NEW MEXICO OZONE ATTAINMENT INITIATIVE

1. 2014 and 2023 Emissions
2. CAMx 2014 Base and Model Performance
3. 2023 CAMx Modeling Status
4. Next Steps -- Future Year Control Strategy

Ralph Morris, Pradeepa Vennam, Marco Rodriguez, Jeremiah Johnson, Chao-Jung Chien and Tejas Shah, Ramboll

Tom Moore and Mary Uhl, WESTAR

NM OAI Study Webinar#4

August 31, 2020

RAMBOLL Bright ideas. Sustainable change.

AGENDA – NMED OAI STUDY WEBINAR#4 – AUGUST 31, 2020

- 2014 and 2023 Emissions
  - Natural Emissions for 2014
  - Updates to 2023 Emissions to Remove Duplicates and Other Updates
  - SMOKE Emissions Modeling for 2014 and 2023
  - Summary of 2014 and 2023 Emissions
- CAMx 2014 36/12/4-km Base Case Modeling
  - Final CAMx Configuration for 2014 Base Case
  - CAMx 2014 Base Case Ozone Model Performance Evaluation
  - Status of Task 5 2014 Base Case and Model Evaluation Report
- Next Steps

OVERVIEW OF NM OAI PHOTOCHEMICAL MODELING STUDY

- *Task 1: Modeling Protocol, QAPP and Work Plan – Completed May 2020*
- *Task 2: Meteorological Modeling – Completed June 2020*
- *Task 3: Boundary Conditions – Completed June 2020*
- *Task 4: 2014 and 2023 Emissions – 2014 Completed June 2020*
  - *2023 Almost Completed August 2020 –* **only 2023 SMOKE-MOVES for 12-km 12WUS2 left**
- *Task 5: CAMx 2014 Base Case and Model Performance Evaluation – Work done August 2020*
  - **Working on Task 5 2014 Base Case and MPE report done in early September**
- **Task 6: Future Year (2023) Modeling**
  - **6.1: CAMx 2023 Base Case Modeling – Set-up ready to start (need 2023 12-km mobile)**
  - **6.2: Model Attainment Test – Not Started**
  - **6.3: Source Apportionment Modeling – Not Started**
  - **6.4: Emissions Sensitivity/Control Modeling – Not Started**
- **Task 7: Technical Support Document and Technology Transfer – Not Started**

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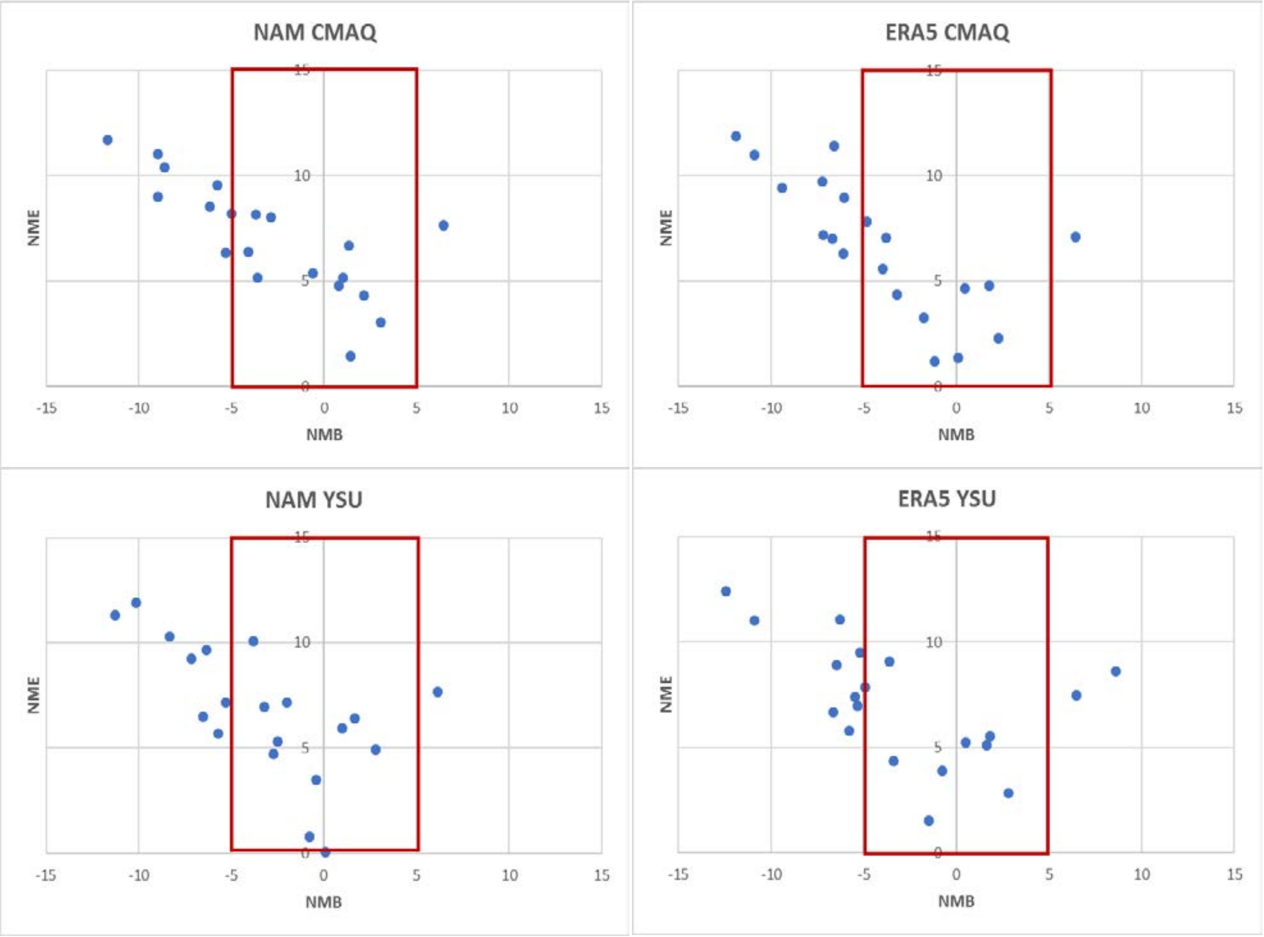
PREVIOUS WEBINAR HIGHLIGHTS (JULY 27, 2020)

- 2014 and 2023 Emissions
  - Summary of SMOKE processing
  - Identification & elimination of duplicate sources
  - Preliminary results
- CAMx 2014 Meteorological Sensitivity Runs
  - WRF/NAM and WRF/ERA5 simulations
  - Kv = CMAQ-like and Kv = YSU
  - Four CAMx WRF sensitivity simulations
  - WRF/NAM w/ Kv=CMAQ selected
    - Ozone performance for all four runs close
    - WRF/NAM w/ Kv=CMAQ had slightly lower bias and better performance on some observed ozone peaks

Site-Specific Bias/Error Soccer Plots for Four CAMx WRF Sensitivity Tests



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2014 AND 2023 EMISSIONS

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NEW MEXICO EMISSIONS DATA

- 2014 anthropogenic emissions are based on the WRAP/WAQS 2014v2
  - Onroad emissions based on SMOKE-MOVES processing with 2014 activity and WRF meteorology
  - O&G emissions based on state-of-the-science WRAP OGWG emission estimates
  - NMED found a generator engine missing in 2014v2 inventory (94 tpy NOx)
  - Consistent emissions data between the Regional Haze and OAI studies
- 2023 anthropogenic emissions are based on the EPA 2016v1 platform
  - Like 2014, onroad emissions created using SMOKE-MOVES and O&G emissions based on WRAP OGWG
  - NMED found duplicate sources between WRAP O&G and EPA non-EGU sectors
  - Found double counting of NM sources in WRAP O&G inventory: Title V and minor point sources
  - Updated San Juan Generating Station (NOx 7,059 TPY) and added Lordsburg Generating Station
  - Updated three O&G sources: Chaco Gas Plant (NOx 2,053 tpy), Carlsbad CS, and Mountainair CS (NOx 645 tpy)

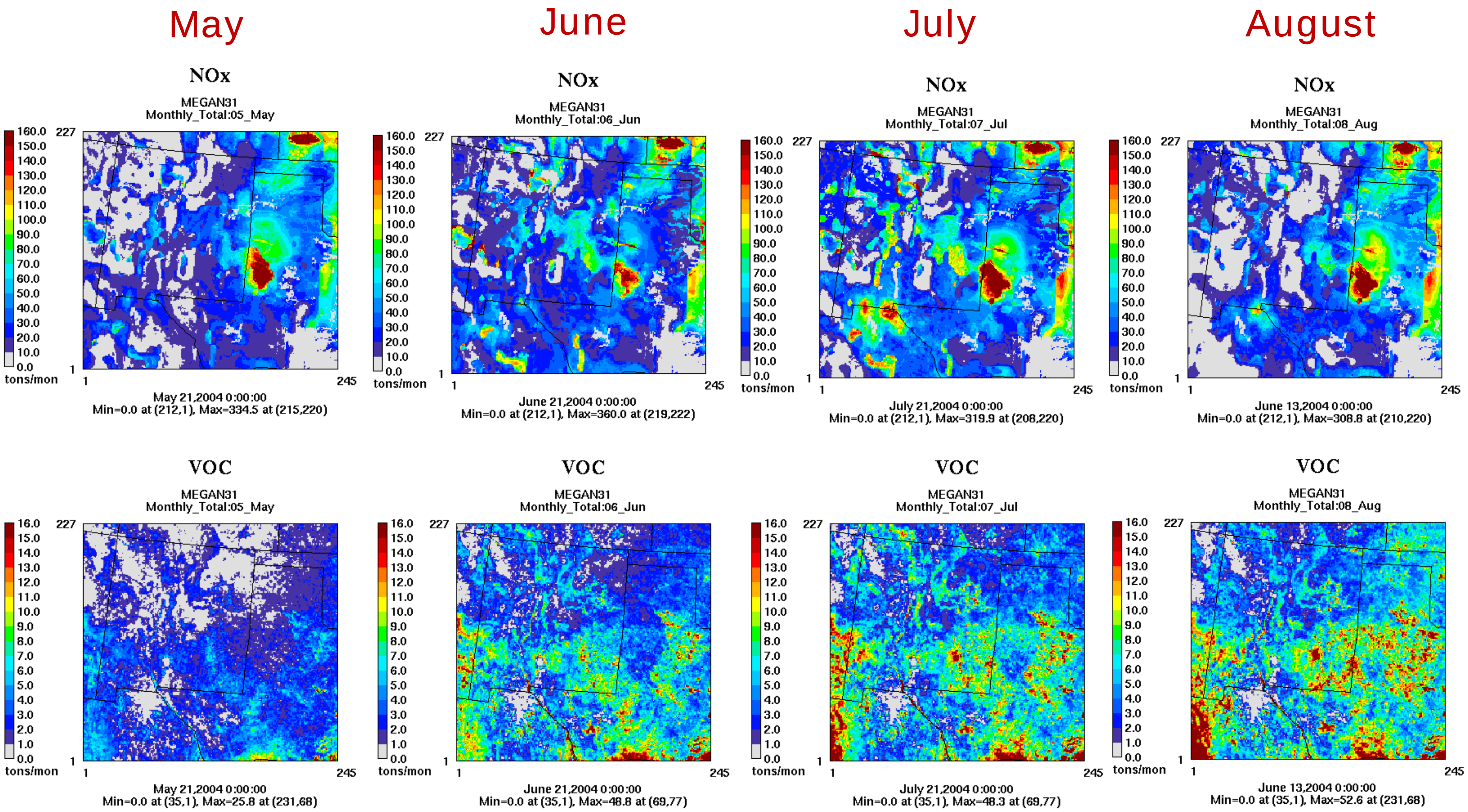
NATURAL EMISSIONS

Remained the same between 2014 and 2023

- Lightening NOx: Lightning NOx (LNOx) emissions processor with 2014 WRF meteorological data to generate CAMx-ready emissions
- Oceanic Emissions: OCEANIC emissions processor was used to generate sea salt and dimethyl sulfide (DMS) emissions
- Fire Emissions: Agricultural, prescribed burn and wildfire emissions from WRAP 2014v2 modeling developed by WRAP Smoke and Fire Workgroup
- Windblown dust: CAMx windblown dust (WBD) processor
- Biogenic Emissions: MEGAN v3.1 biogenic emissions model

