0.4	-0.4	-2.1	-1.5	-1.9
350450009	BLOOM	64.3	60.2	-0.7	-1.4	-1.9	0.0	-0.4	-0.1	-0.1
350450018	NAVAJ	67.0	63.3	-0.9	-2.1	-1.7	-0.1	-0.4	-0.2	-0.1
350451005	SUBST	63.7	59.6	-0.6	-1.5	-3.1	-0.1	-0.5	-0.2	-0.2
350490021	SNTFE	64.3	60.4	-0.2	-0.3	-0.2	-0.3	-1.2	-0.7	-0.8
350610008	LUNAS	66.3	62.0	-0.2	-0.3	-0.3	-0.3	-1.1	-1.0	-0.4

SMAT UAA (DVC₂₀₁₂₋₂₀₁₆) 2028 DVF NM SOURCE CONTRIBUTIONS



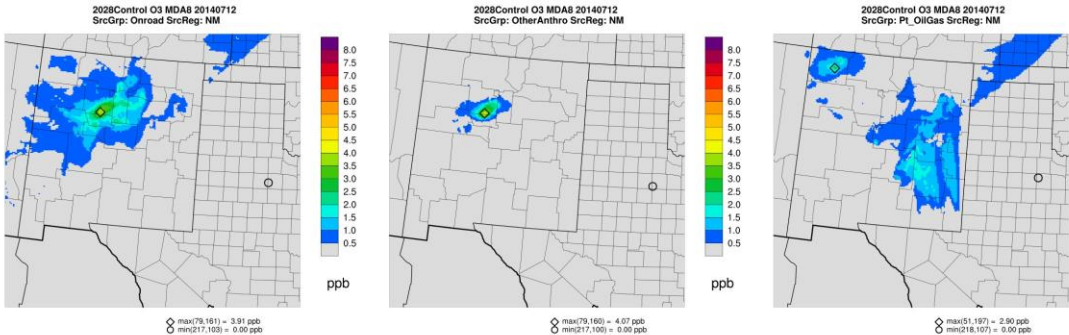
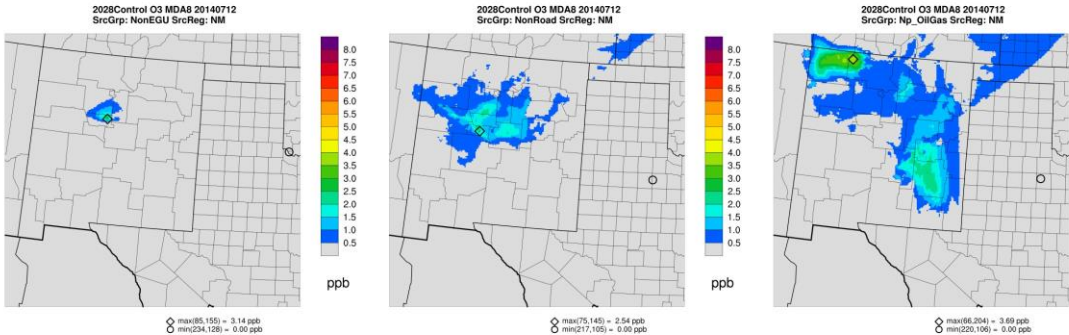
HIGHEST NEW MEXICO SOURCE SECTOR OZONE CONTRIBUTIONS TO MDA8 OZONE DURING EPISODE



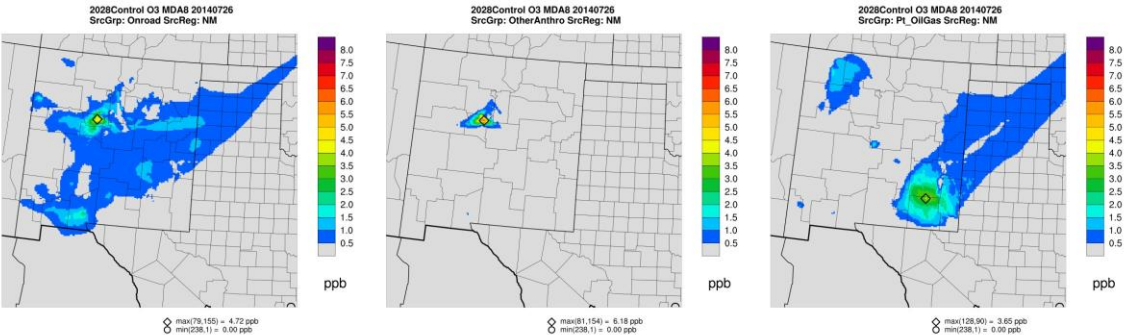
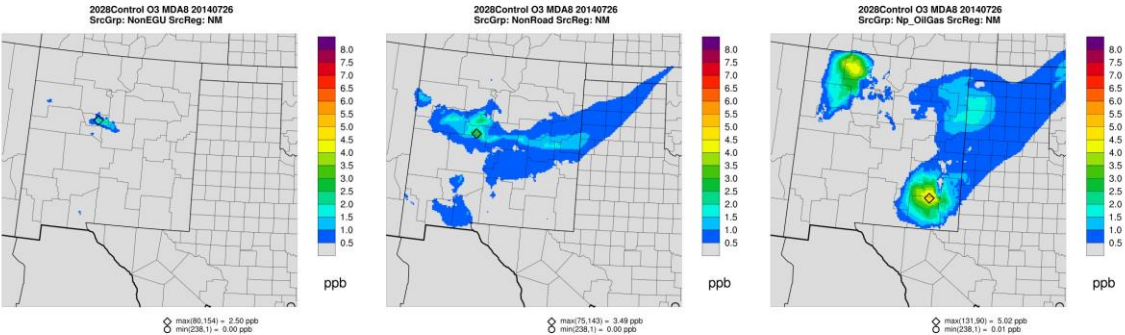
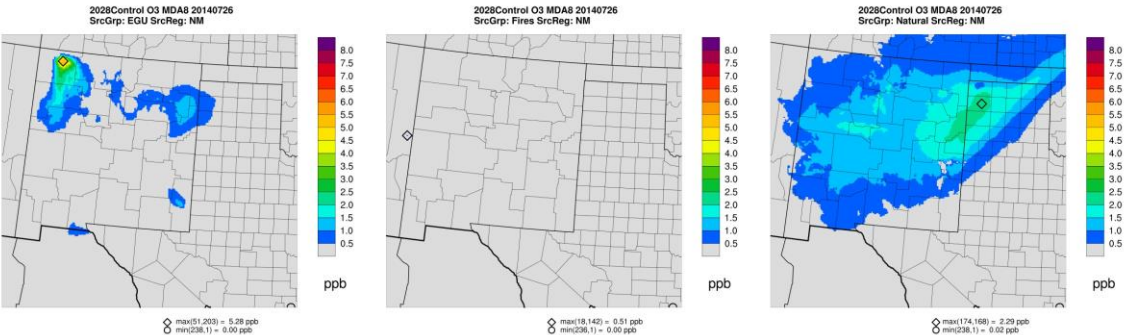
2028 NEW MEXICO SOURCE SECTOR

EGU	Fires	Natural
NonEGU	Non-Road	O&G_NP
On-Road	OAnthro	O&G_PT

July 12, 2014



July 26, 2014



2028 OZONE DVF NO INTERNATIONAL ANTHRO EMISSIONS

- 2028 ozone DVF projections using $DVC_{2012-2016}$, $DVC_{2015-2019}$ and $DVC_{2017-2019}$
- Elimination of international anthropogenic emissions reduces 2028 ozone DVF by 13 to 25 ppb
- 2028 ozone DVF w/ no international anthropogenic emissions range from 38 to 53 ppb

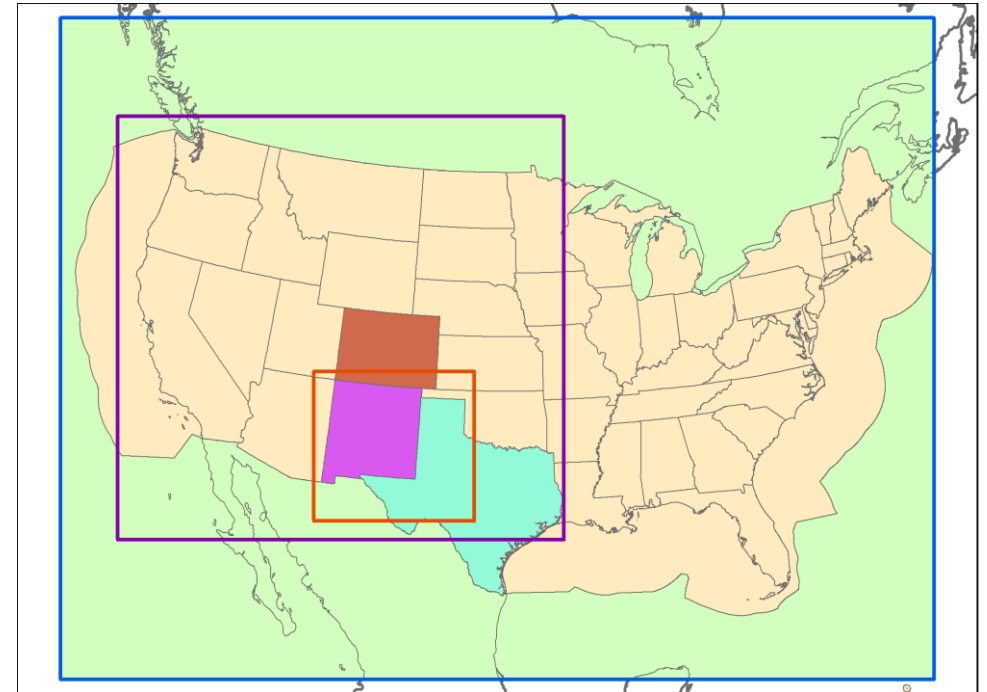
2012-14 DVC (ppb)	2028OGCS DVF (ppb)	2028INTL DVF (ppb)	2028 DVF Difference OGCS-INTL (ppb)	Site Name
66.3	60.7	47.2	-13.5	Del Norte HS
68.0	62.0	48.5	-13.5	South East Heights
66.0	60.5	47.1	-13.4	South Valley
67.0	62.1	48.5	-13.6	Westside
65.0	58.8	45.7	-13.1	Foothills
66.3	59.8	39.9	-19.9	La Union
67.0	61.8	38.4	-23.4	Sunland Park
67.0	62.2	39.6	-22.6	Chaparral
72.0	66.8	42.6	-24.2	Desert View
71.3	66.0	42.2	-23.8	Santa Teresa
65.0	60.2	41.5	-18.7	Solano
69.0	66.4	46.1	-20.3	Carlsbad
62.0	58.9	43.0	-15.9	Chino Copper Smelt
66.0	63.3	44.9	-18.4	Hobbs Jefferson
66.0	62.5	43.3	-19.2	Deming Airport
64.0	60.0	47.4	-12.6	Coyote Ranger Dist
64.0	58.1	44.4	-13.7	Bernalillo (E Avenida)
64.3	60.2	46.4	-13.8	Bloomfield
67.0	63.3	50.2	-13.1	Navajo Lake
63.7	59.6	48.5	-11.1	Substation
64.3	60.4	47.9	-12.5	Santa Fe Airport
66.3	62.0	47.5	-14.5	Los Lunas (Los Lentos)

2015-19 DVC (ppb)	2028OGCS DVF (ppb)	2028INTL DVF (ppb)	2028 DVF Difference OGCS-INTL (ppb)	Site Name
69.0	63.1	49.2	-13.9	Del Norte HS
66.0	60.5	47.1	-13.4	South Valley
69.0	62.4	48.5	-13.9	Foothills
68.7	62.0	41.3	-20.7	La Union
70.7	65.7	41.8	-23.9	Chaparral
74.3	68.9	43.9	-25.0	Desert View
74.0	68.5	43.8	-24.7	Santa Teresa
67.7	62.7	43.3	-19.4	Solano
73.7	70.9	49.2	-21.7	Carlsbad
71.0	69.3	44.1	-25.2	Carlsbad NP
69.3	66.5	47.1	-19.4	Hobbs Jefferson
66.3	62.2	49.1	-13.1	Coyote Ranger Dist
67.0	60.9	46.5	-14.4	Bernalillo (E Avenida)
67.0	62.8	48.3	-14.5	Bloomfield
69.0	65.2	51.7	-13.5	Navajo Lake
67.3	62.9	51.2	-11.7	Substation
65.0	61.0	48.4	-12.6	Santa Fe Airport
66.7	62.3	47.8	-14.5	Los Lunas (Los Lentos)

2017-19 DVC (ppb)	2028OGCS DVF (ppb)	2028INTL DVF (ppb)	2028 DVF Difference OGCS-INTL (ppb)	Site Name
70.0	64.0	49.9	-14.1	Del Norte HS
67.0	61.4	47.8	-13.6	South Valley
71.0	64.2	49.9	-14.3	Foothills
70.0	63.2	42.1	-21.1	La Union
73.0	67.8	43.1	-24.7	Chaparral
77.0	71.4	45.5	-25.9	Desert View
76.0	70.3	45.0	-25.3	Santa Teresa
70.0	64.8	44.7	-20.1	Solano
79.0	76.0	52.8	-23.2	Carlsbad
71.0	68.1	48.3	-19.8	Hobbs Jefferson
67.0	62.8	49.6	-13.2	Coyote Ranger Dist
68.0	61.8	47.2	-14.6	Bernalillo (E Avenida)
68.0	63.7	49.1	-14.6	Bloomfield
69.0	65.2	51.7	-13.5	Navajo Lake
69.0	64.5	52.5	-12.0	Substation
66.0	62.0	49.1	-12.9	Santa Fe Airport
68.0	63.5	48.7	-14.8	Los Lunas (Los Lentos)

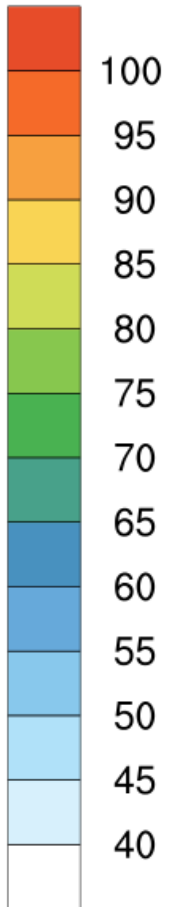
CAMX 2028 O&G CS OSAT OZONE SOURCE APPORTIONMENT

- Use the OSAT version of CAMx ozone source apportionment tool
 - OSAT O3V and O3N tracers give indication of whether ozone formation is more VOC or NOx sensitive
- Definition of Source Groups
 - Source Regions (5):
 - Use same 5 Source Regions as APCA SA run
 - Source Categories (3):
 - Anthropogenic Emissions
 - Natural (Biogenic, lightning NOx, WBD, oceanic)
 - Fires (U.S. WF, Rx and Ag and other)
 - 17 Source Groups (5 x 3 + 2 [IC,BC])
 - Runs faster than CAMx APCA SA Run (50 Source Groups)
- Post-Processing
 - Compare amount of ozone that is formed under more VOC sensitive vs. NOx sensitive conditions



SPATIAL MAPS OF OSAT VOC/NOX OZONE SENSITIVITY

- Use O3N and O3V tracers from emissions-based Source Groups to determine amount of ozone formed under VOC sensitive versus NOx sensitive conditions:
 - Percent NOx Sensitive Ozone Formation = $100 \times O3N / (O3V + O3N)$ Scale Used →
- Daily spatial maps of MDA8 ozone concentrations and percent ozone formed under NOx emissions sensitive conditions
 - Total MDA8 ozone from all Source Groups ($O3V + O3N + O3_{BC}$)
 - Boundary Condition (BC) ozone defined by 2014 GEOS-Chem run so no information on VOC/NOx sensitivity
 - MDA8 ozone and percent NOx sensitive ozone for all emissions-based Source Groups
 - ($O3V + O3N$) from anthropogenic, fire and natural emissions Source Categories and all 5 Source Regions
 - MDA8 ozone and percent NOx sensitive ozone for all anthropogenic emissions Source Groups
 - MDA8 ozone and percent NOx sensitive ozone for New Mexico anthropogenic emissions
 - Provide control strategy relevant information on relative importance of New Mexico VOC and NOx emissions

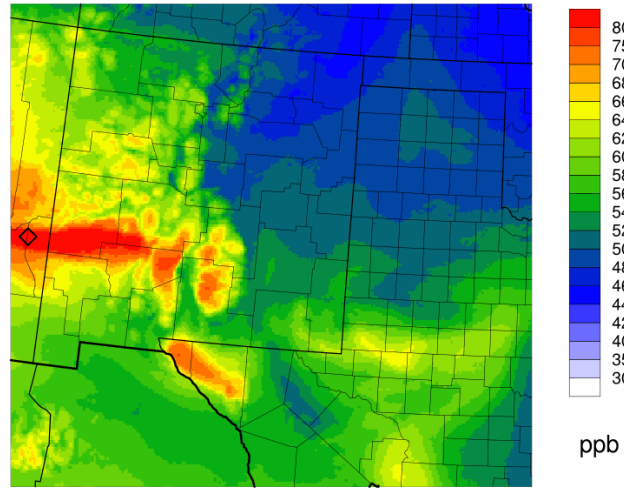


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2028 OSAT SA RESULTS FOR MAY 17, 2014

All Source Regions/Categories

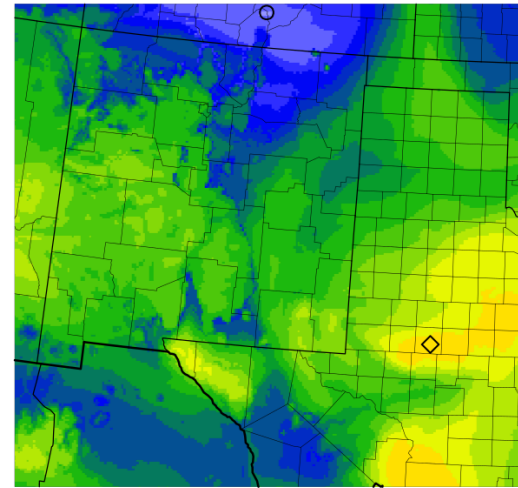
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat 20140517