MEGAN V3.1 EMISSIONS

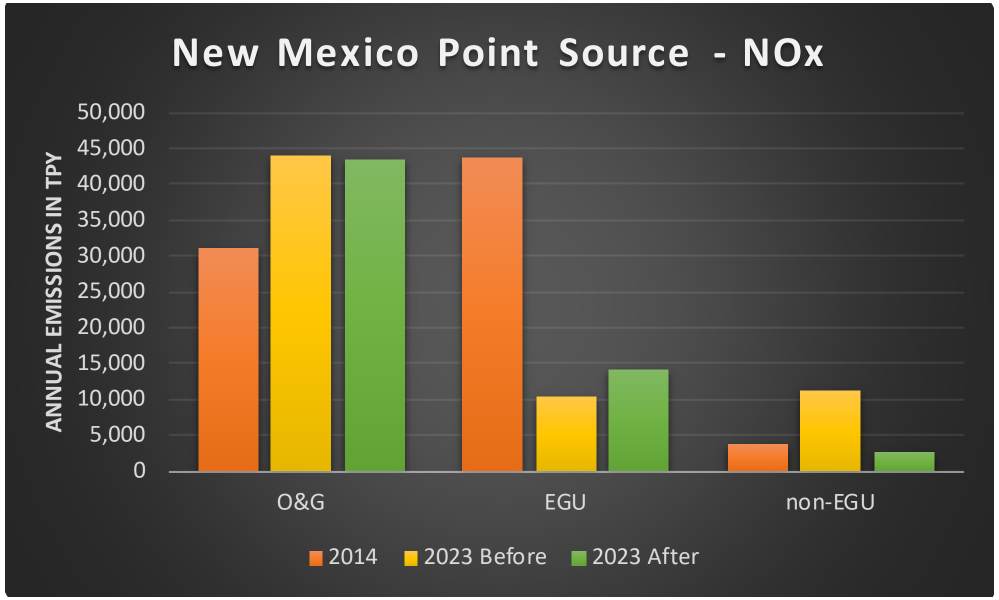
- Soil NOx

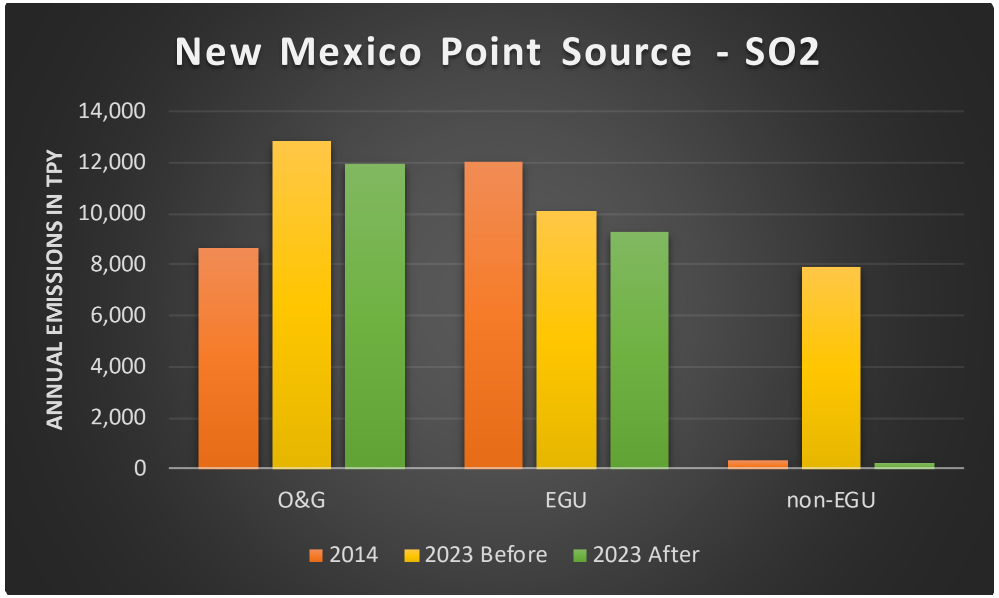


Month	tons/day	
	NOx	VOC
May	1,131	4,139
Jun	1,369	8,615
Jul	1,666	10,248
Aug	1,323	11,438

DUPLICATE POINT SOURCES IN 2023

- NMED identified 21 facilities double counted in 2023 non-EGU and WRAP point O&G inventory
  - o Double counted emissions: NOx 8,669 TPY and SO2 7,662 TPY
  - o Represents approximately 9% (NOx) and 24% (SO2) of the New Mexico 2023 O&G emissions
- Duplicates in the WRAP O&G inventory: Some sources were present in Title V and minor point O&G sources datasets in the OGWG inventory.
  - o Double counted emissions NOx: 1,927 TPY and SO2: 942 TPY





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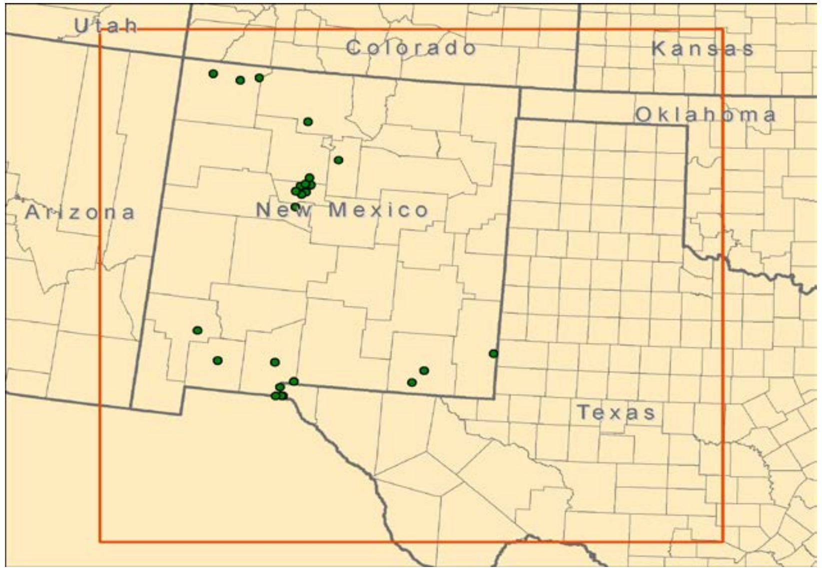
SMOKE PROCESSING SECTORS

US-Anthro

Sector	Description
afdust_adj	- Area fugitive dust
ag	- Agricultural ammonia sources
nonpt	- Other nonpoint sources
np_oilgas_wrap	- Non-point Oil and Gas for 7 WRAP States (CO, MT, NM, ND, SD, UT, WY)
np_oilgas	- Non-point Oil and Gas
nonroad	- Non-road mobile
rail	- Locomotive
onroad	- On-road mobile
ptegu	- EGU point sources
ptnonipm	- Non-EGU point sources
pt_oilgas_wrap	- Point Oil and Gas for 7 WRAP States (CO, MT, NM, ND, SD, UT, WY)
pt_oilgas_wrap	- Point Oil and Gas
rwc	- Residential Wood Combustion



New Mexico
4-km Domain

Non-US Anthro & Natural

Sector	Description
onroad_mex	- Mexico onroad mobile
othar	- Mexico area
othpt	- Mexico point sources
MEGAN/BEIS	- Biogenic
LtNOx	- Lightning Nox
AG fire	- Ag Fire
RX fire	- Prescribed Fire
WF fire	- Wild Fire
Ptfire_othna	- Mexico fire
WBD	- Windblown Dust

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NEW MEXICO 4-KM DOMAIN EMISSIONS (ANTHRO ONLY)

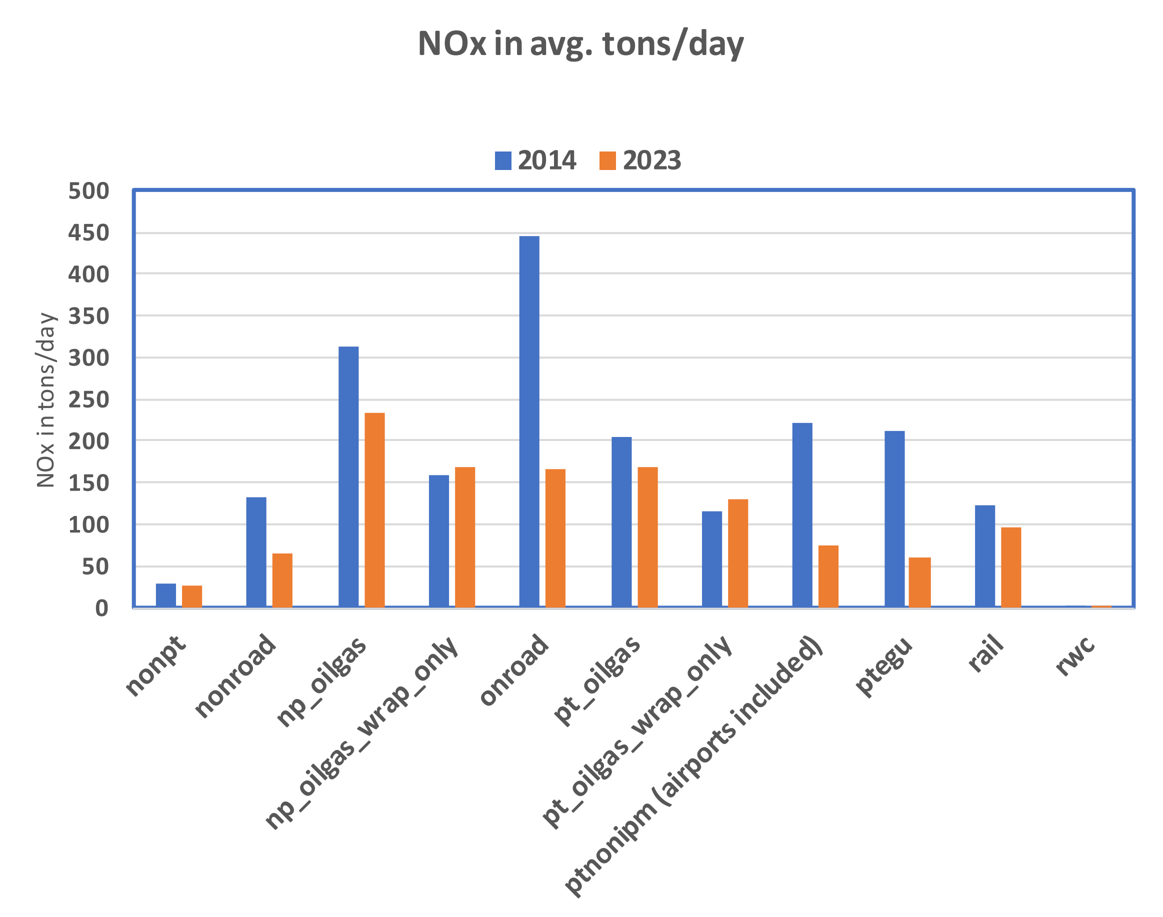
2014 in average tons/day

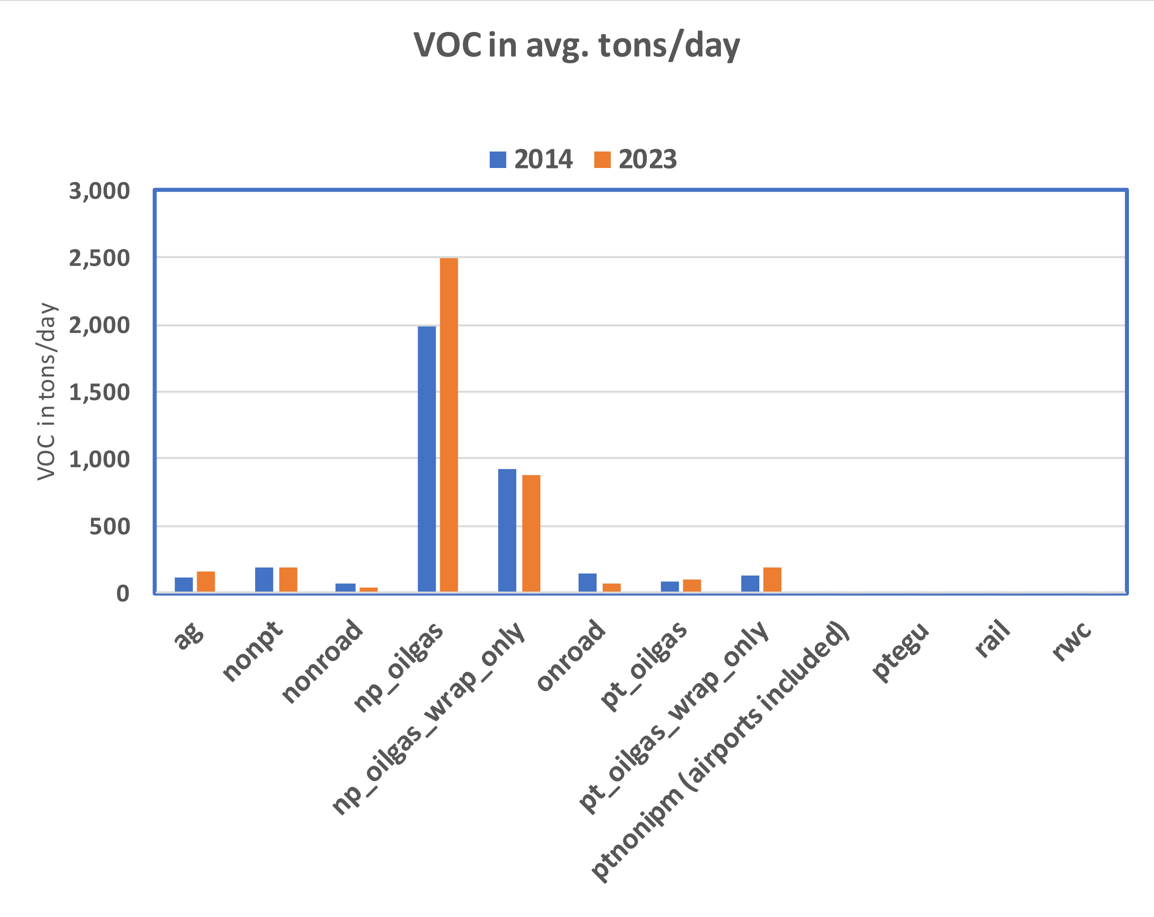
Sector	CO	NOx	VOC
ag	0.0	0.0	43.4
nonpt	141.3	28.5	213.2
nonroad	570.3	133.4	73.2
np_oilgas	286.8	311.7	1,642.5
np_oilgas_wrap_only	237.7	157.8	567.3
onroad	1,476.2	444.5	150.6
onroad_mex	356.3	98.4	34.4
othar	19.9	42.2	103.3
othpt	28.4	20.2	8.3
ptegu	89.2	210.6	5.0
pt_oilgas	113.8	205.2	48.4
pt_oilgas_wrap_only	89.9	114.7	56.1
ptnonipm	74.4	47.5	24.4
rail	22.9	122.7	6.2
rwc	7.0	0.1	1.2
TOTAL	**3,513.9**	**1,937.6**	**2,977.3**

2023 in average tons/day

Sector	CO	NOX	VOC
ag	0.0	0.0	65.7
nonpt	141.9	27.3	217.0
nonroad	504.9	64.1	39.3
np_oilgas	298.3	234.3	2,124.5
np_oilgas_wrap_only	267.4	169.0	559.6
onroad	841.8	166.6	0.0
onroad_mex	336.3	98.0	35.0
othar	21.6	44.1	121.8
othpt	32.8	19.1	11.3
ptegu	34.0	60.6	1.6
pt_oilgas	99.0	169.1	57.9
pt_oilgas_wrap_only	111.4	130.5	86.5
ptnonipm	55.9	43.9	20.2
rail	22.1	96.4	4.2
rwc	7.0	0.1	1.1
TOTAL	**2,774.2**	**1,323.1**	**3,345.6**

NEW MEXICO 4-KM EMISSIONS COMPARISON: 2014 VS. 2023





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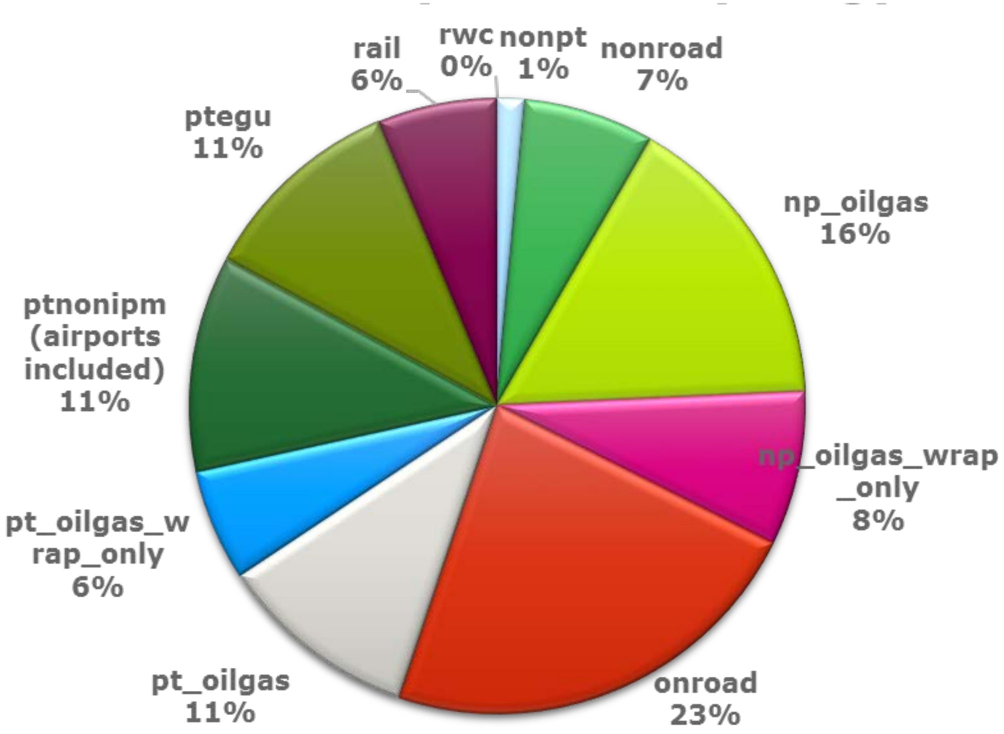
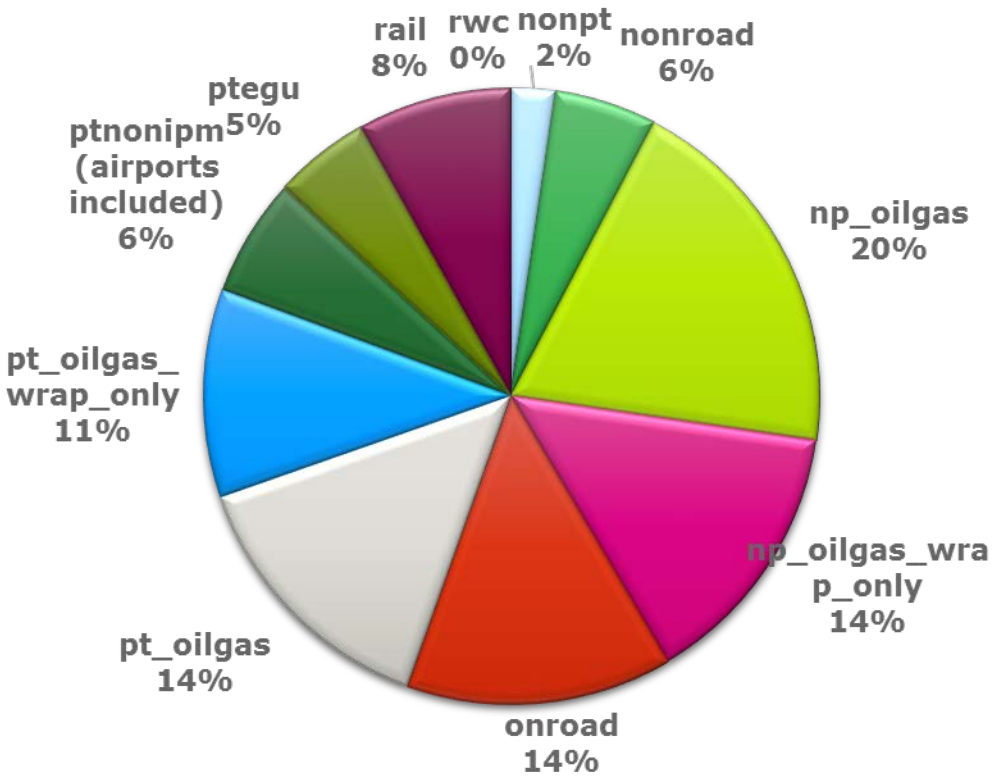
NEW MEXICO 4-KM NOX COMPARISON