◇ max(9, 117) = 128.6 ppb
○ min(243, 225) = 43.7 ppb

All Regions Anthro

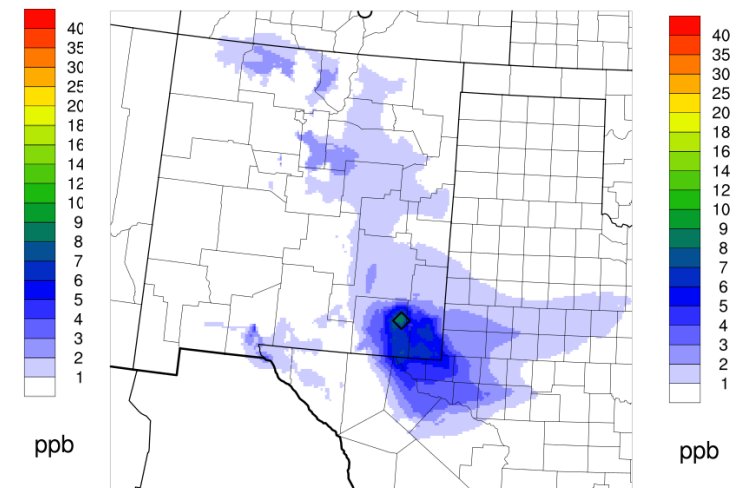
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_all_anthro 20140517



◇ max(194, 67) = 22.7 ppb
○ min(118, 221) = 3.0 ppb

New Mexico Anthro

Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_NM_anthro 20140517

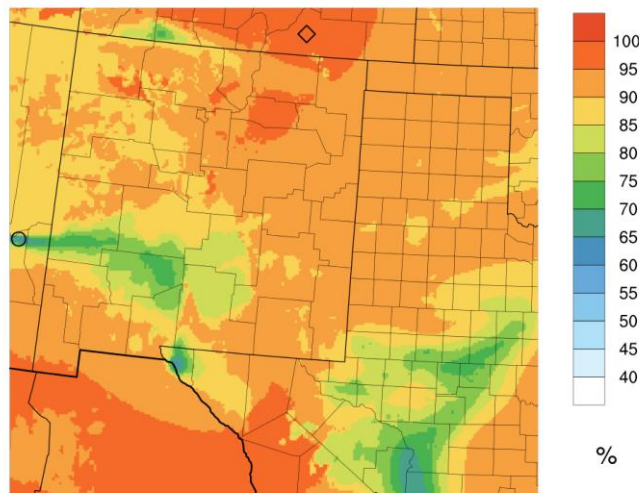


◇ max(136, 81) = 8.9 ppb
○ min(119, 225) = 0.0 ppb

Ozone
Concentrations
(ppb)

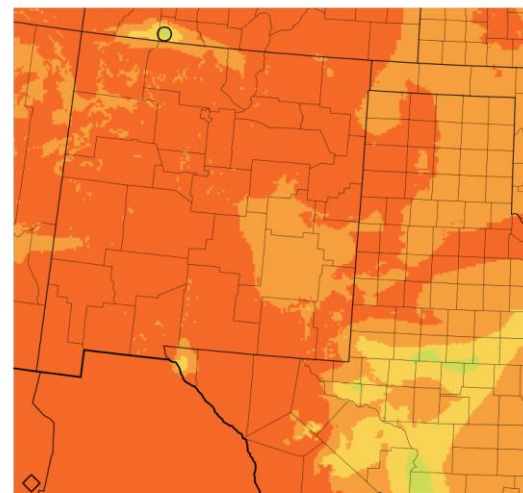
Percent NOx
Sensitive
Ozone

2028cntl_osat_all_emis 20140517



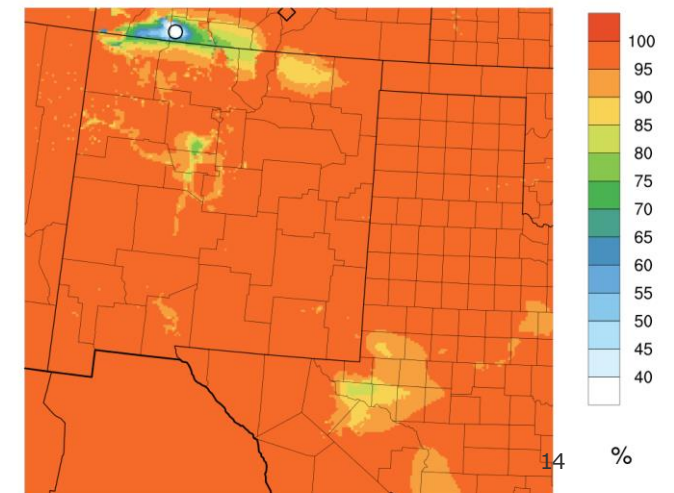
◇ max(137, 213) = 97.3%
○ min(5, 119) = 63.9%

2028cntl_osat_all_anthro 20140517



◇ max(9, 7) = 98.3%
○ min(70, 213) = 82.1%

2028cntl_osat_NM_anthro 20140517



◇ max(121, 223) = 99.6%
○ min(70, 214) = 31.6%

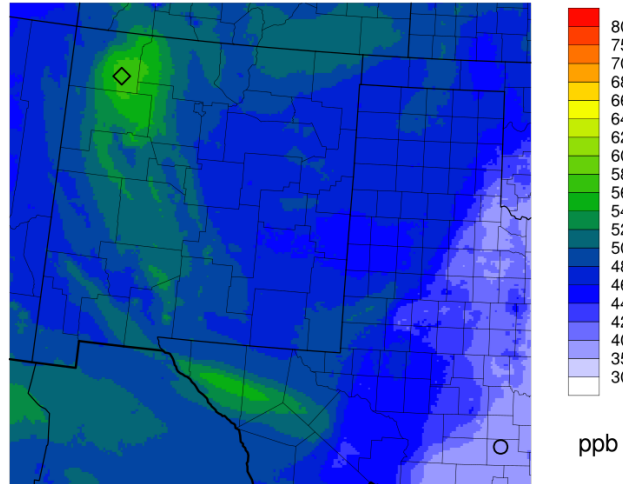
RAMBOLL

2028 OSAT SA RESULTS FOR MAY 26, 2014

Ozone
Concentrations
(ppb)

All Source Regions/Categories

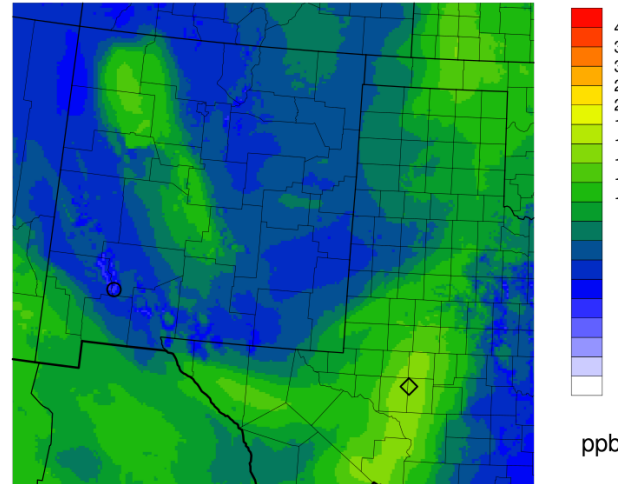
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat 20140526



◇ max(53,191) = 57.6 ppb
○ min(229, 19) = 36.5 ppb

All Regions Anthro

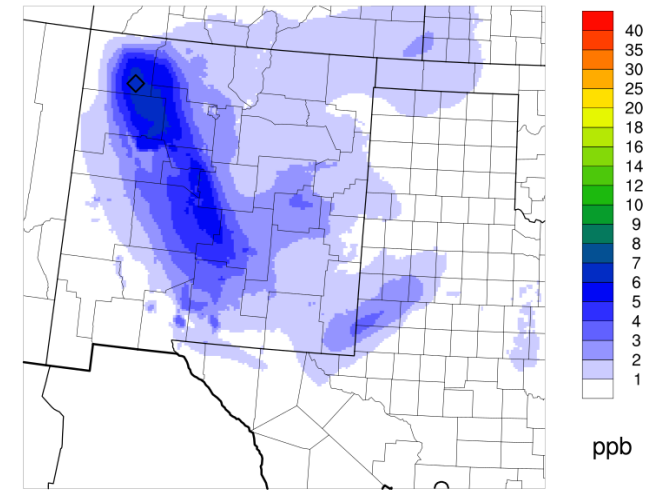
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_all_anthro 20140526



◇ max(185, 47) = 15.0 ppb
○ min(48, 92) = 4.2 ppb

New Mexico Anthro

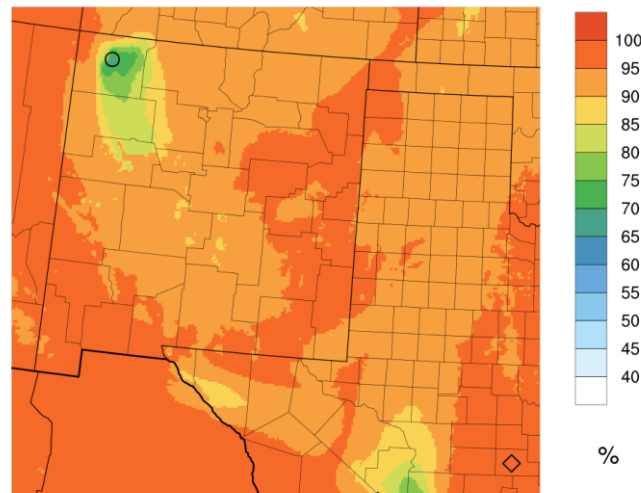
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_NM_anthro 20140526



◇ max(53,189) = 6.8 ppb
○ min(195, 1) = 0.0 ppb

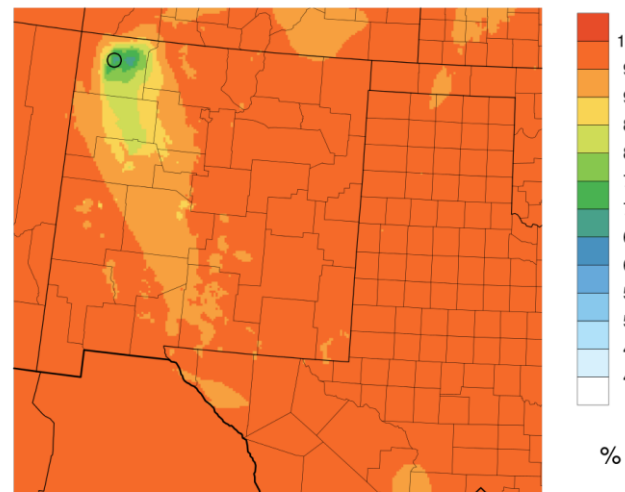
Percent NOx
Sensitive
Ozone

Percent NOx-limited Ozone formation 4km
2028cntl_osat_all_emis 20140526



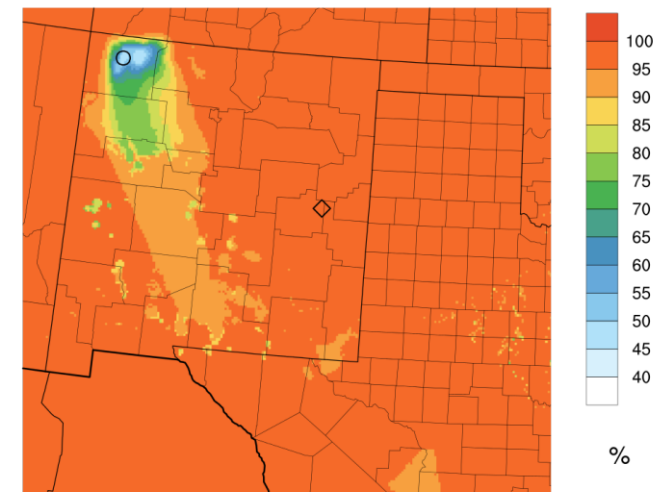
◇ max(230, 16) = 98.1%
○ min(47, 201) = 68.0 %

Percent NOx-limited Ozone formation 4km
2028cntl_osat_all_anthro 20140526



◇ max(215, 1) = 98.7%
○ min(47, 201) = 68.6 %

2028cntl_osat_NM_anthro 20140526



◇ max(138,133) = 98.8%
○ min(47, 202) = 45.2 %

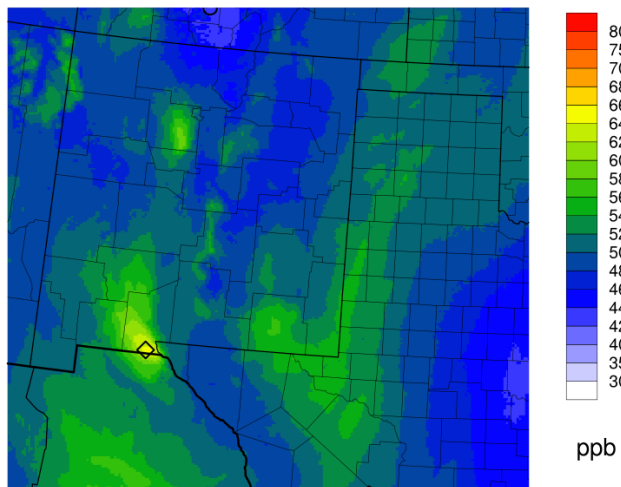
RAMBOLL

2028 OSAT SA RESULTS FOR MAY 28, 2014

Ozone
Concentrations
(ppb)

All Source Regions/Categories

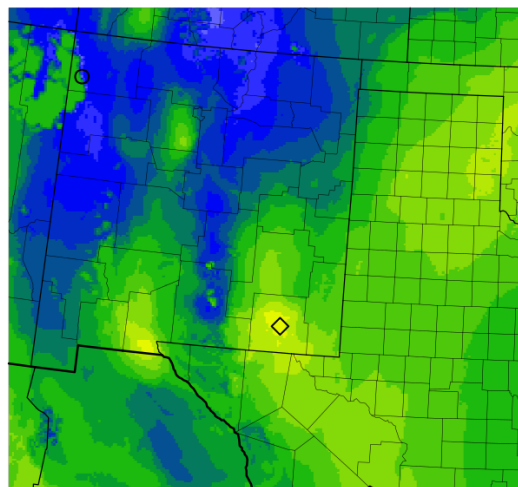
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat 20140528



◇ max(65, 66) = 64.3 ppb
◇ min(95,225) = 41.8 ppb

All Regions Anthro

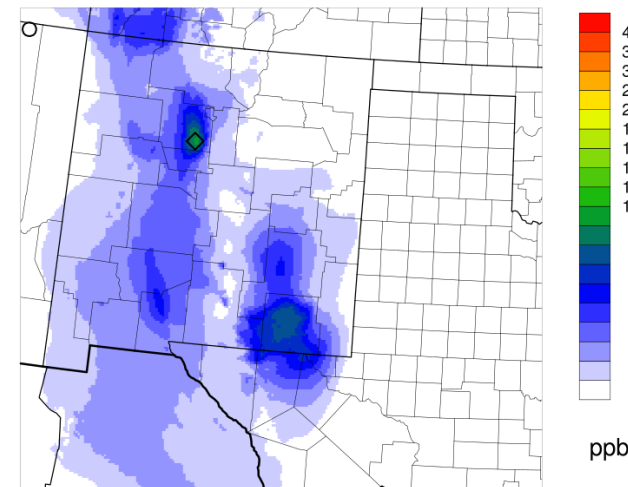
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_all_anthro 20140528



◇ max(127, 77) = 18.9 ppb
◇ min(35,193) = 3.6 ppb

New Mexico Anthro

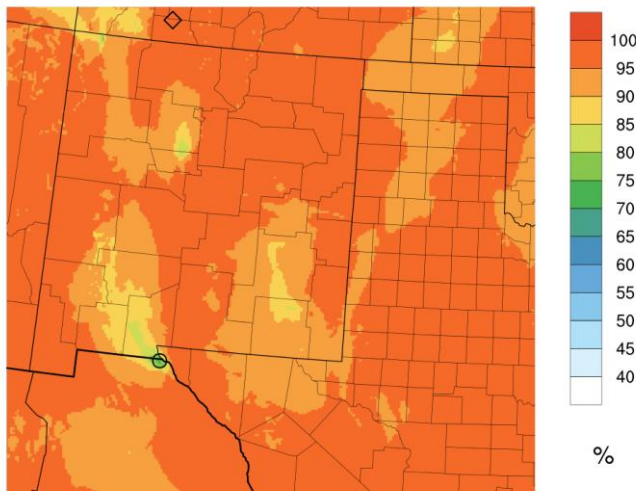
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_NM_anthro 20140528



◇ max(82,163) = 9.3 ppb
◇ min(5,215) = 0.1 ppb

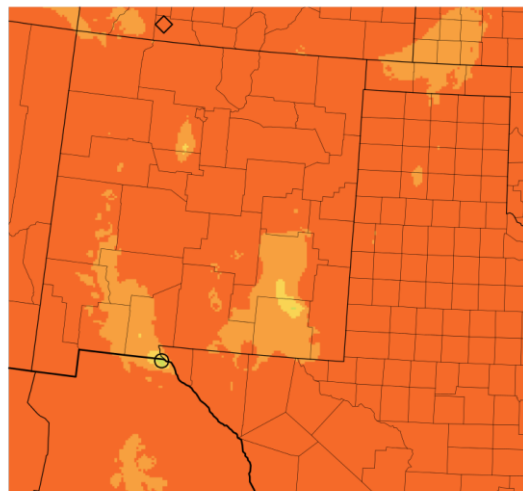
Percent NOx
Sensitive
Ozone

2028cntl_osat_all_emis 20140528



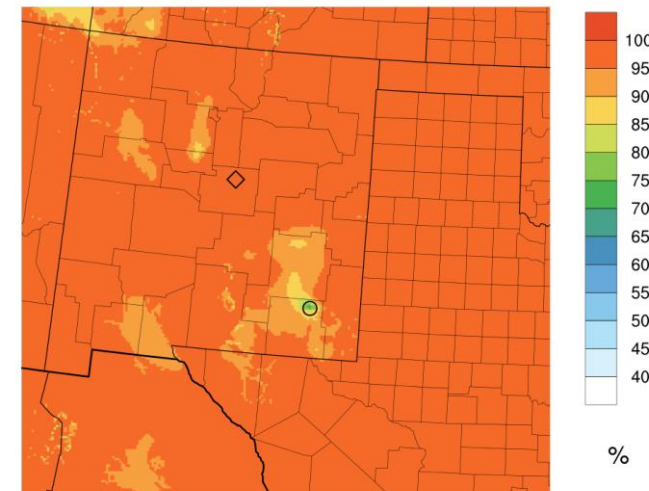
◇ max(77,219) = 97.7%
◇ min(71, 63) = 72.8 %