2014 NOx



1,938 TPD

2023 NOx



1,323 TPD

-615 TPD (32%) Reduction

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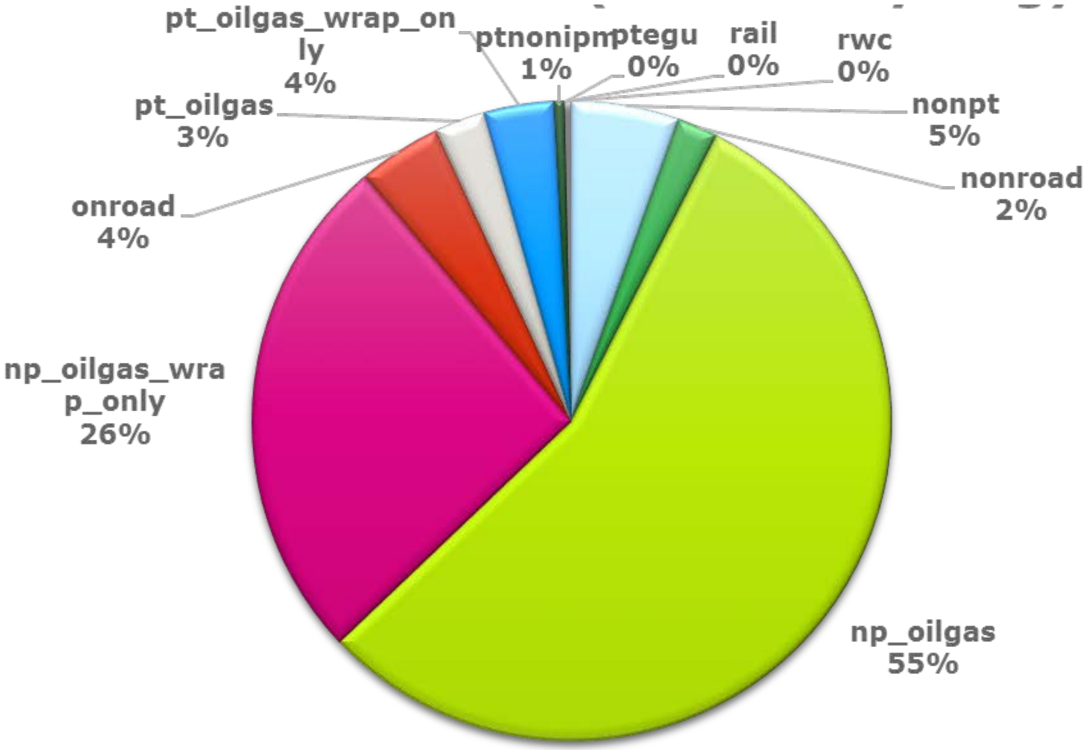
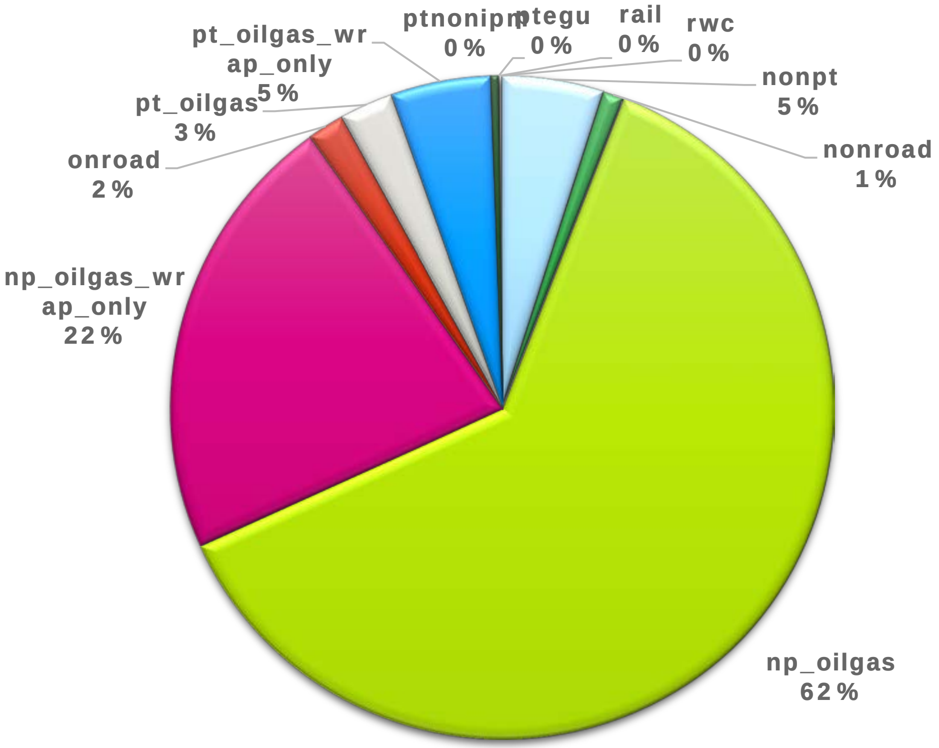
NEW MEXICO 4-KM VOC COMPARISON