2028cntl_osat_all_anthro 20140528



◇ max(72,217) = 98.7%
◇ min(71, 63) = 81.2 %

2028cntl_osat_NM_anthro 20140528

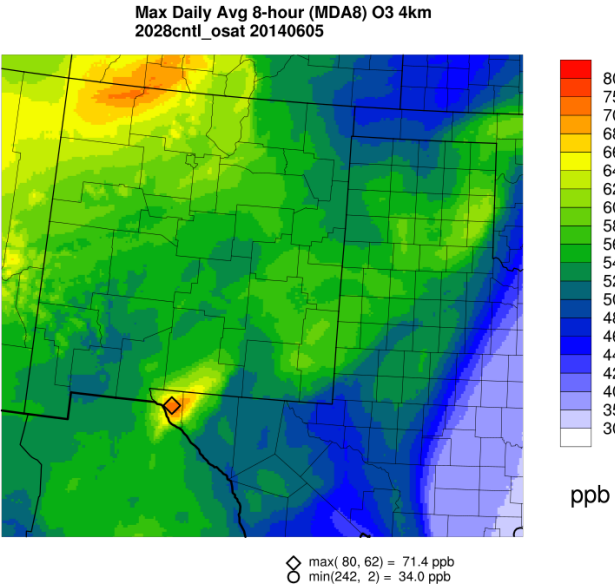


◇ max(99,146) = 99.3%
◇ min(133, 87) = 74.6 %

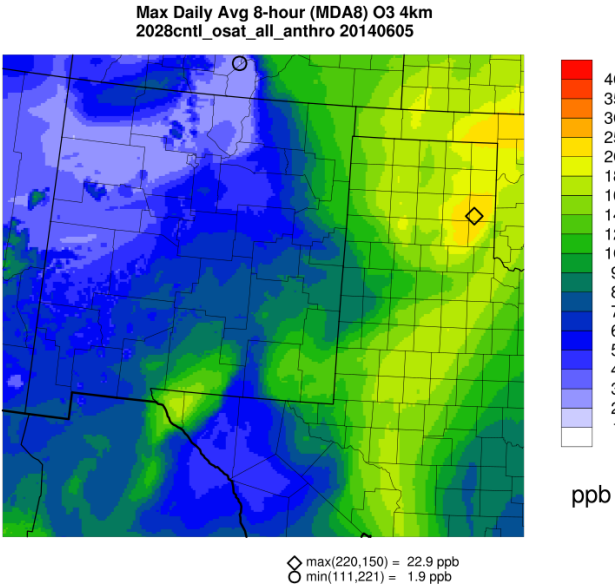
2028 OSAT SA RESULTS FOR JUNE 5, 2014

Ozone
Concentrations
(ppb)

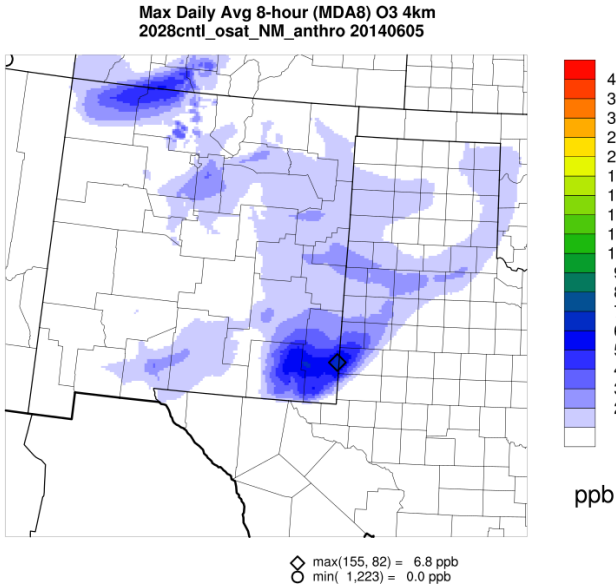
All Source Regions/Categories



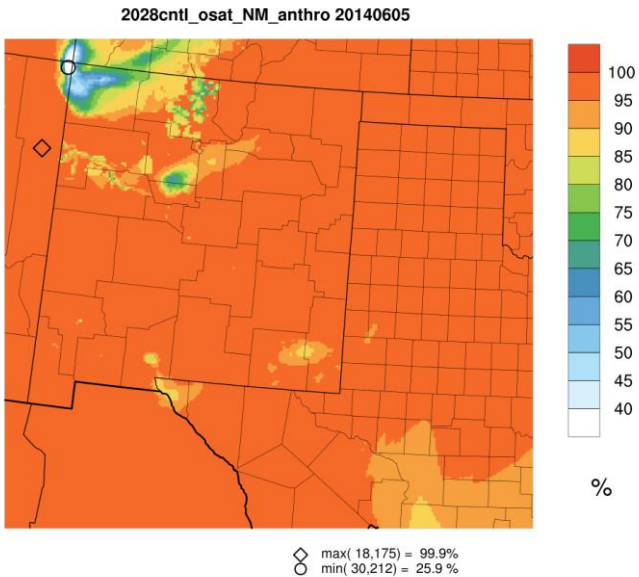
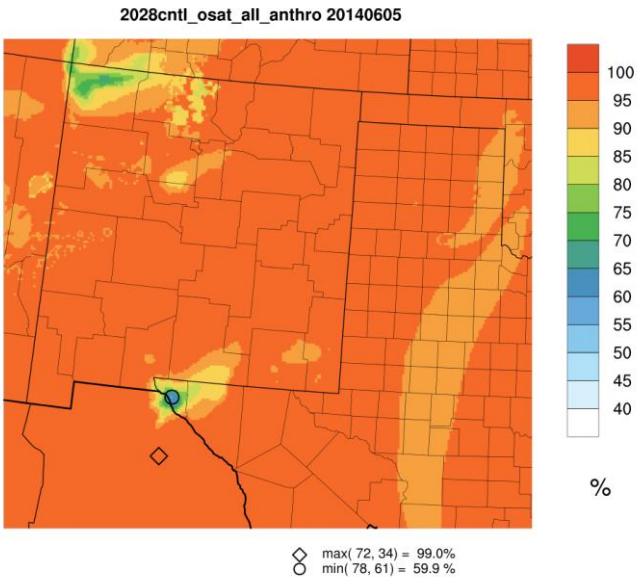
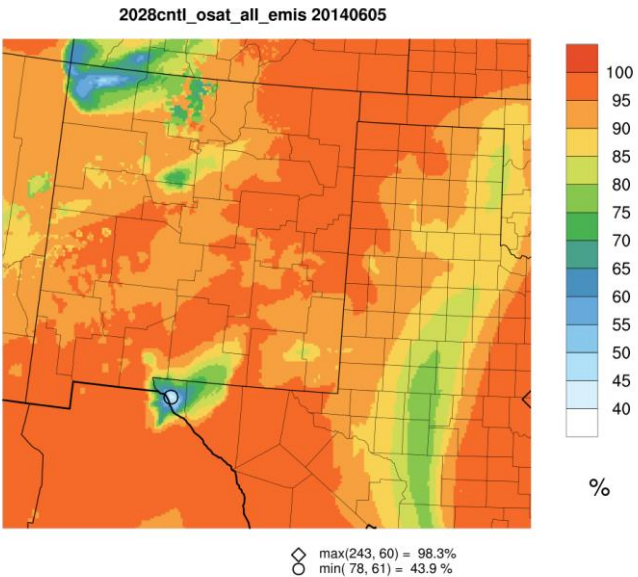
All Regions Anthro



New Mexico Anthro



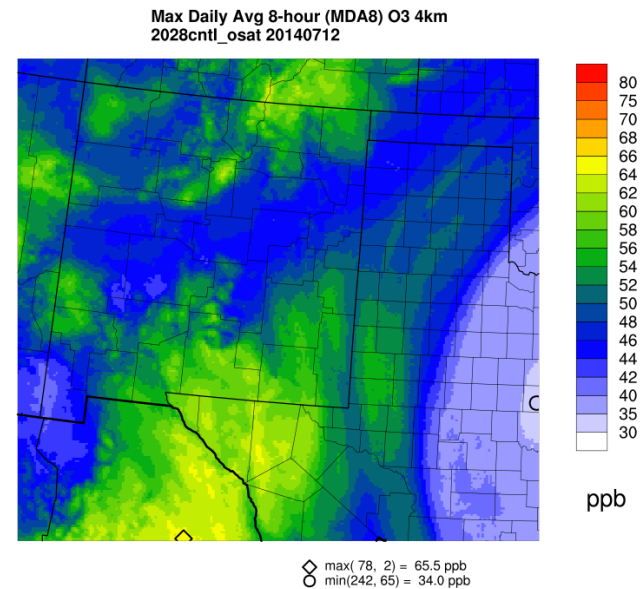
Percent NOx
Sensitive
Ozone



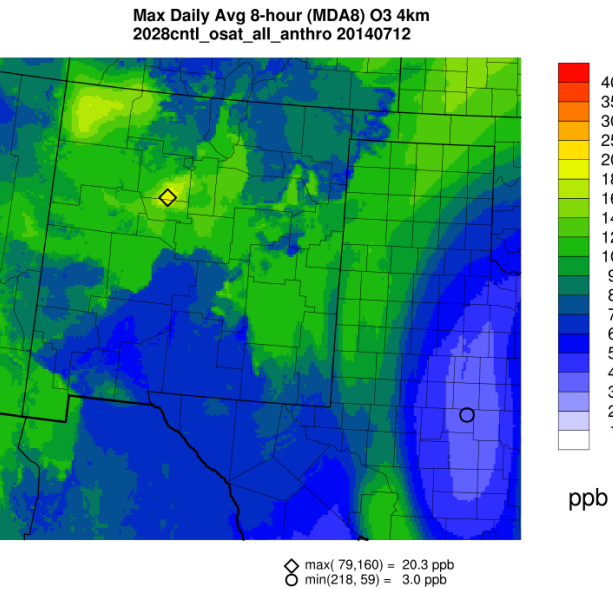
2028 OSAT SA RESULTS FOR JULY 12, 2014

Ozone
Concentrations
(ppb)

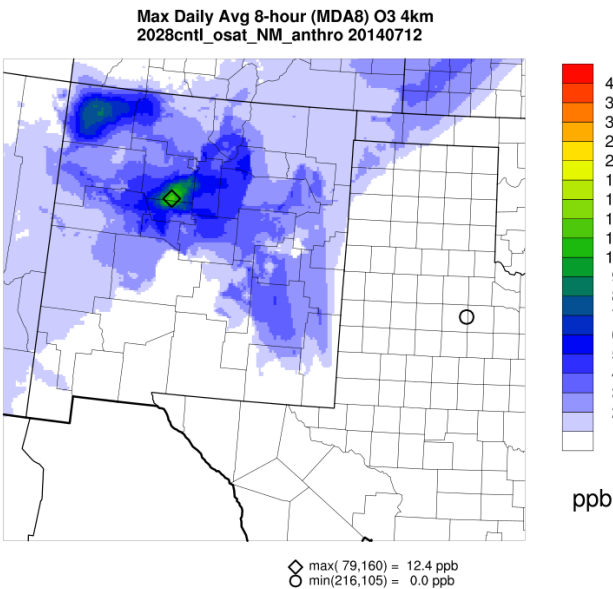
All Source Regions/Categories



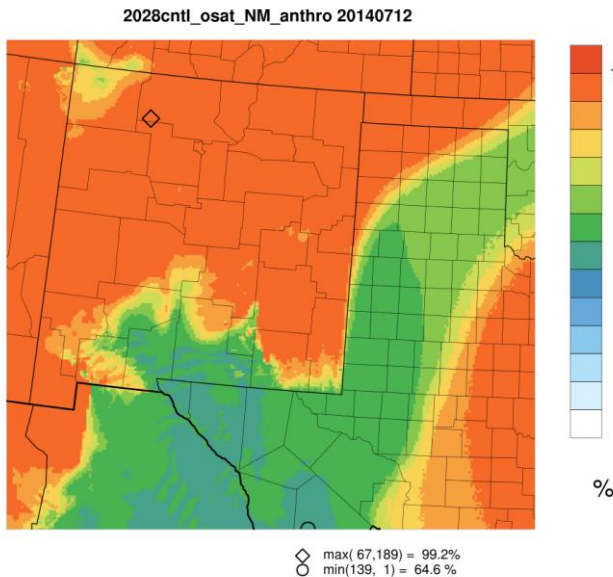
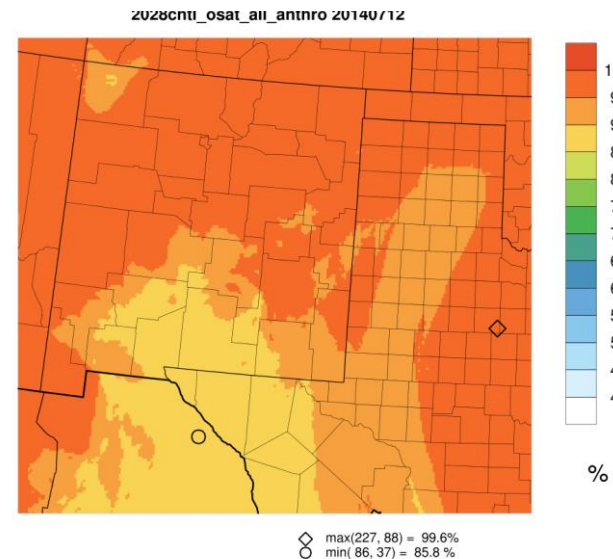
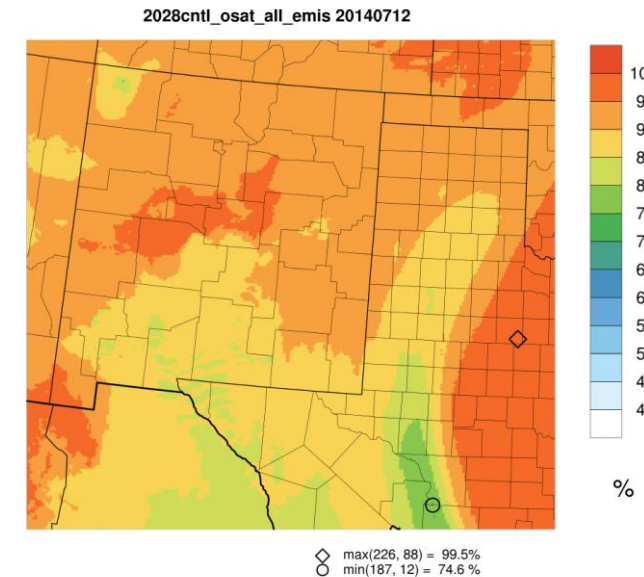
All Regions Anthro



New Mexico Anthro



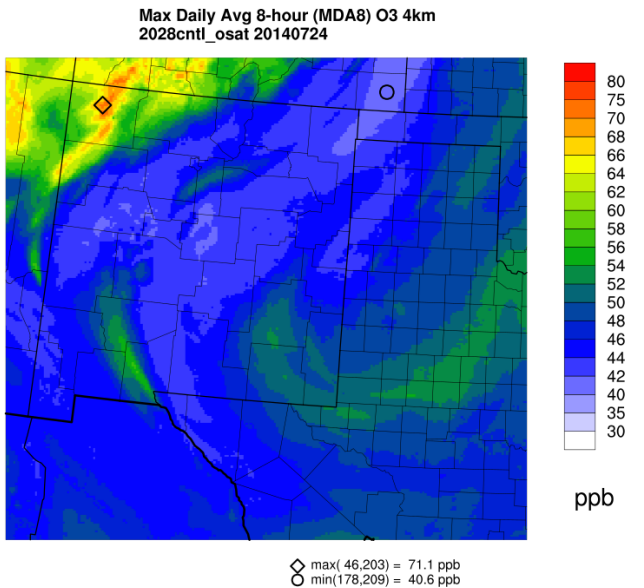
Percent NOx
Sensitive
Ozone



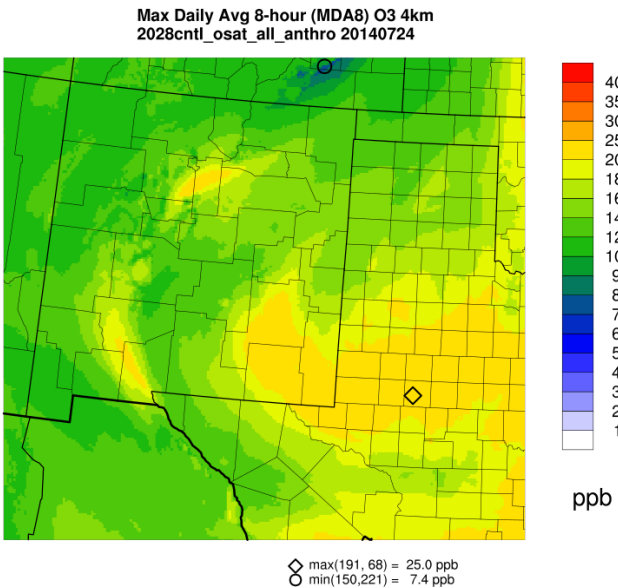
2028 OSAT SA RESULTS FOR JULY 24, 2014

Ozone
Concentrations
(ppb)

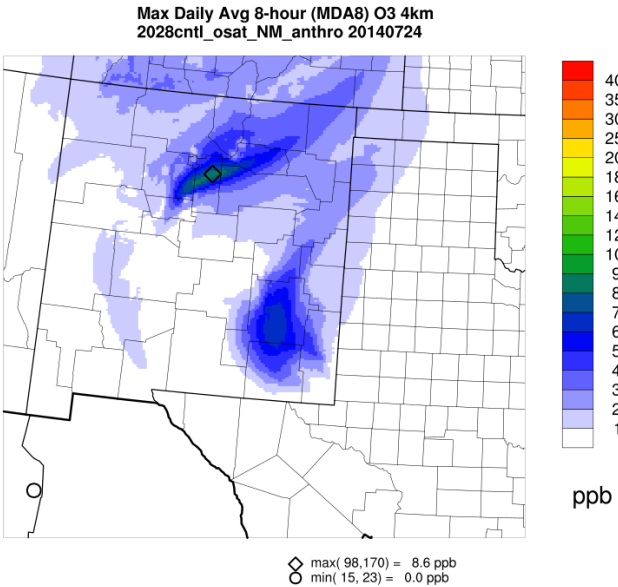
All Source Regions/Categories



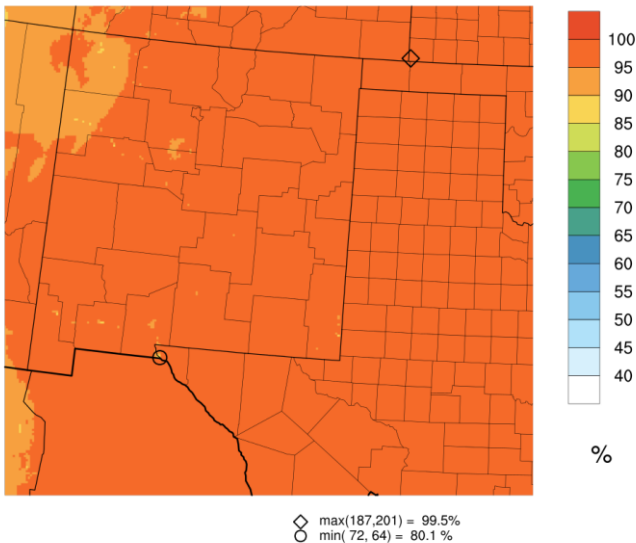
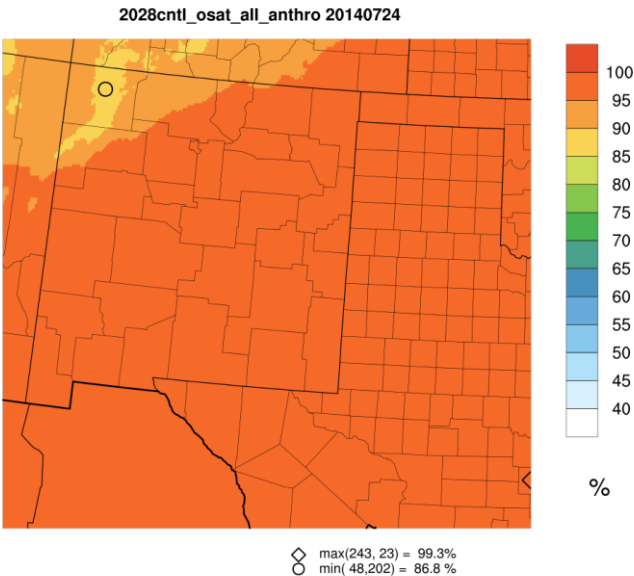
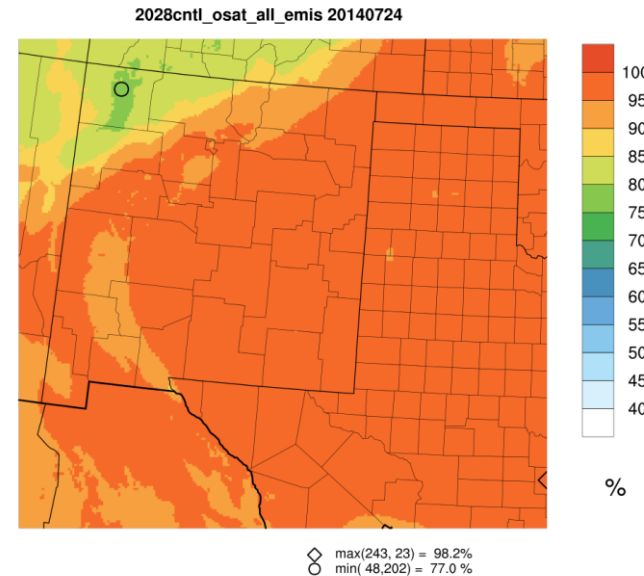
All Regions Anthro



New Mexico Anthro



Percent NOx
Sensitive
Ozone

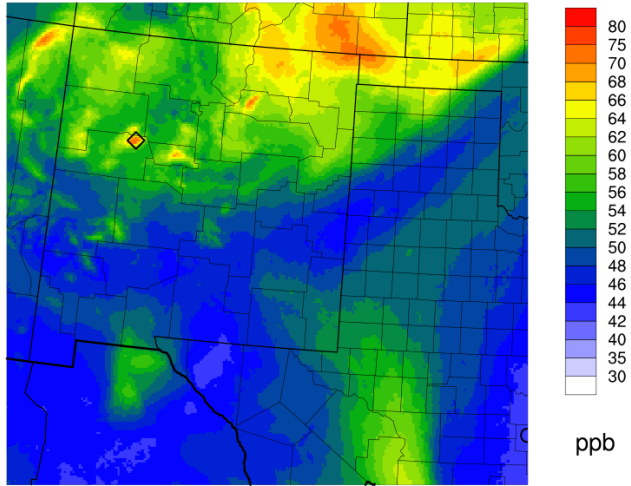


2028 OSAT SA RESULTS FOR JULY 26, 2014

Ozone
Concentrations
(ppb)

All Source Regions/Categories

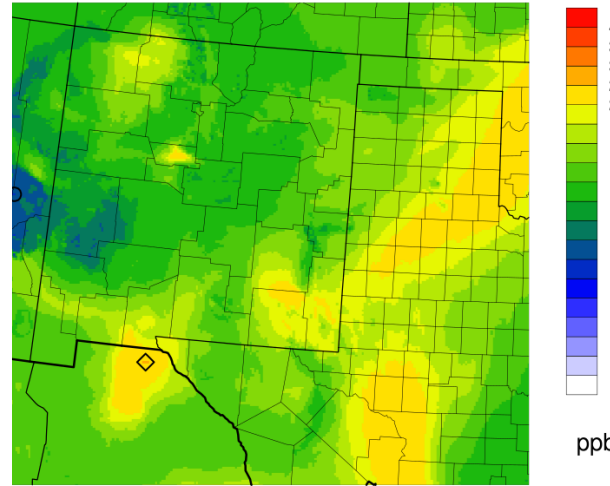
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat 20140726



max(61,161) = 72.0 ppb
min(243, 24) = 42.4 ppb

All Regions Anthro

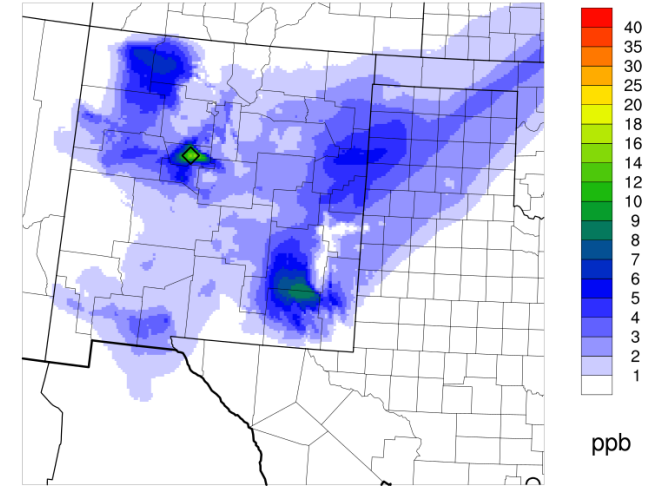
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_all_anthro 20140726



max(65, 58) = 25.1 ppb
min(4,136) = 6.9 ppb

New Mexico Anthro

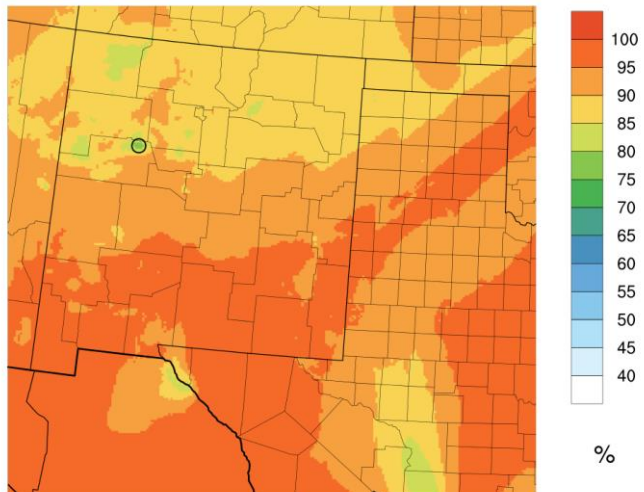
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_NM_anthro 20140726



max(79,154) = 14.4 ppb
min(238, 1) = 0.0 ppb

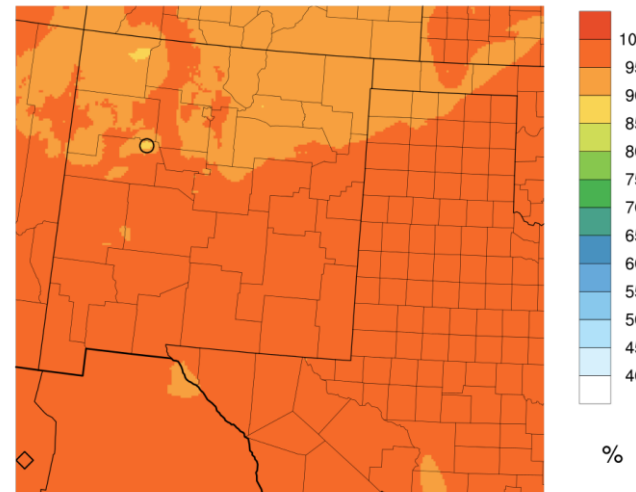
Percent NOx
Sensitive
Ozone

2028cntl_osat_all_emis 20140726



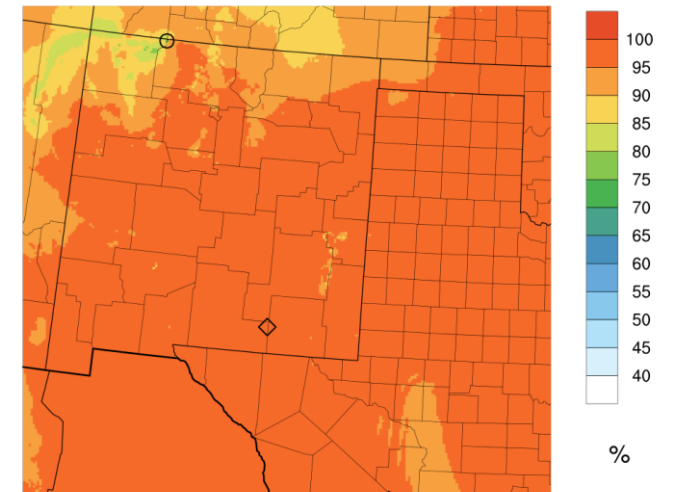
max(1, 2) = 97.7%
min(61,161) = 77.9%

2028cntl_osat_all_anthro 20140726



max(5, 17) = 99.0%
min(61,161) = 87.9%

2028cntl_osat_NM_anthro 20140726



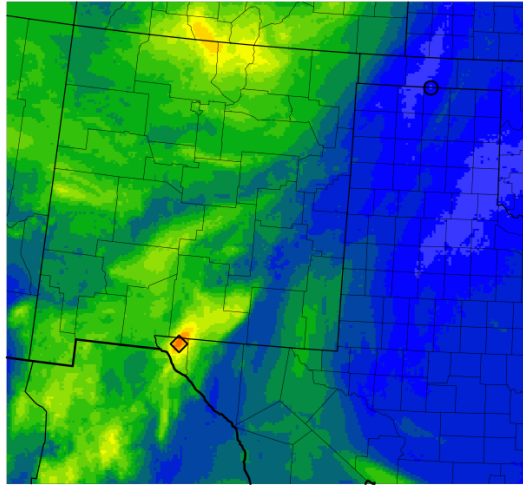
max(113, 78) = 99.4%
min(67,209) = 72.4%

RAMBOLL

2028 OSAT SA RESULTS FOR AUGUST 14, 2014

All Source Regions/Categories

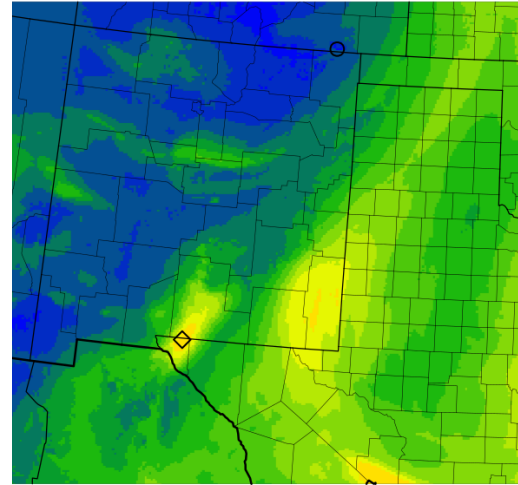
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat 20140814



◇ max(81, 66) = 71.2 ppb
○ min(198, 185) = 42.5 ppb

All Regions Anthro

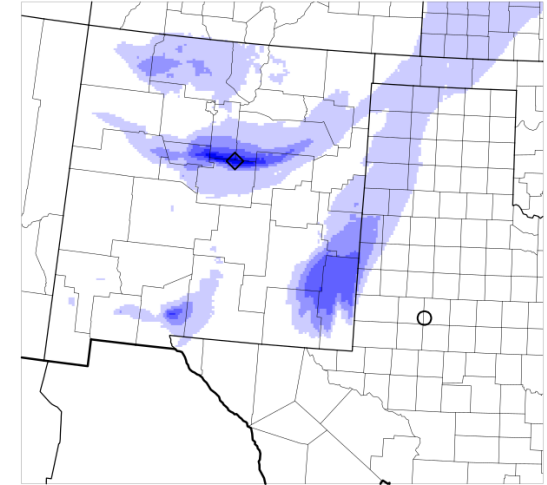
Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_all_anthro 20140814



◇ max(82, 68) = 23.2 ppb
○ min(154, 203) = 5.3 ppb

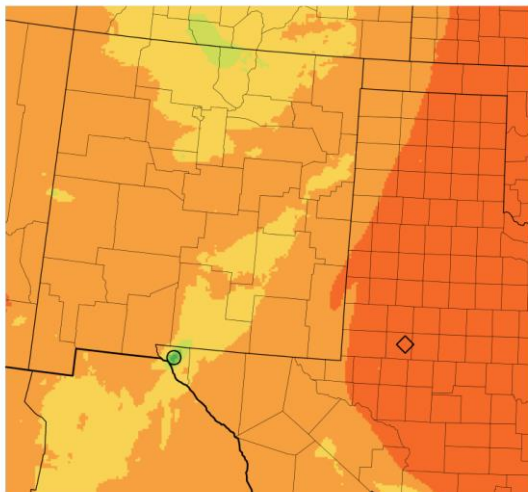
New Mexico Anthro

Max Daily Avg 8-hour (MDA8) O3 4km
2028cntl_osat_NM_anthro 20140814



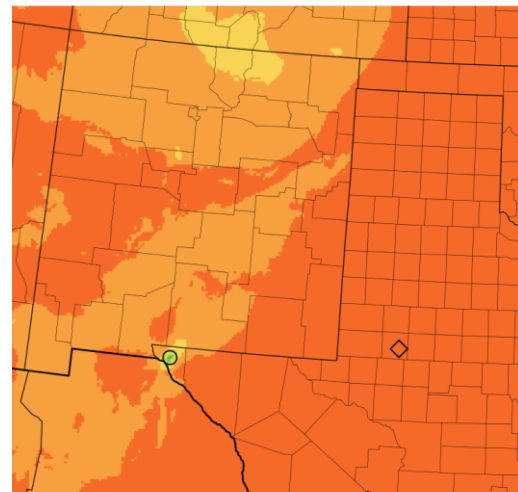
◇ max(100, 151) = 5.6 ppb
○ min(188, 78) = 0.0 ppb

2028cntl_osat_all_emis 20140814



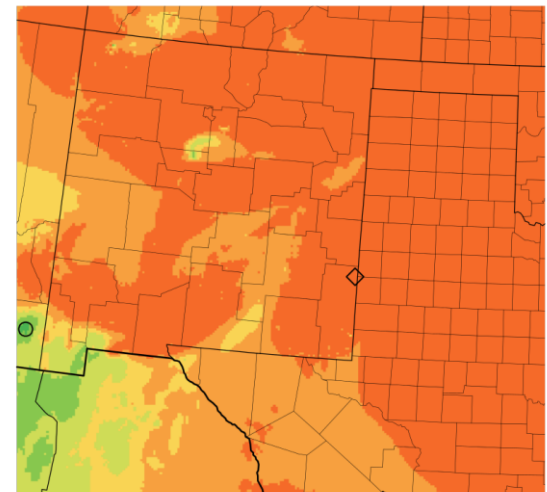
◇ max(184, 70) = 97.7%
○ min(78, 64) = 71.3 %