2014 VOC



2,977 TPD

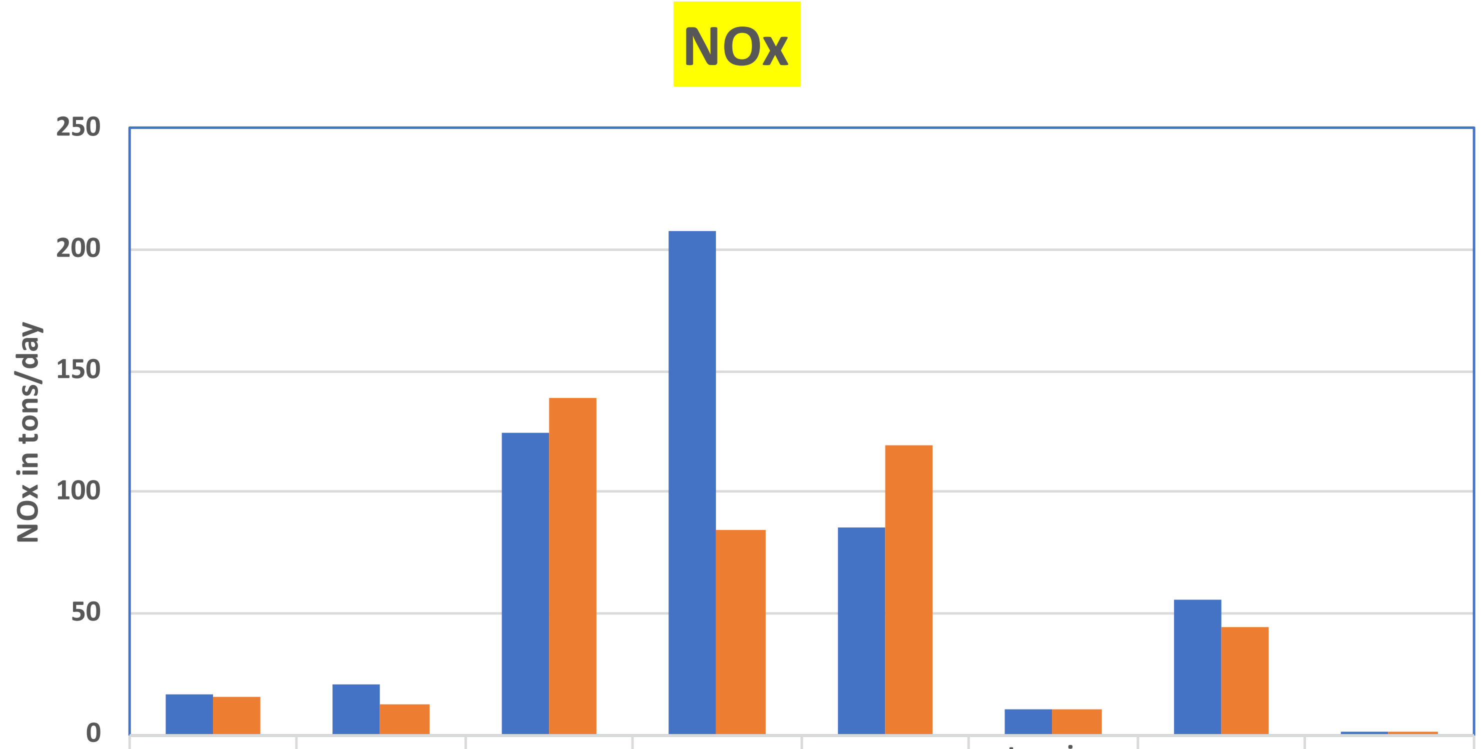
2023 VOC



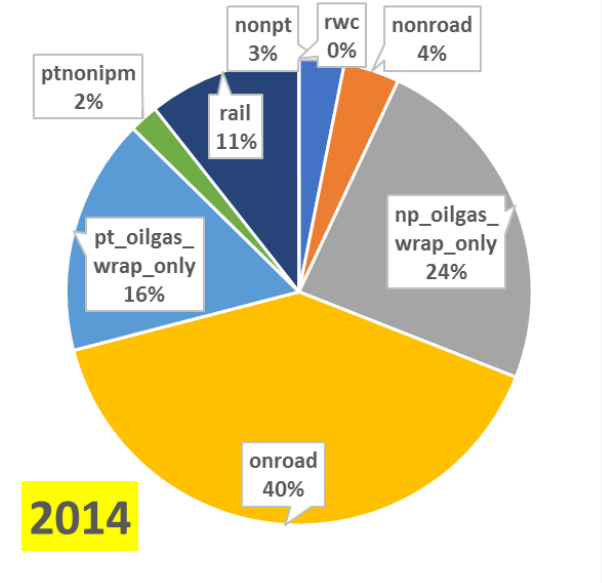
3,346 TPD

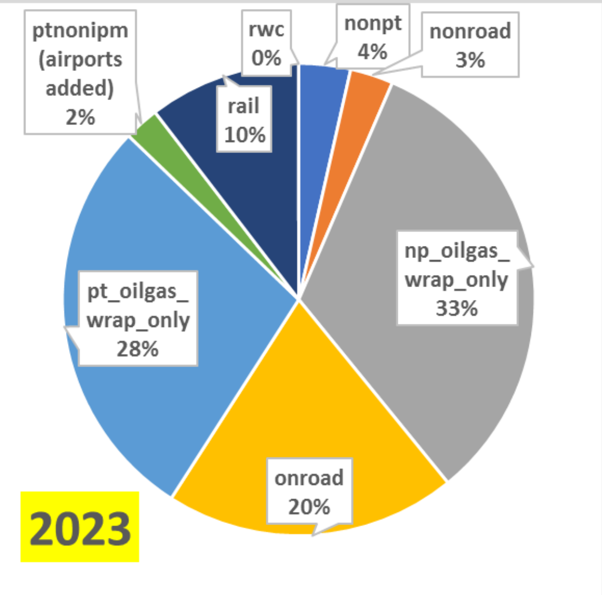
+369 TPD (12 %) Increase

NEW MEXICO NOX SUMMARY

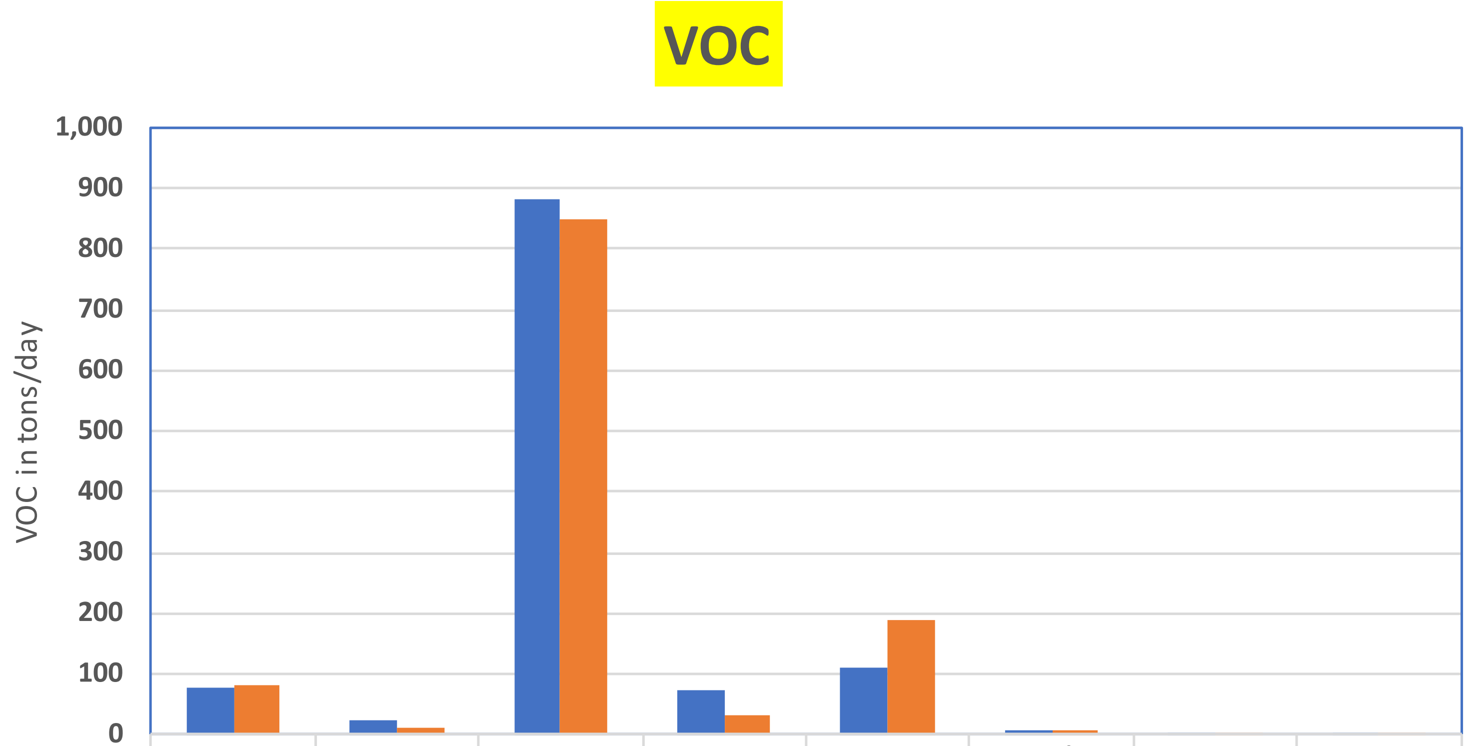


	nonpt	nonroad	np_oilgas_wrap_only	onroad	pt_oilgas_wrap_only	ptnonipm (airports added)	rail	rwc
2014	16	20	125	208	85	10	55	0
2023	15	12	138	85	119	10	44	0

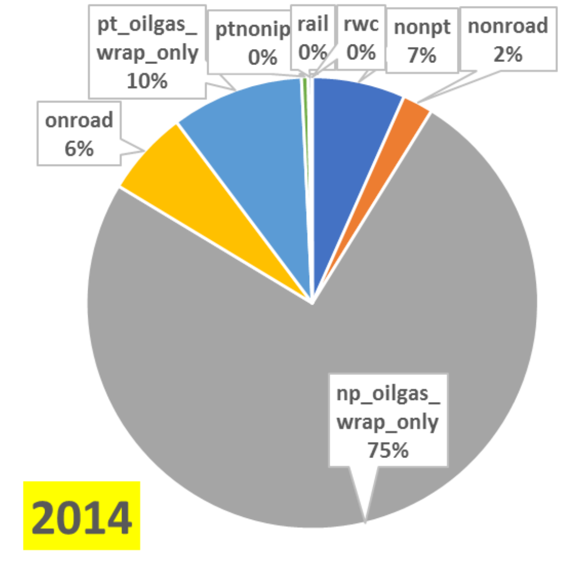


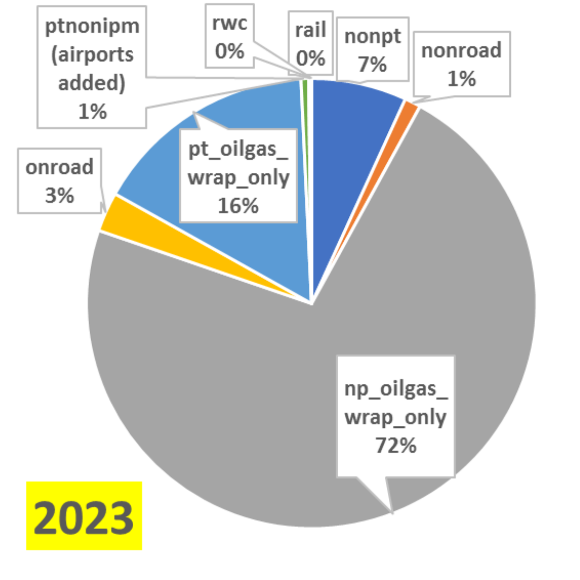


NEW MEXICO VOC SUMMARY



	nonpt	nonroad	np_oilgas_ wrap_only	onroad	pt_oilgas_ wrap_only	ptnonipm (airports added)	rail	rwc
2014	78	26	881	72	112	6	3	1
2023	80	14	849	33	189	6	2	1





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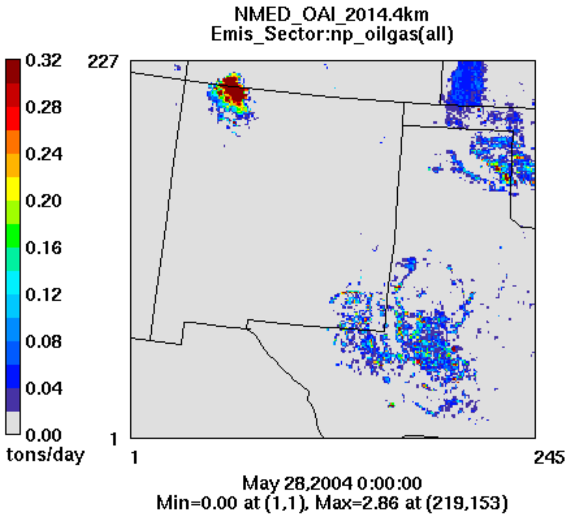
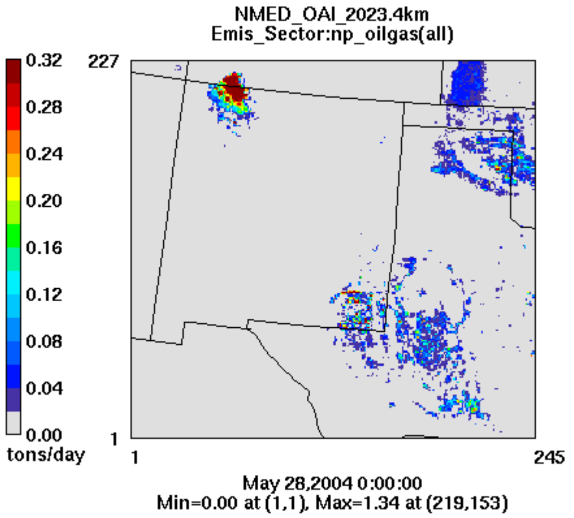
NON-POINT O&G EMISSIONS: NOX

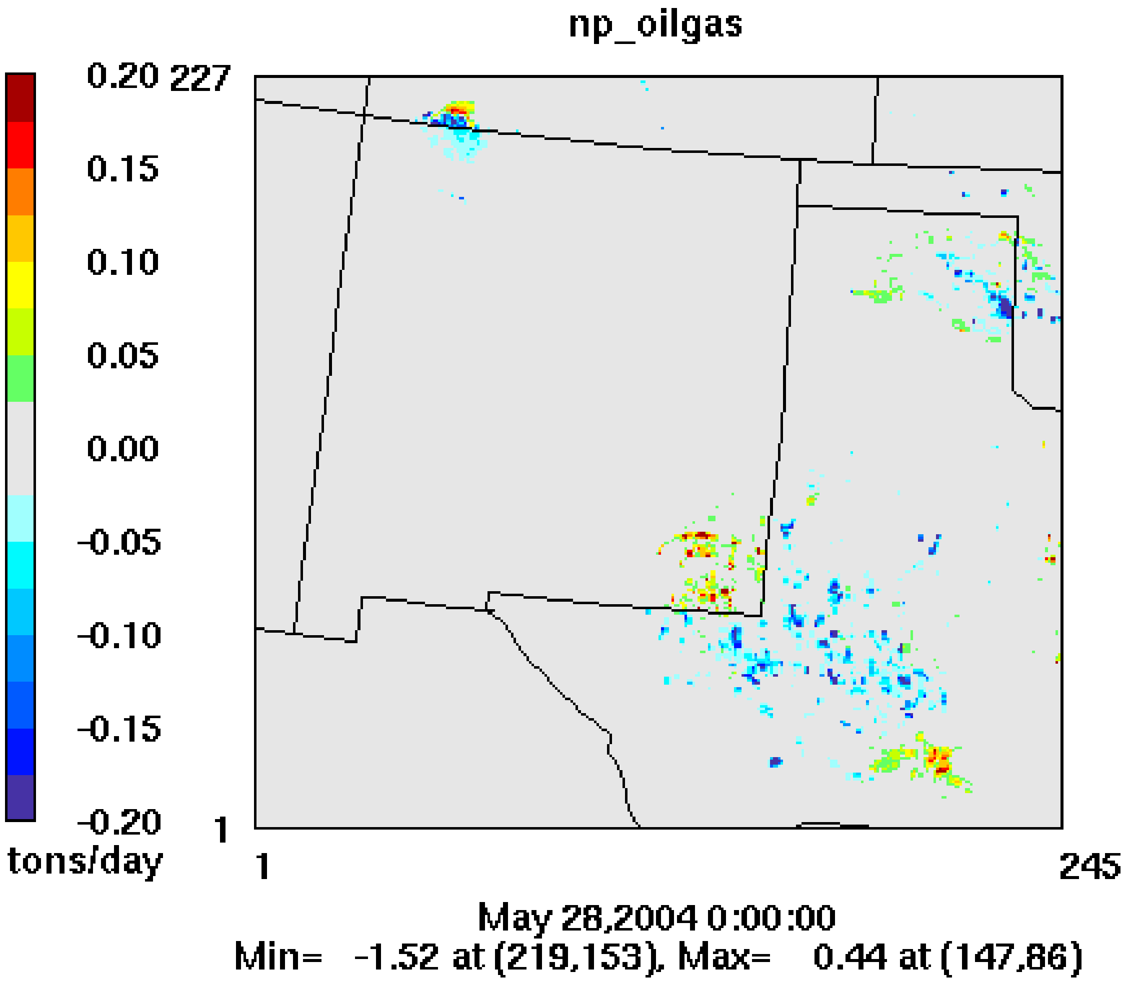
2014



2023



Delta NOx (2023 – 2014)



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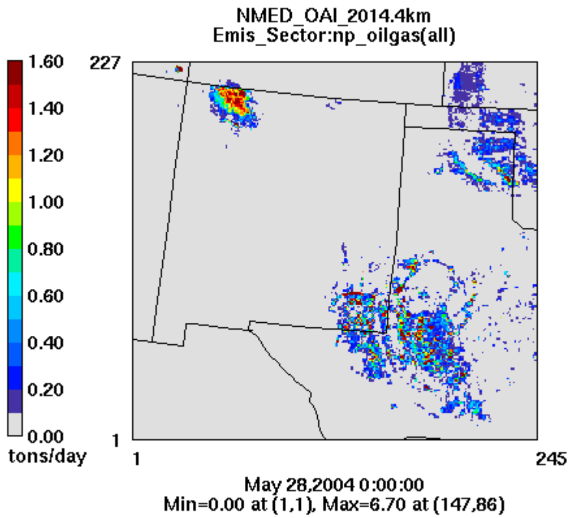
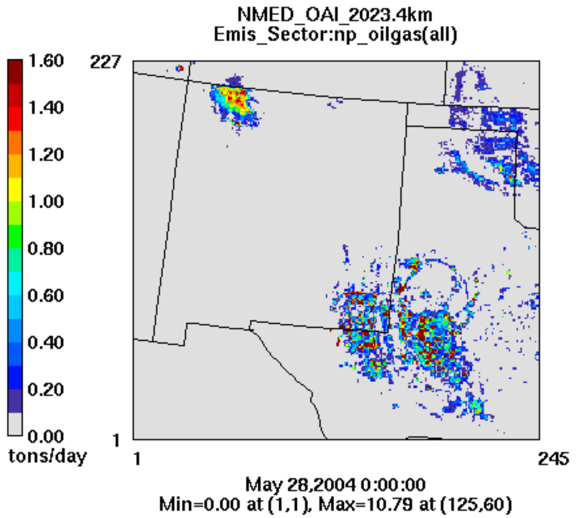
NON-POINT O&G EMISSIONS: VOC

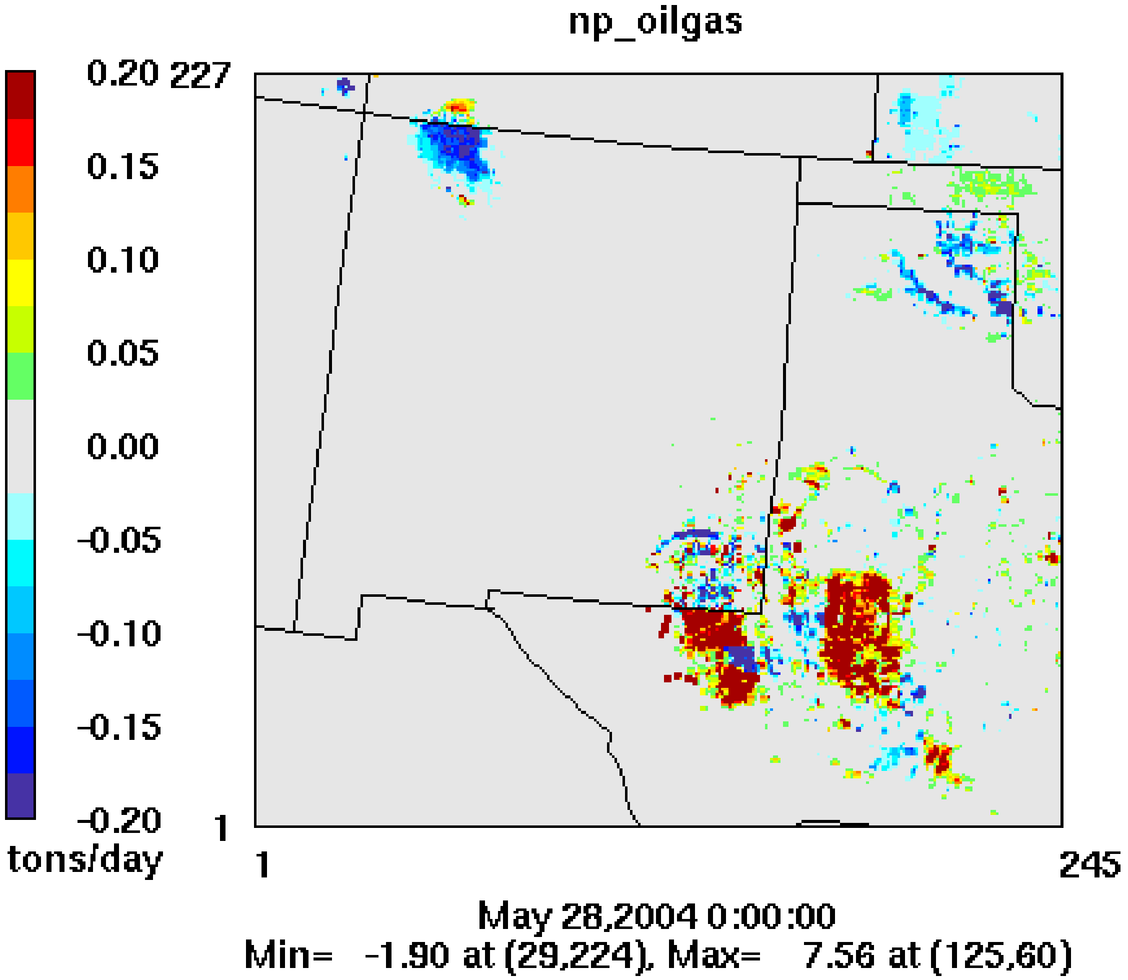
2014



2023



Delta VOC (2023 – 2014)



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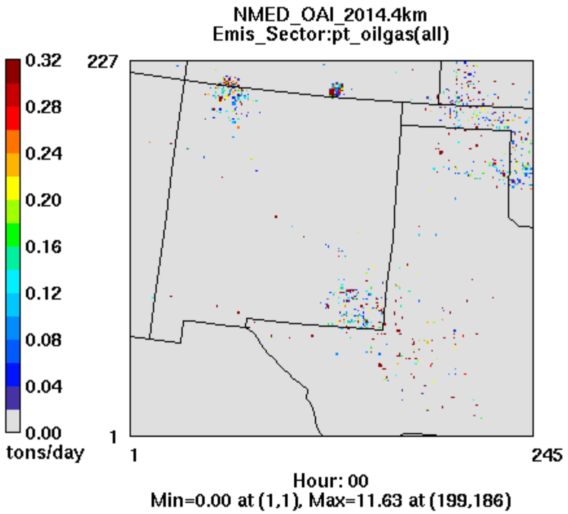
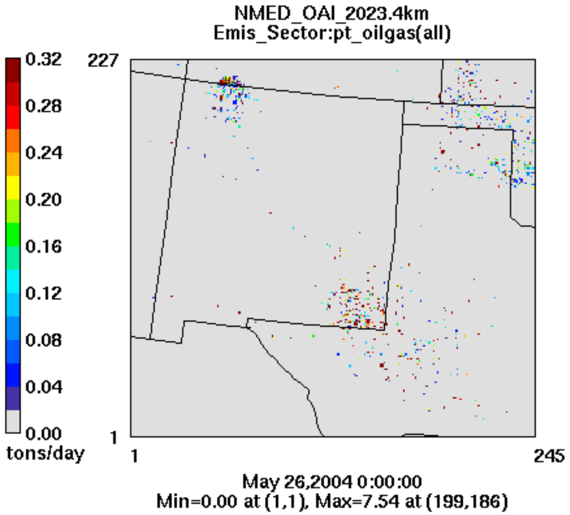
POINT O&G EMISSIONS: NOX