2028cntl_osat_all_anthro 20140814



◇ max(183, 68) = 99.0%
○ min(78, 64) = 74.5 %

2028cntl_osat_NM_anthro 20140814



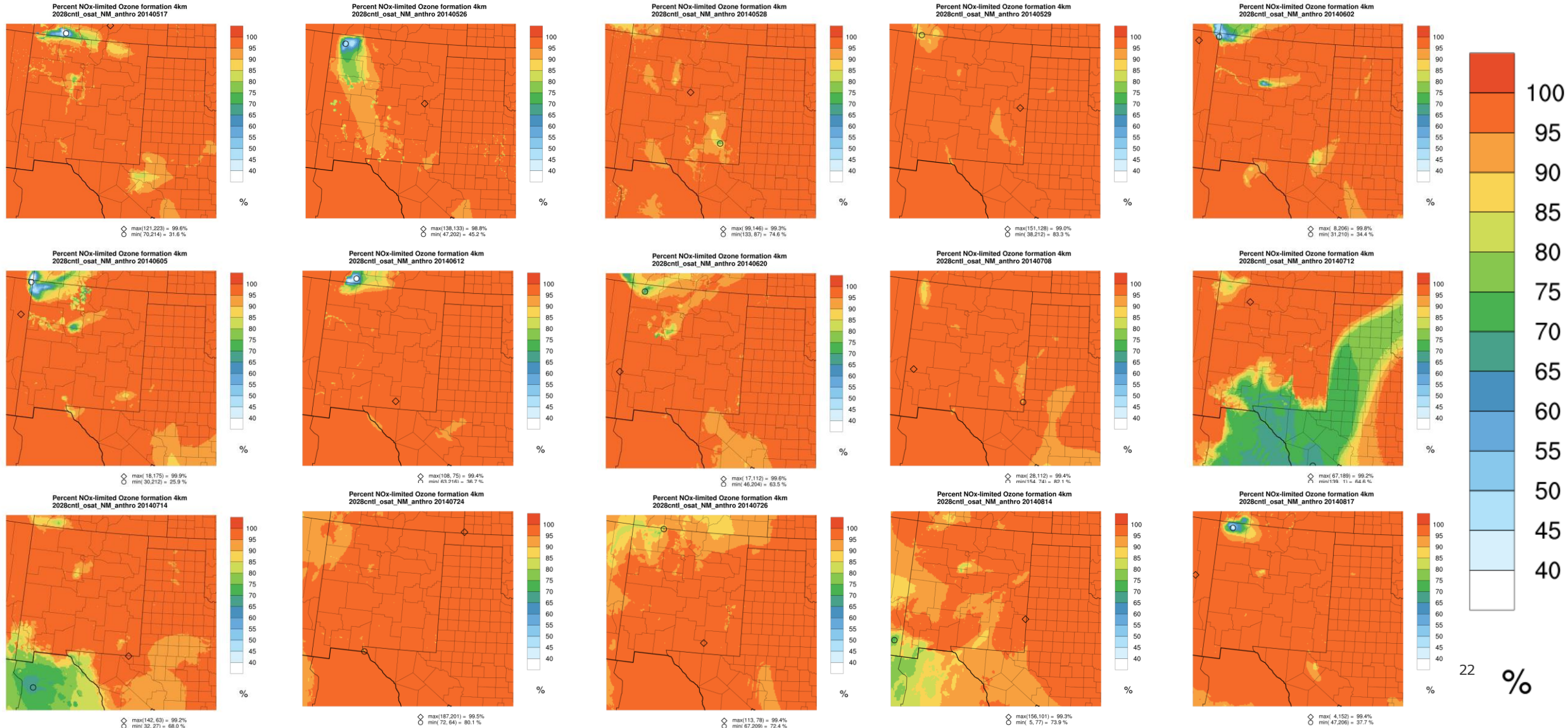
◇ max(156, 101) = 99.3%
○ min(5, 77) = 73.9 %

Ozone
Concentrations
(ppb)

Percent NOx
Sensitive
Ozone

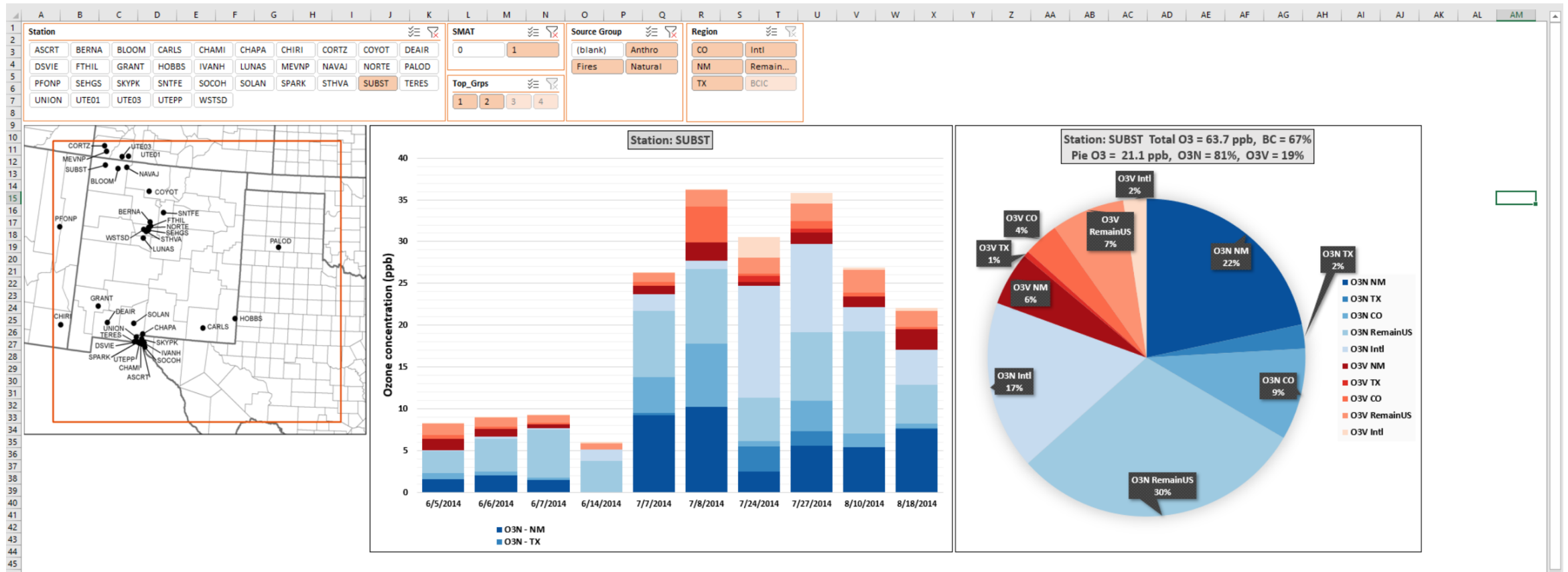
RAMBOLL

PERCENT NOX SENSITIVE OZONE FROM NEW MEXICO ANTHROPOGENIC EMISSIONS ON 15 HIGHER OZONE DAYS



DASHBOARD OF OSAT RESULTS AT MONITORING SITES

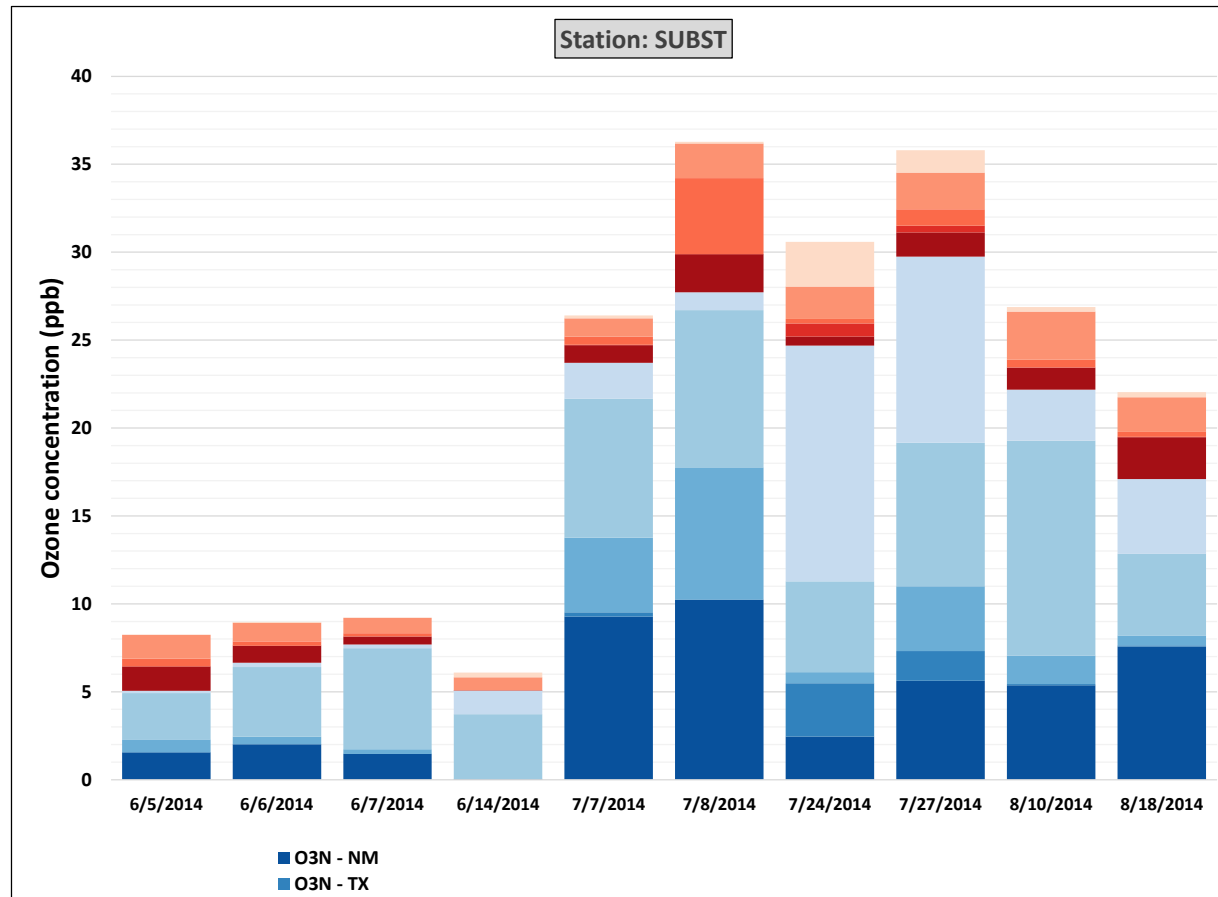
- Select display: monitoring site; 10 days to visualize (SMAT, 2028 1-10, 11-20, etc.); Source Categories (Anthro, Fires, Natural); Source Regions (NM, CO, TX, Remaining U.S. Intl.)
- Displays: Stacked Bar Charts of 10 days O3V and O3N; Pie Chart average across 10 days
 - Cooler colors for NOx sensitive ozone, warmer colors for VOC sensitive ozone



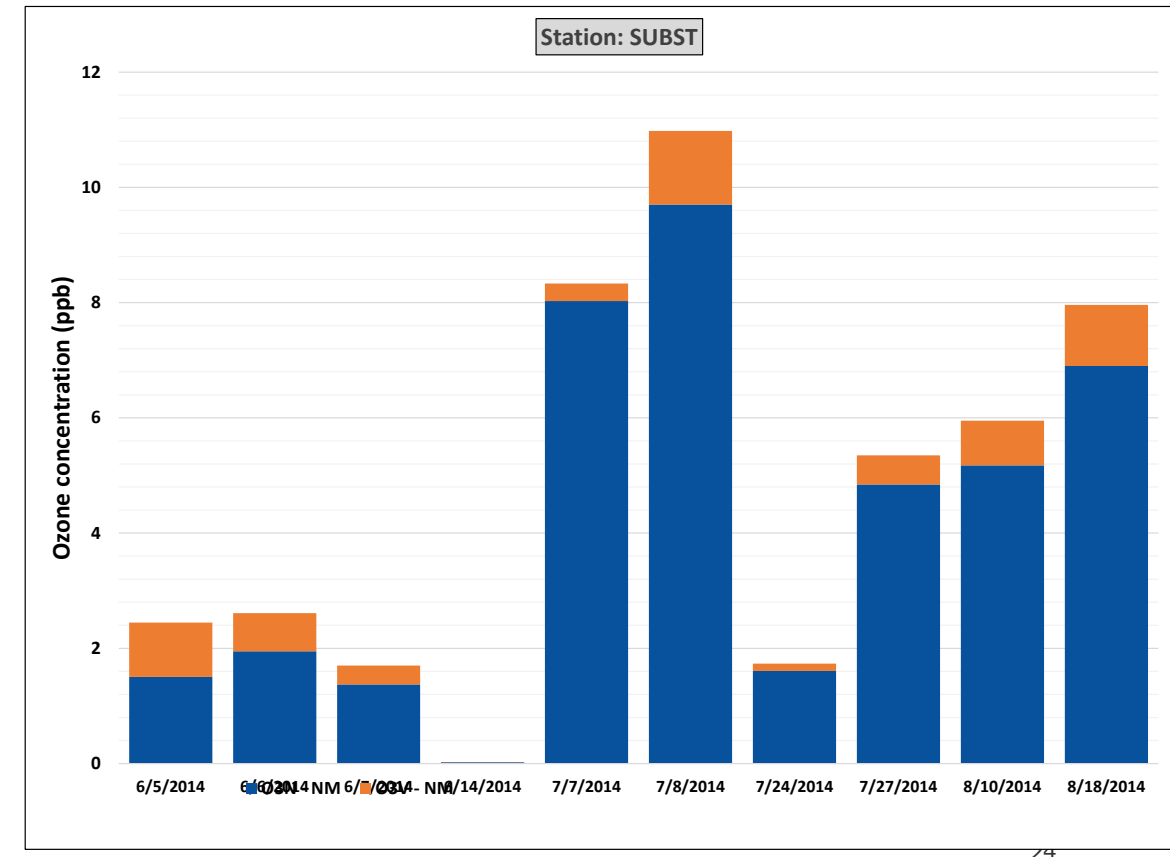
SUBSTATION, SAN JUAN COUNTY – 10 SMAT DAYS

- Lots of day-to-day variation in ozone contributions and percent VOC vs. NOx sensitive ozone
- 70% - 90% NOx sensitive MDA8 ozone

All Source Categories and Regions



New Mexico Anthropogenic

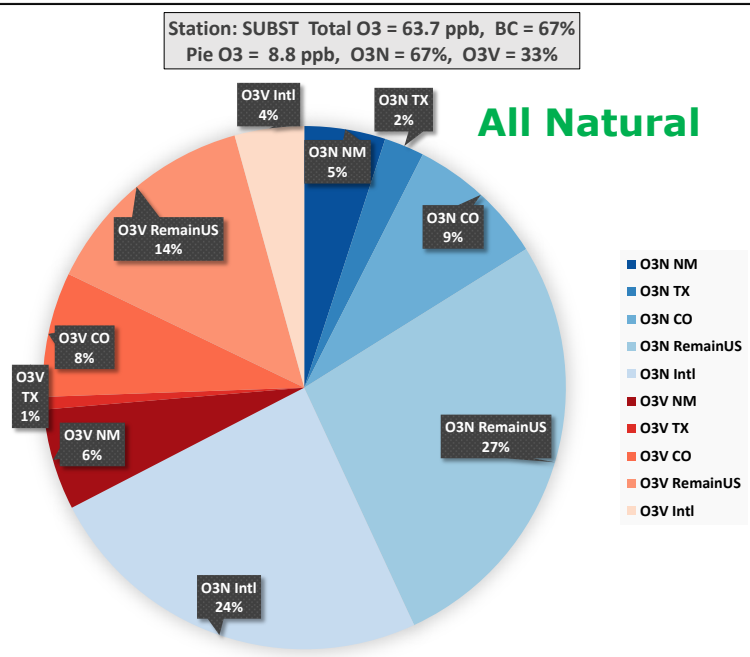
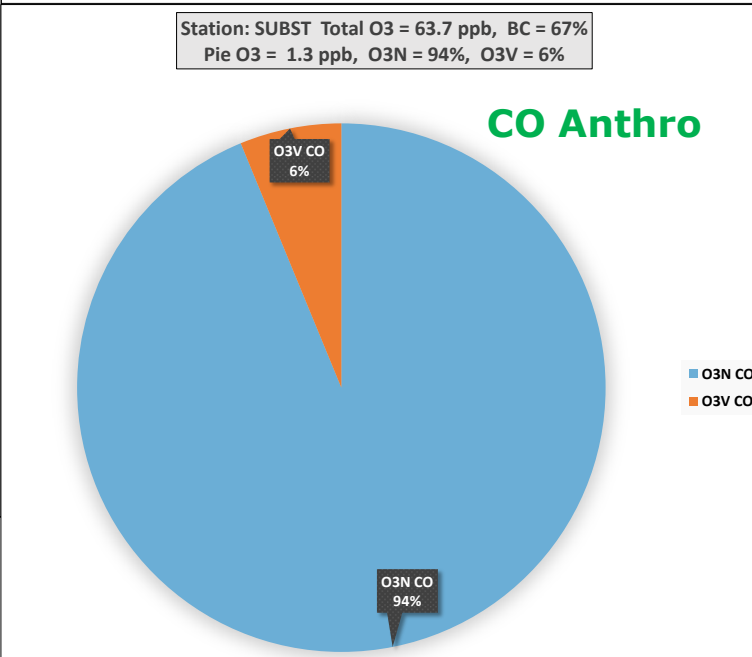
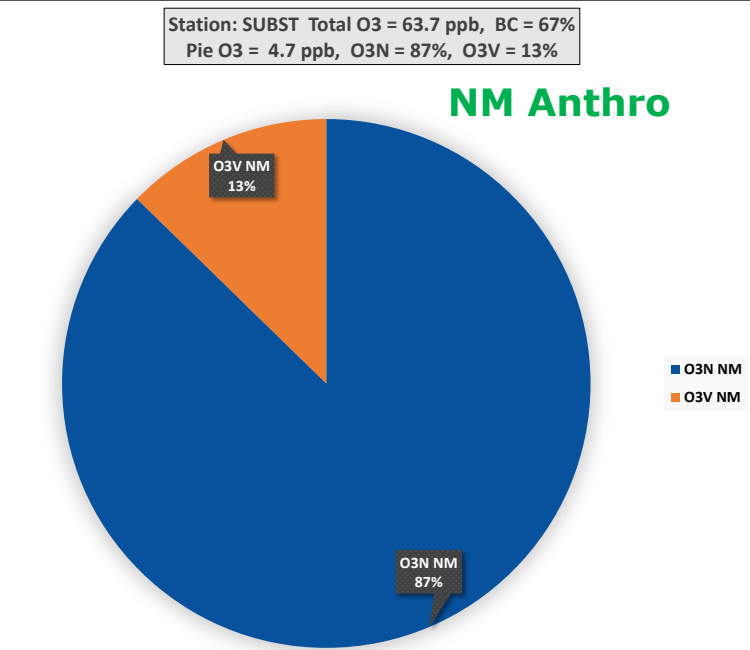
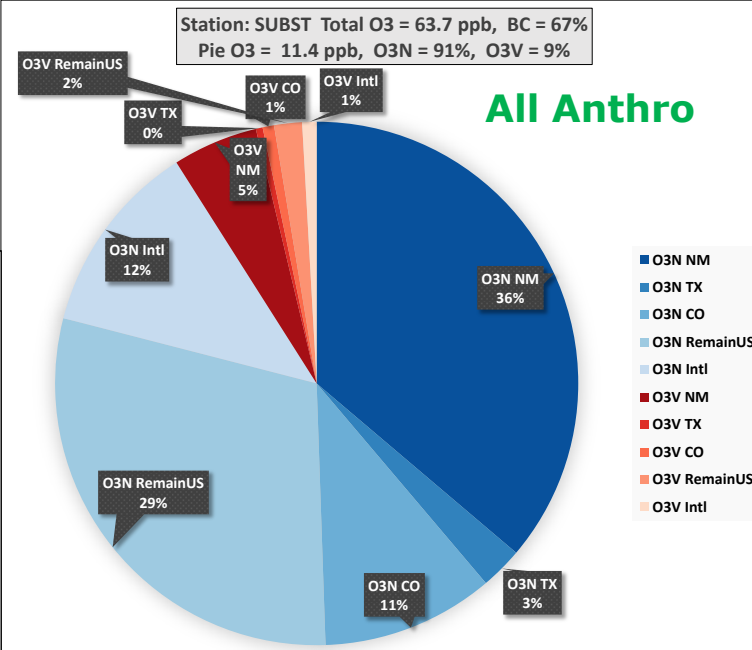
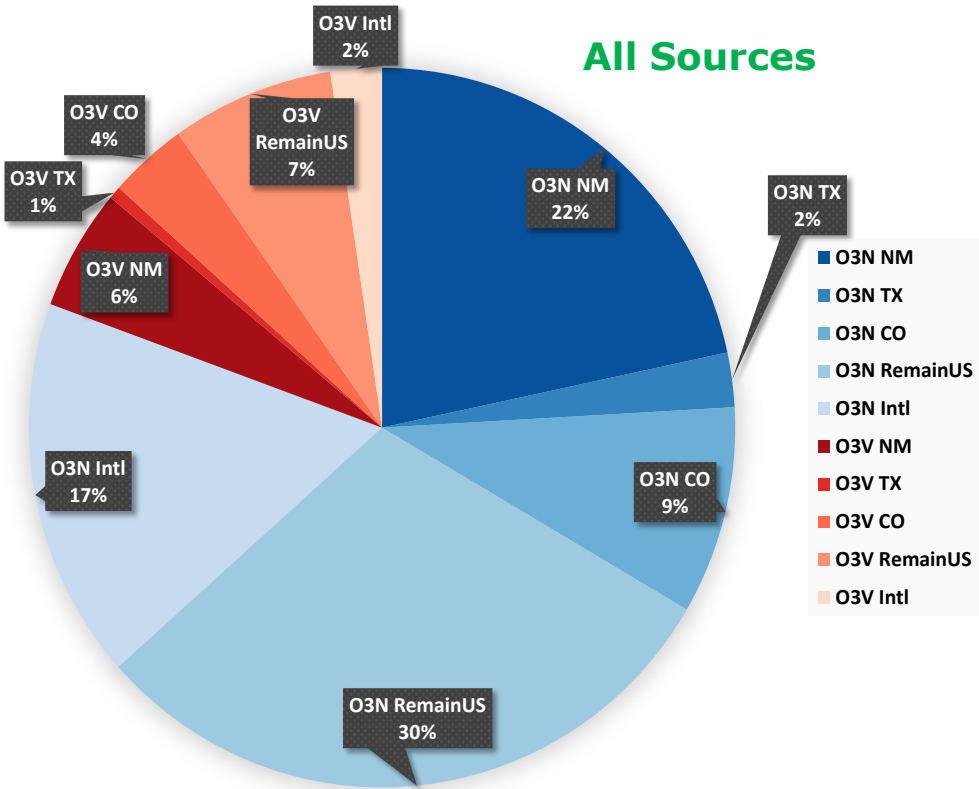


Substation, San Juan County

Average 10 SMAT Days

Station: SUBST Total O3 = 63.7 ppb, BC = 67%
Pie O3 = 21.1 ppb, O3N = 81%, O3V = 19%

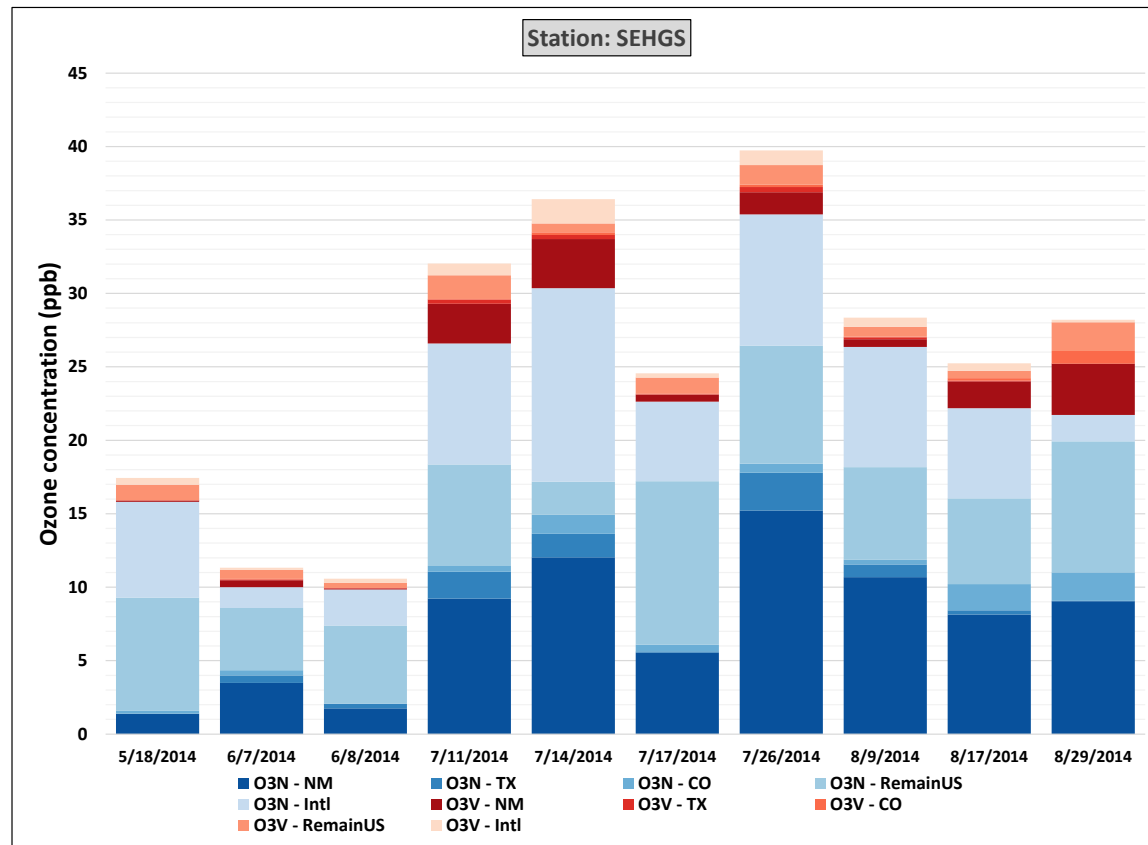
All Sources



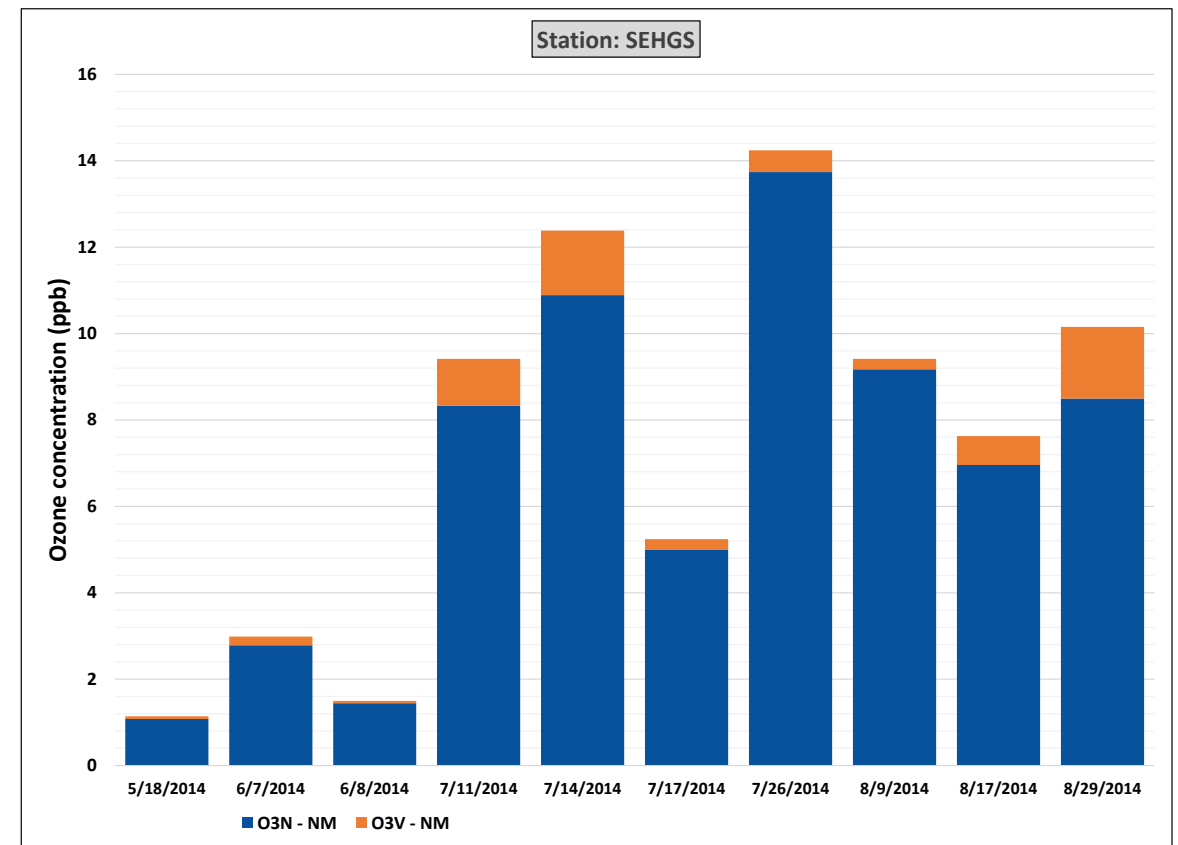
SOUTH EAST HEIGHTS, BERNALILLO COUNTY – 10 SMAT DAYS

- Lots of day-to-day variation in ozone contributions and percent VOC vs. NOx sensitive ozone
- Vast majority is NOx sensitive ozone, a little less VOC sensitive ozone than Substation

All Source Categories and Regions

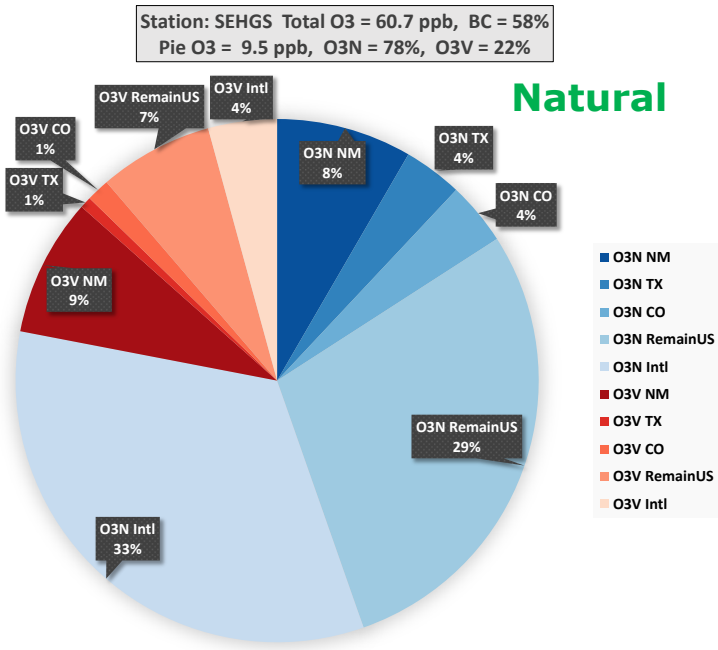
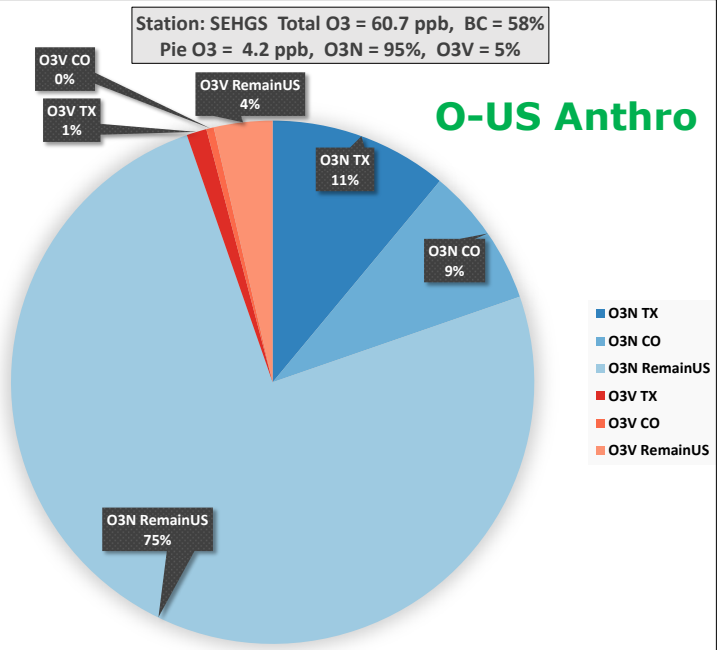
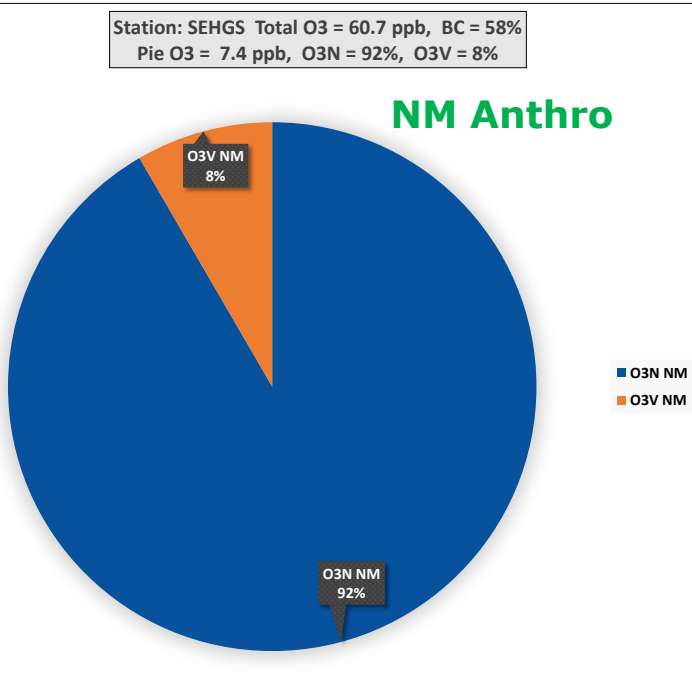
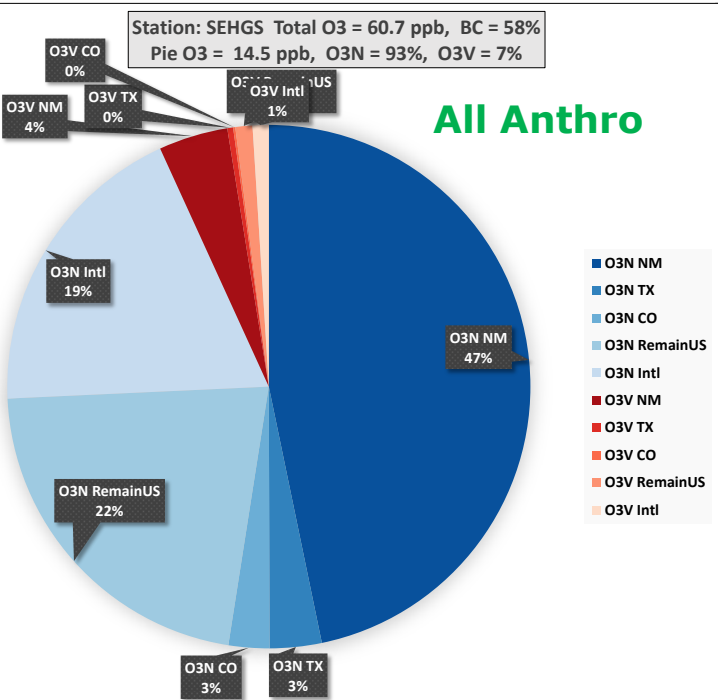
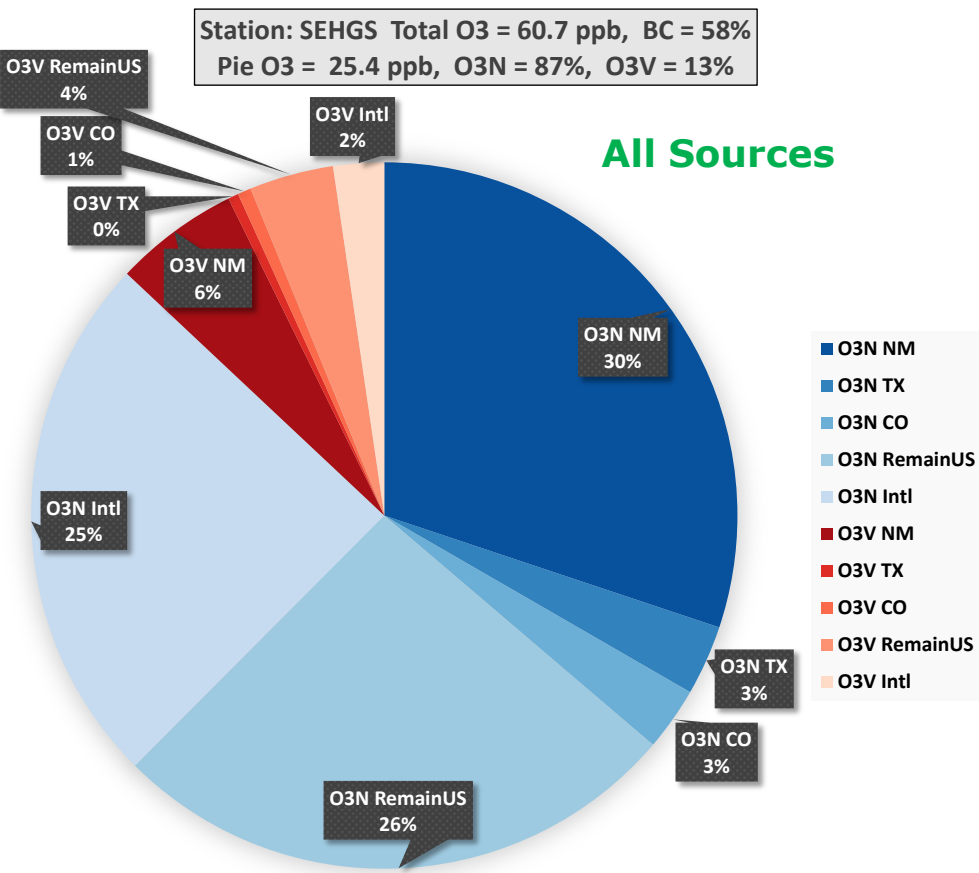