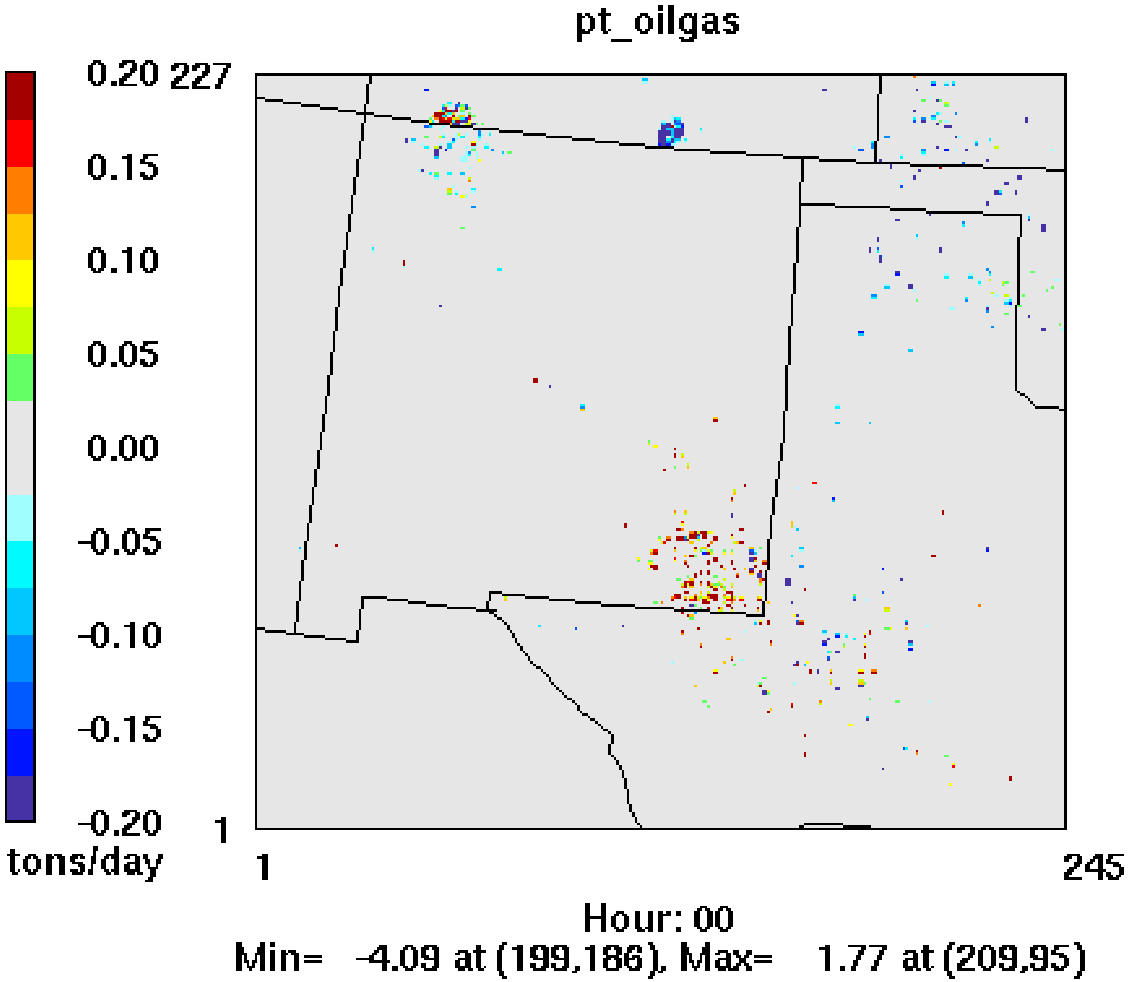
2014



2023



Delta NOx (2023 – 2014)



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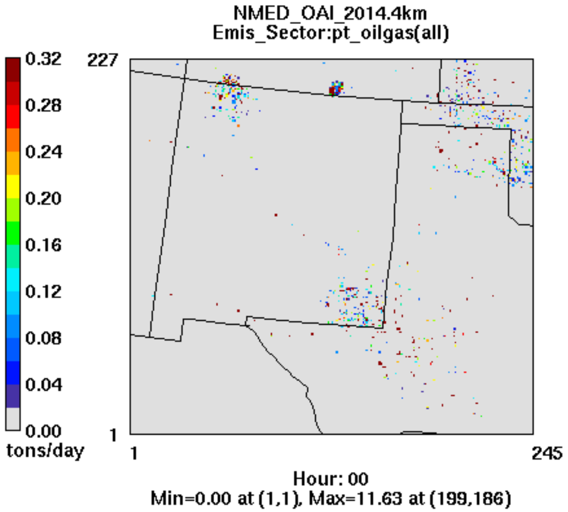
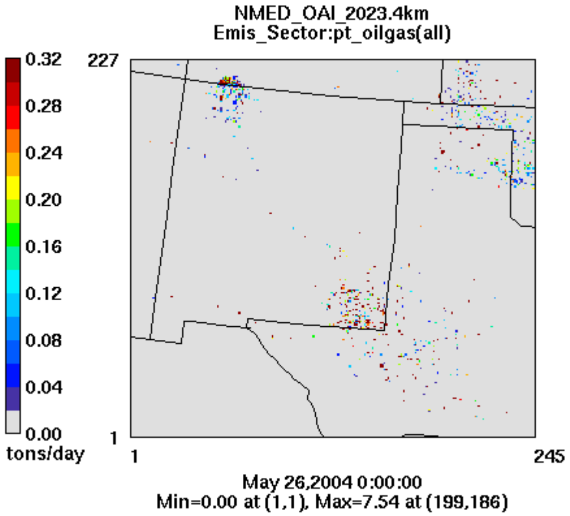
POINT O&G EMISSIONS: VOC

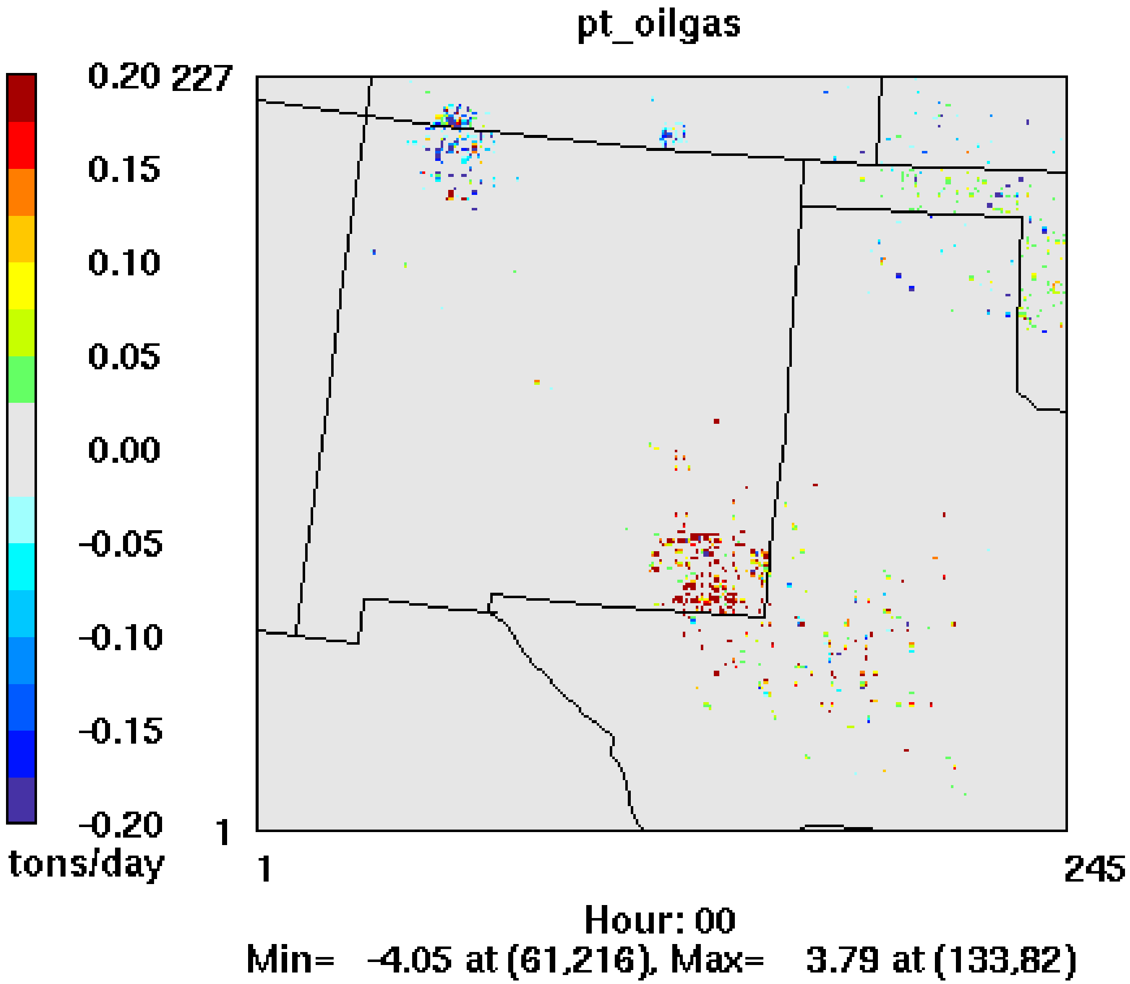
2014



2023



Delta VOC (2023 – 2014)



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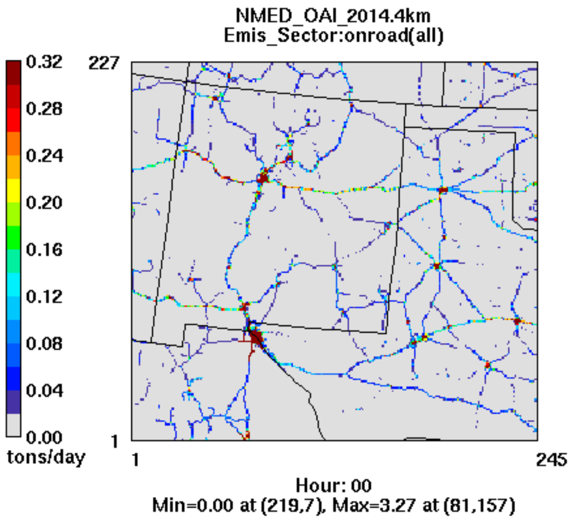
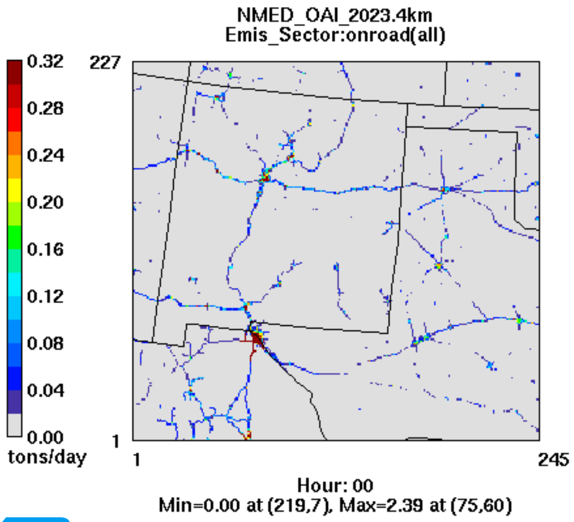
ONROAD EMISSIONS: NOX