New Mexico Anthropogenic



SE Heights, Bernalillo County

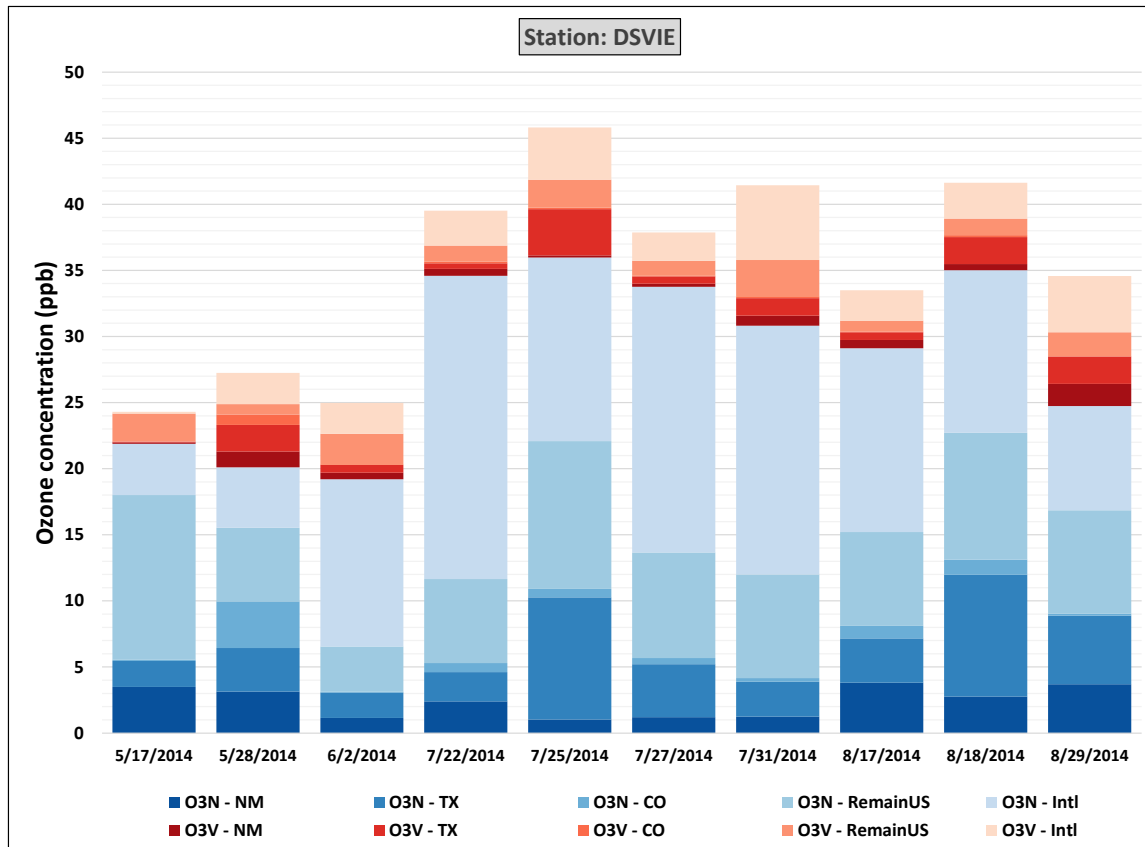
Average 10 SMAT Days



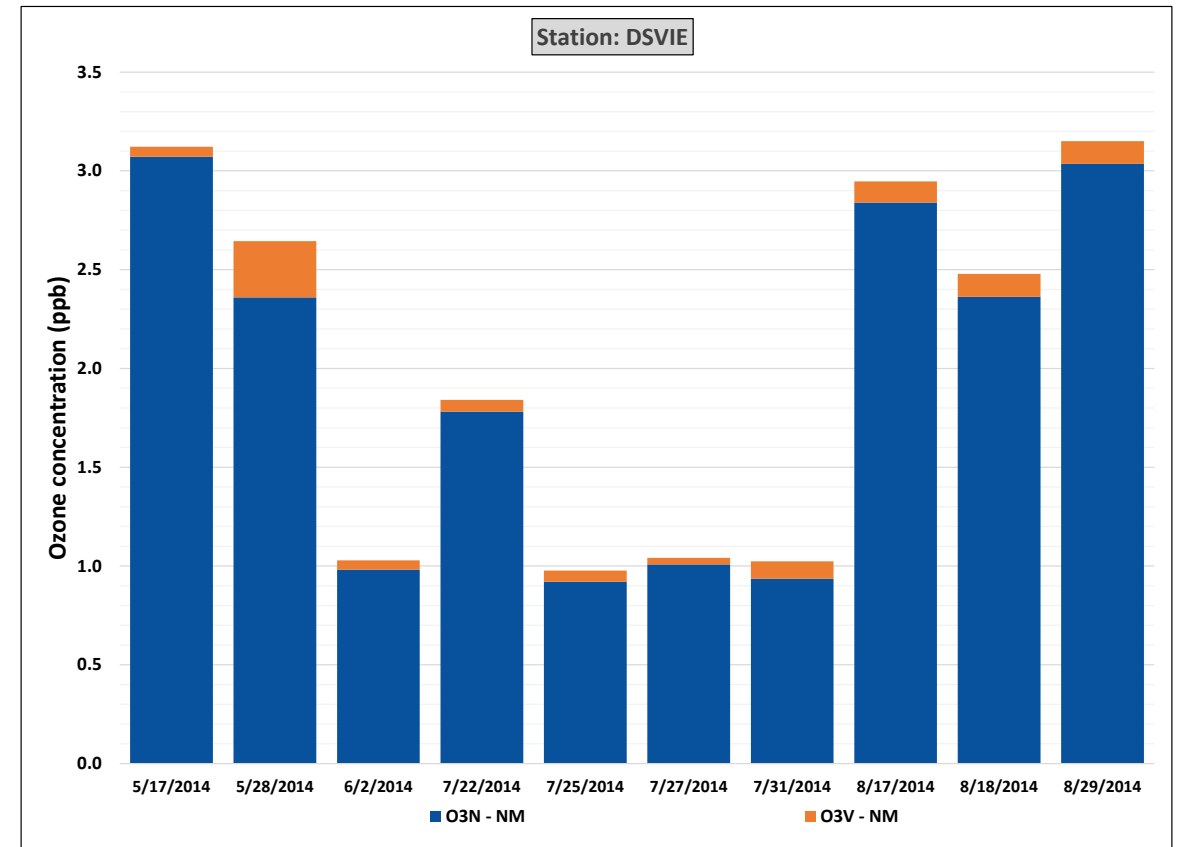
DESERT VIEW, DONA ANA COUNTY – 10 SMAT DAYS

- Mostly NOx sensitive ozone, but more VOC sensitive than other sites due to El Paso
- New Mexico contributions NOx sensitive

All Source Categories and Regions

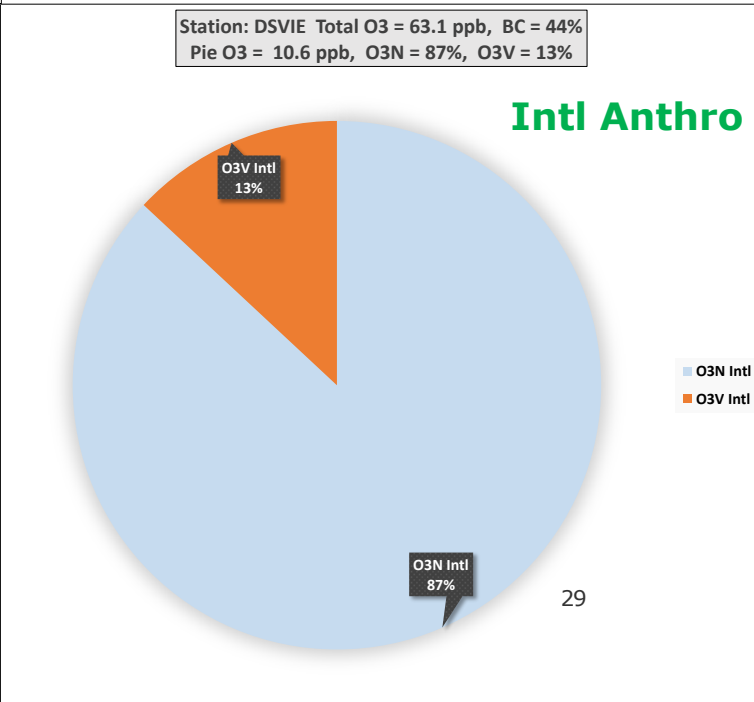
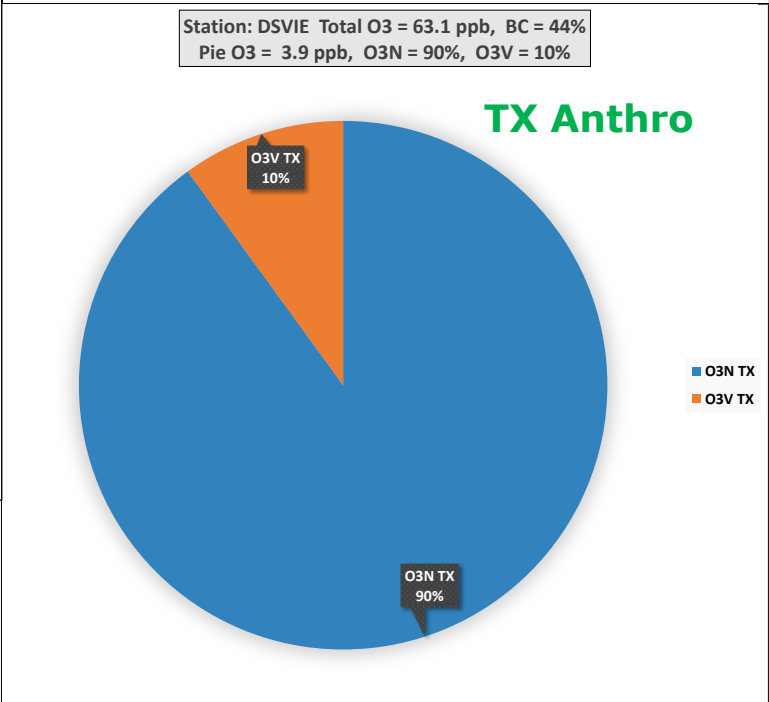
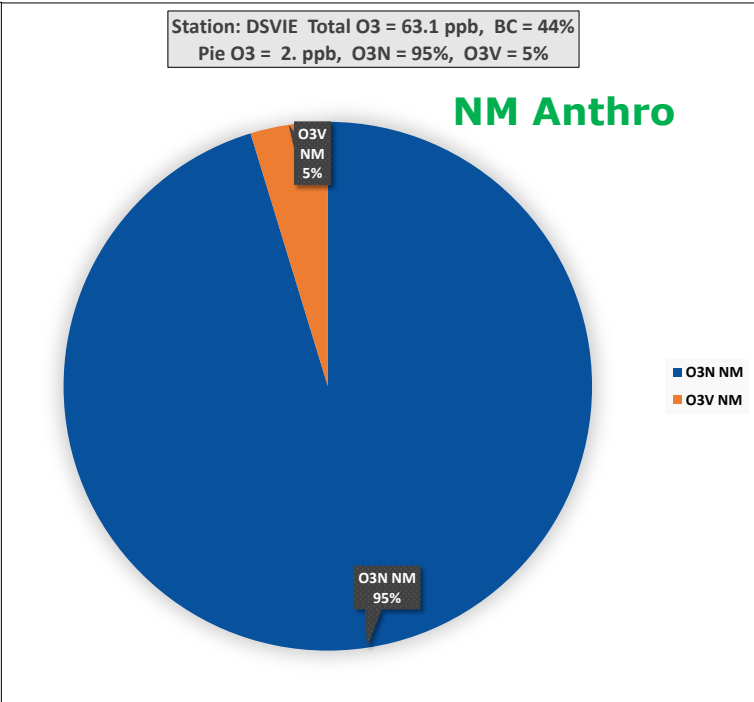
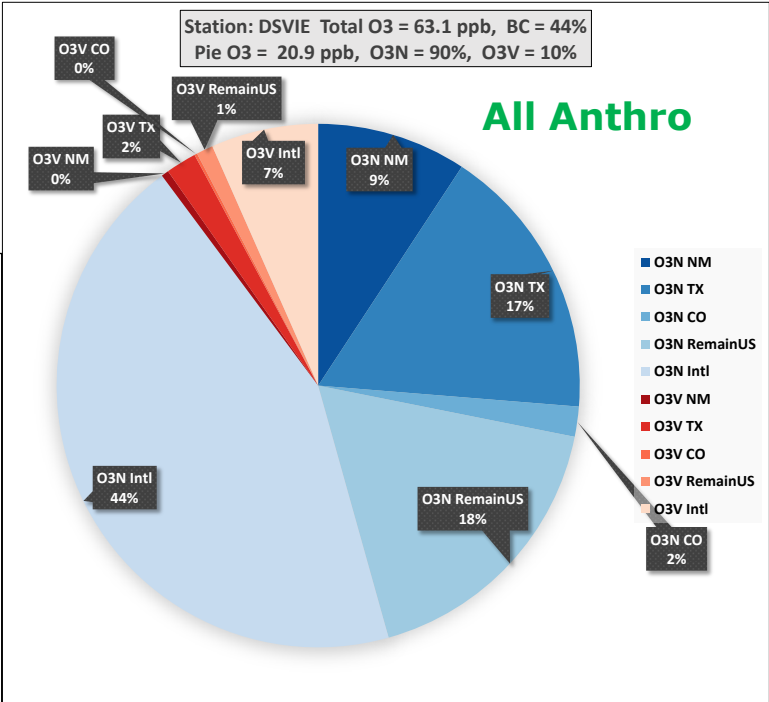
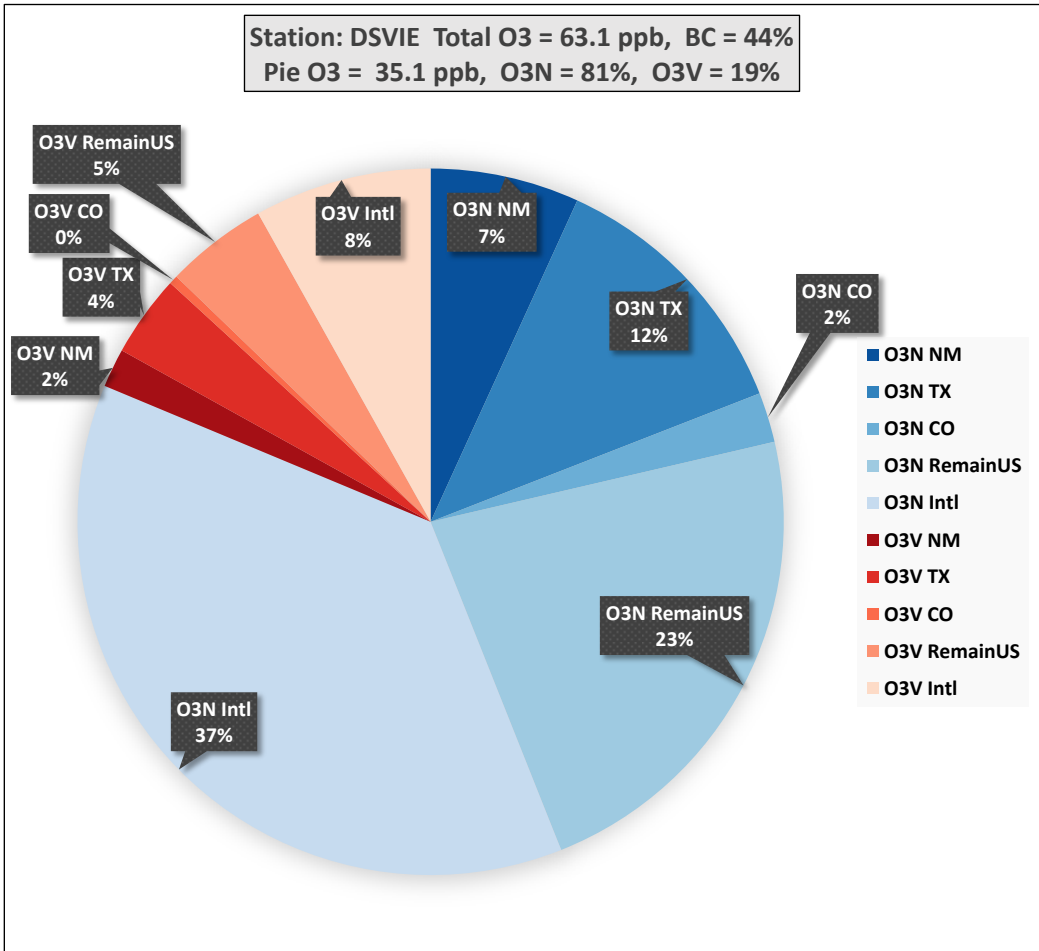


New Mexico Anthropogenic



Desert View, Dona Ana County

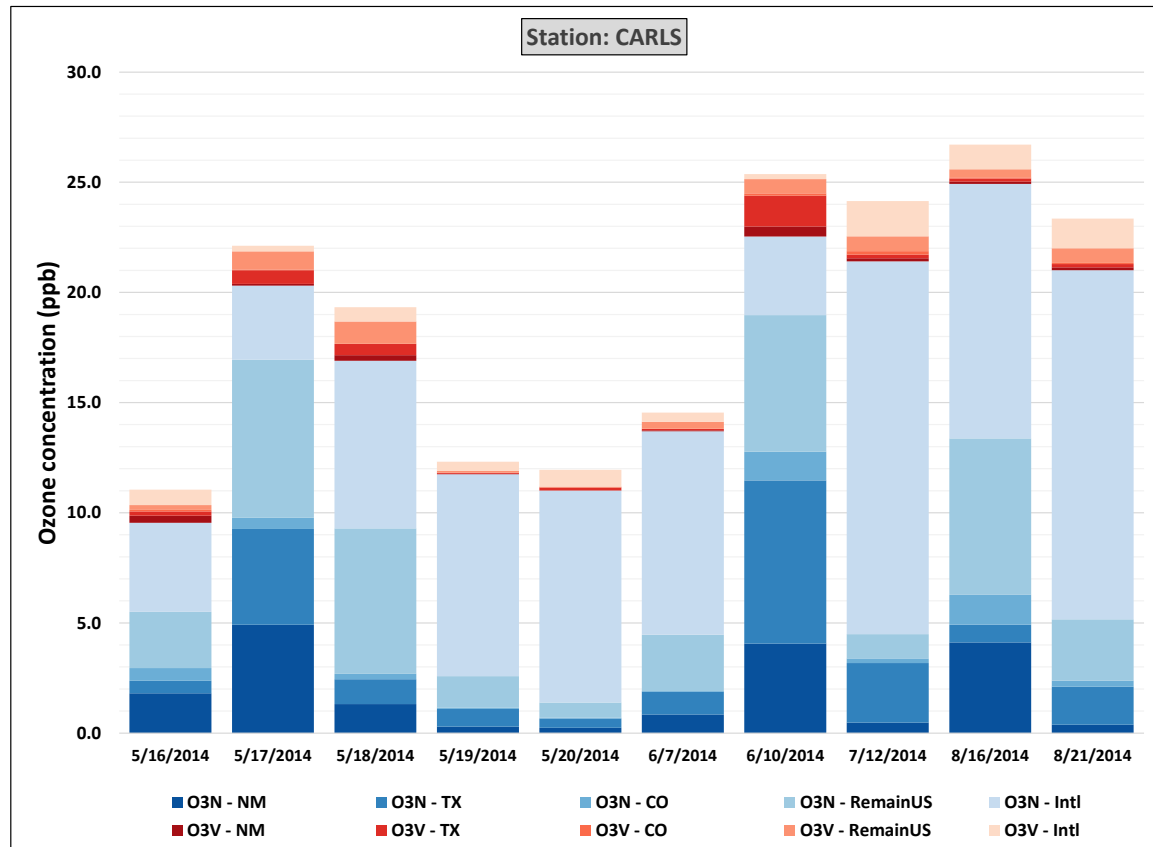
Average 10 SMAT Days



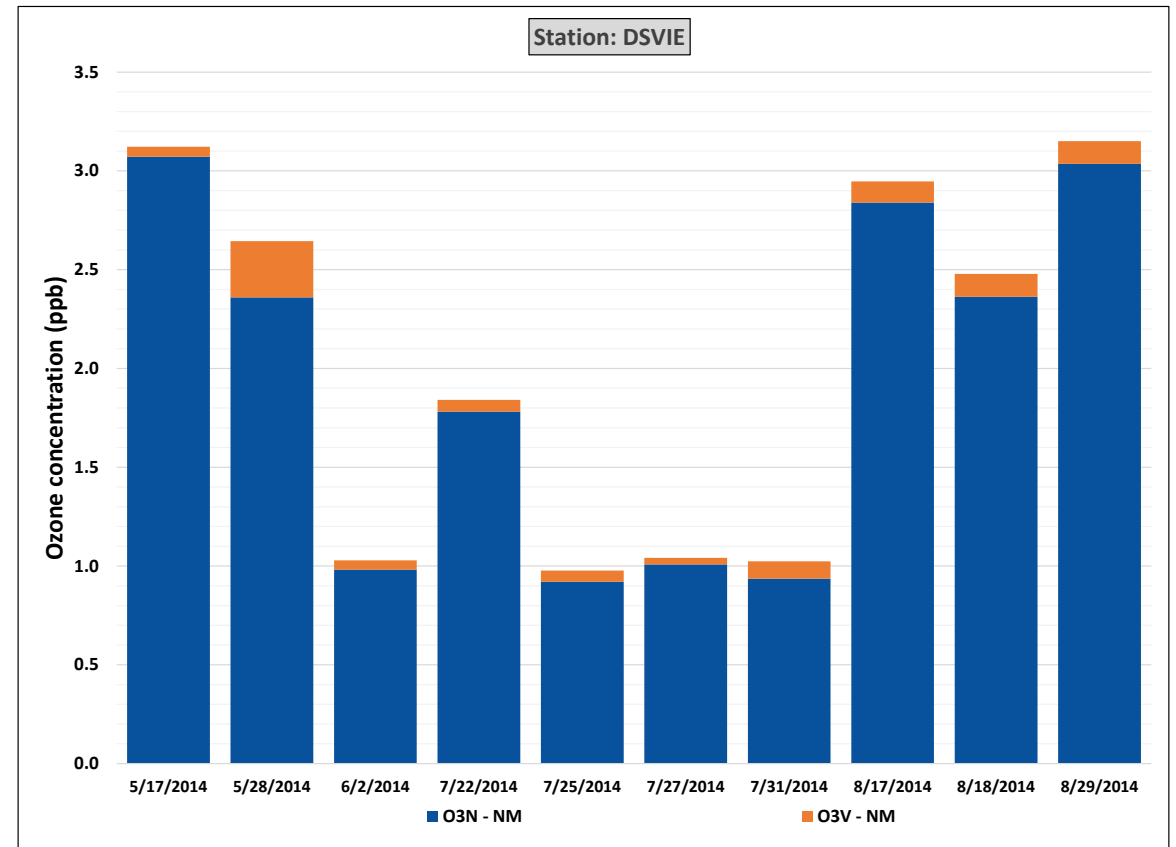
CARLSBAD, EDDY COUNTY – 10 SMAT DAYS

- Mostly NOx sensitive ozone with New Mexico contributions even more NOx sensitive

All Source Categories and Regions

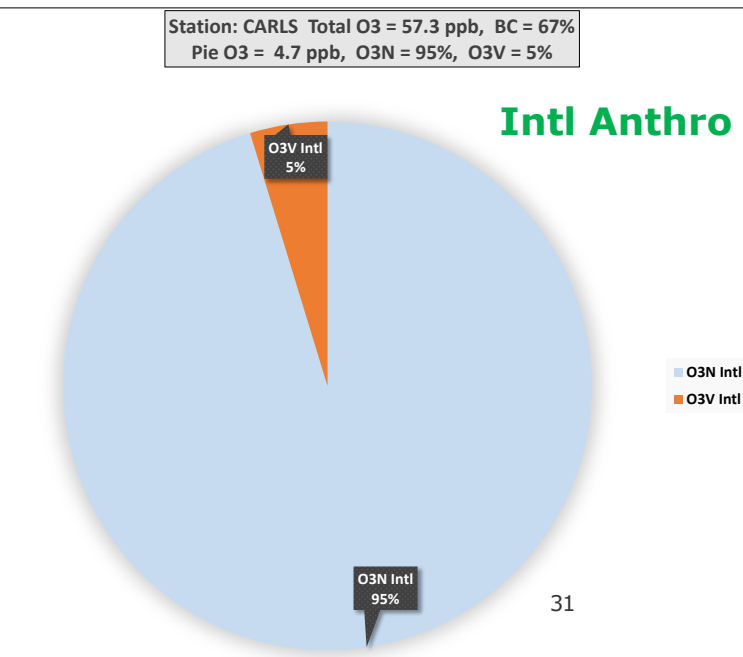
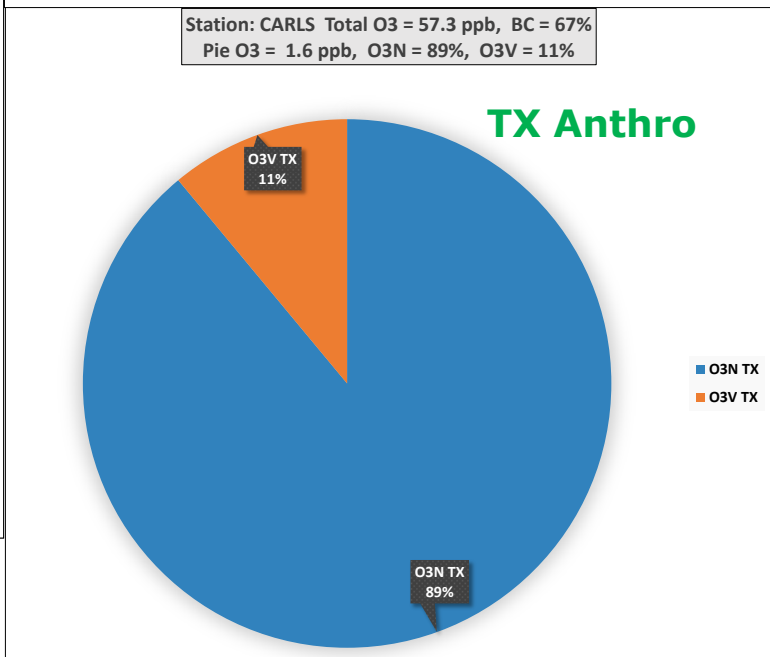
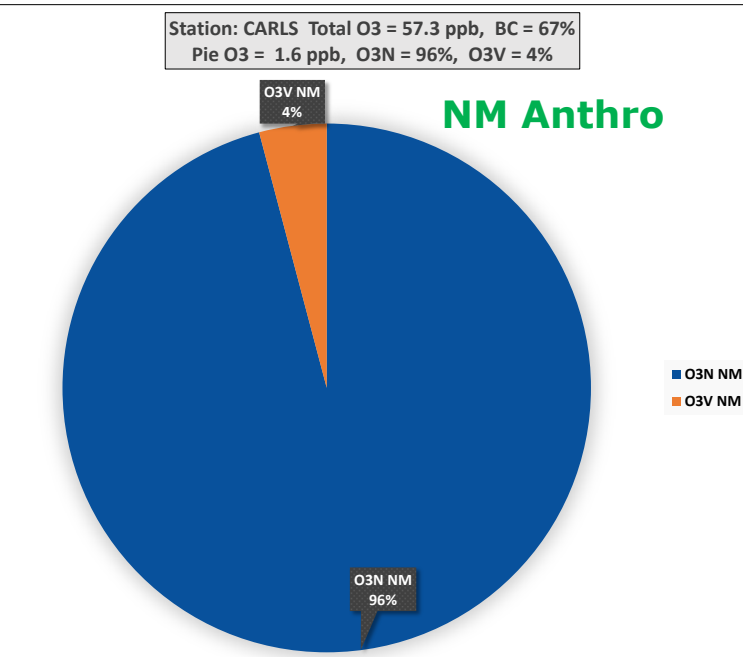
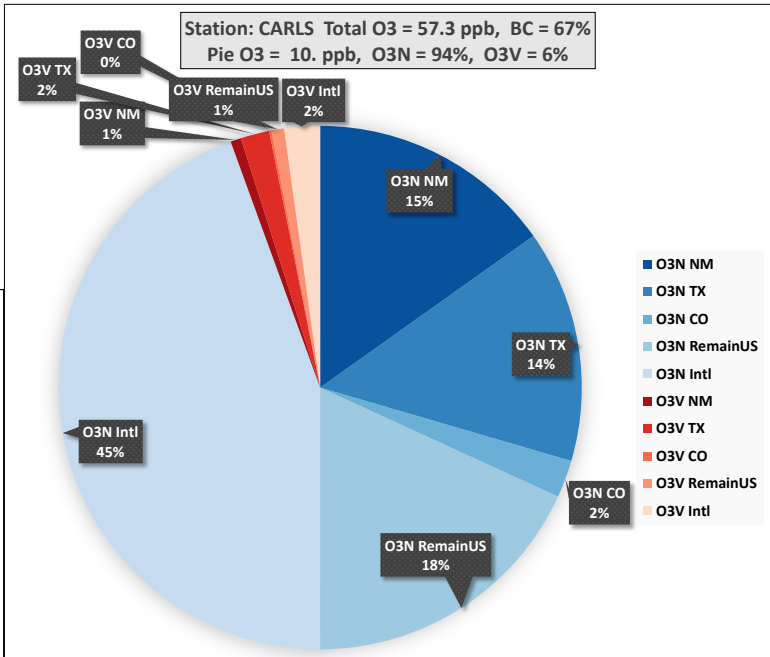
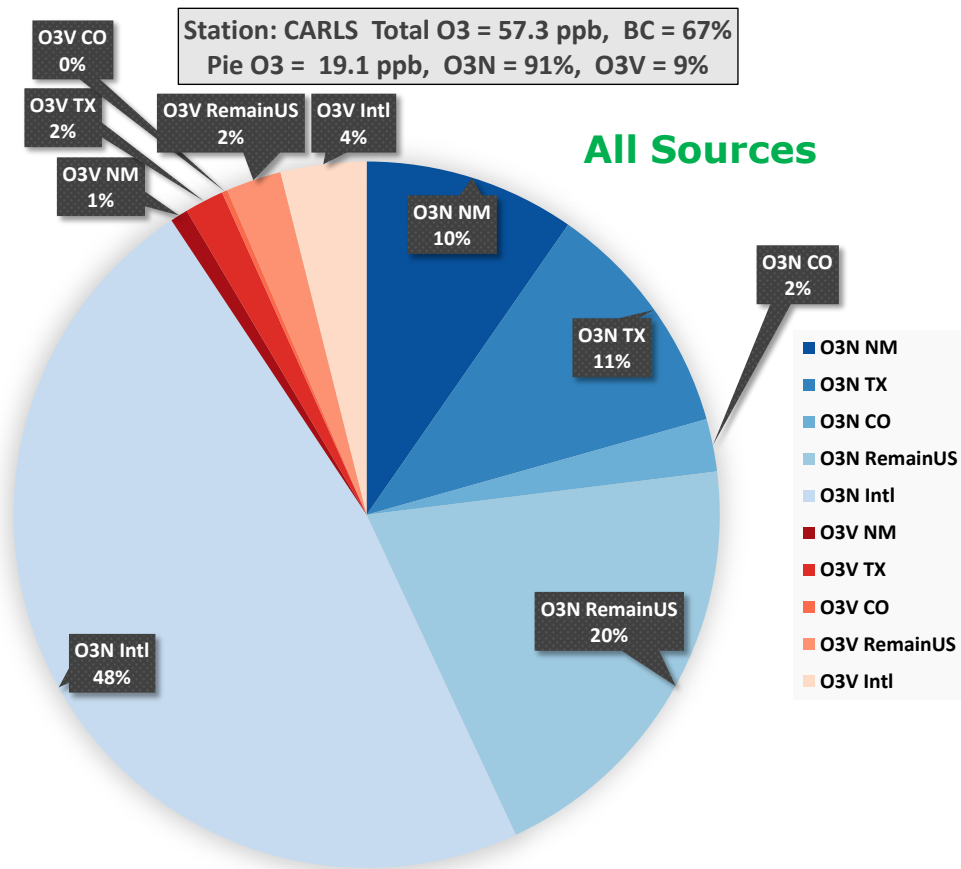


New Mexico Anthropogenic



Carlsbad, Eddy County

Average 10 SMAT Days



CONCLUSIONS VOC/NOX SENSITIVE OZONE OSAT SA

- The OSAT source apportionment suggests that ozone formation leading to elevated ozone concentrations in New Mexico is primarily NO_x sensitive
 - Consistent with regional ozone modeling studies (e.g., OTAG) that found regional NO_x emissions controls most effective at reducing regional ozone concentrations and ozone transport
 - VOC controls can also be effective in urban areas and other areas with concentrated emissions
- There are locations and days when there are higher amounts of VOC sensitive ozone formation:
 - San Juan Basin, El Paso-Juarez, Albuquerque and, to a lesser extent, Permian Basin
- The OSAT source apportionment provides a general indication of potential relative effectiveness of NO_x vs. VOC controls for reducing ozone concentrations. It is not a substitute for actual control strategy modeling with explicit emission reductions of targeted sources.
 - Ozone formation is complex and reducing emissions changes the chemistry from the previous state that can cause non-linear responses in ozone concentrations

DRAFT FINAL AQTSD (DUE MAY 4; ACTUAL WEEK OF APR 26)

1. Introduction
2. 2014 WRF Meteorological Modeling
3. Boundary Condition Inputs
4. 2014 Emission Inputs
5. Diagnostic Sensitivity Tests
6. 2014 Base Case Modeling and Model Performance Evaluation
7. 2028 Base Case Modeling and Ozone Design Value Projections
8. 2028 Oil and Gas Control Strategy Modeling and Ozone Design Value Projections
9. Sensitivity of 2028 Ozone Design Value Projections to Current Year Design Values
10. APCA Source Sector Ozone Source Apportionment Modeling
11. OSAT VOC/NO_x Sensitivity Ozone Source Apportionment Modeling
12. Summary and Conclusions
13. References