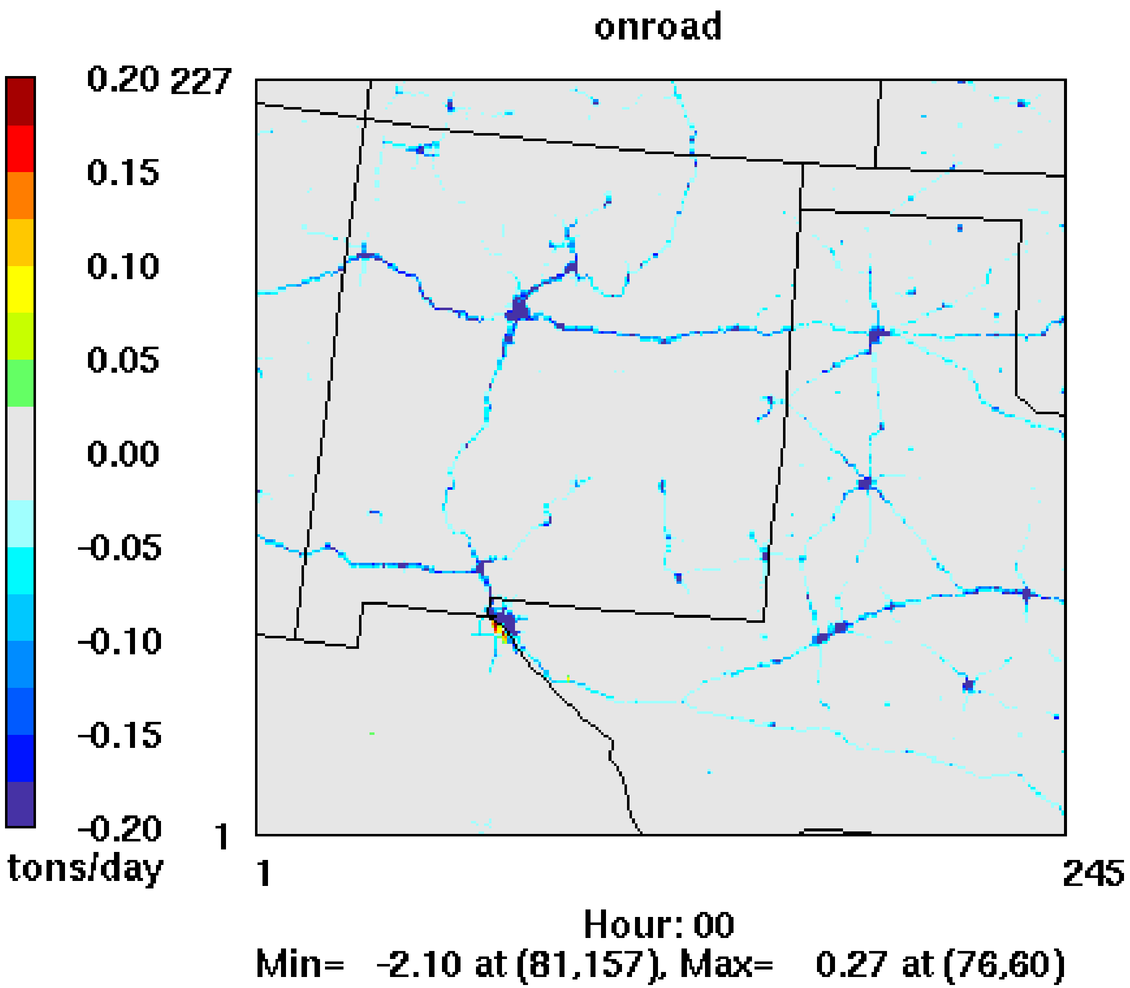
2014



2023

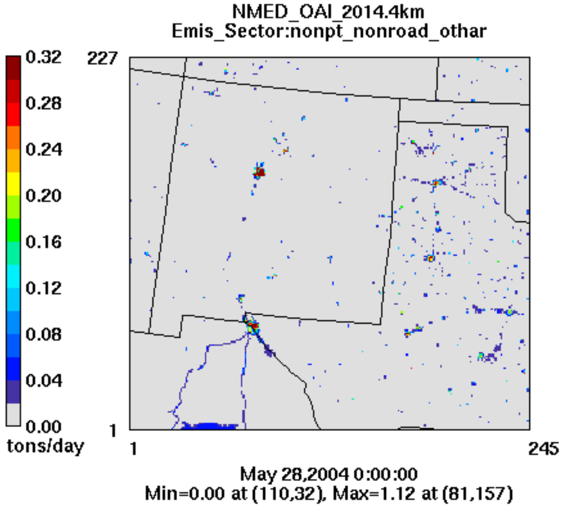


Delta NOx (2023 – 2014)

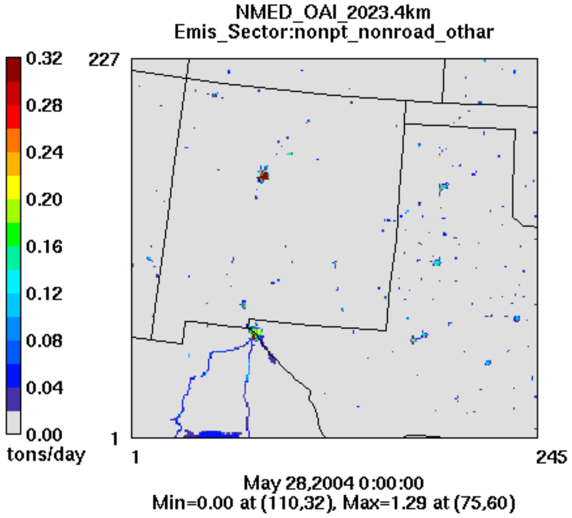


NONPOINT AND NONROAD EMISSIONS: NOX

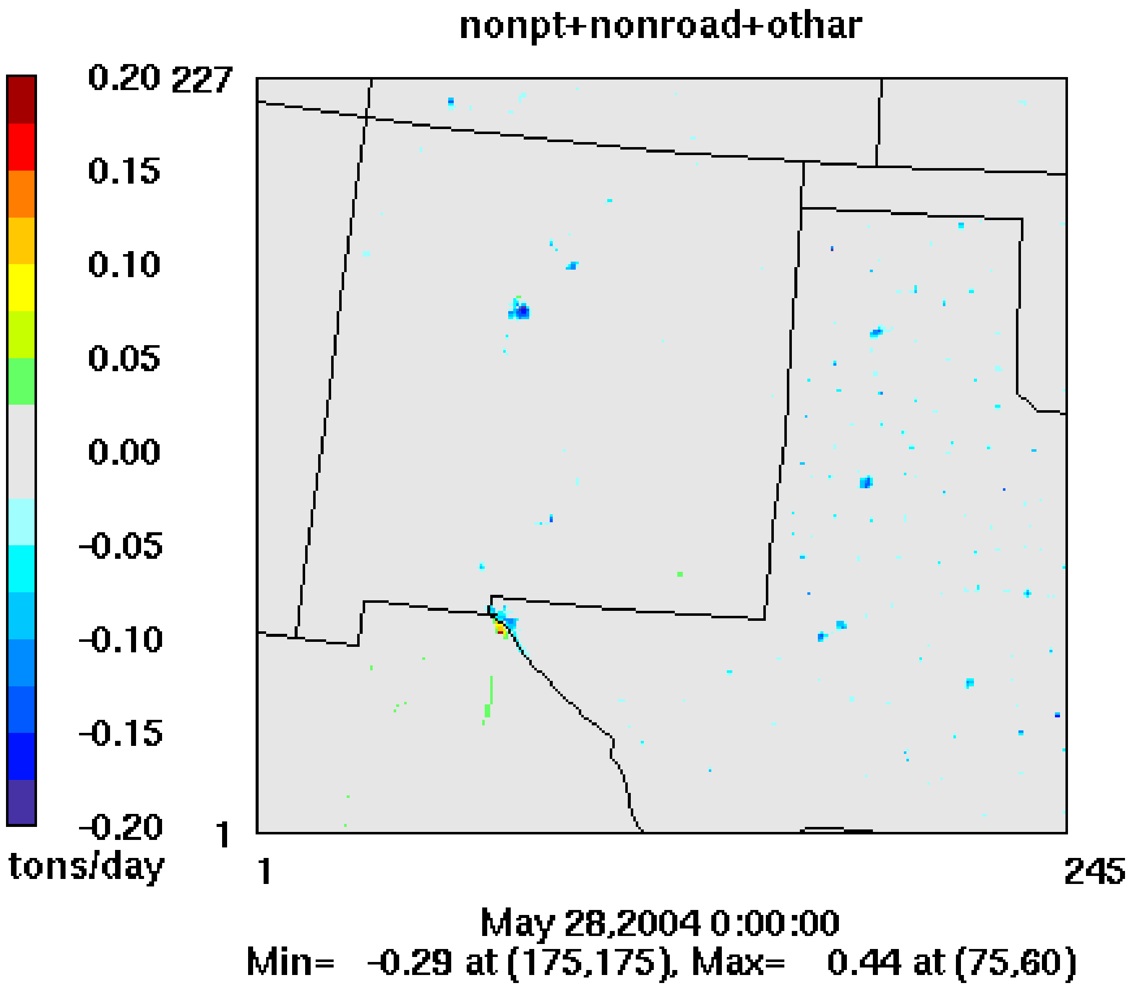
2014



2023

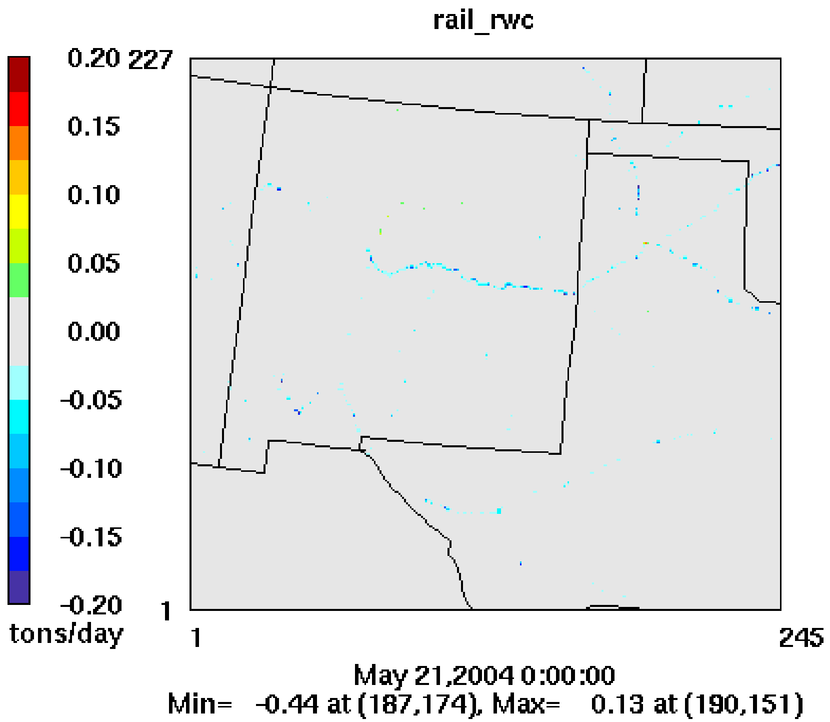


Delta NOx (2023 – 2014)

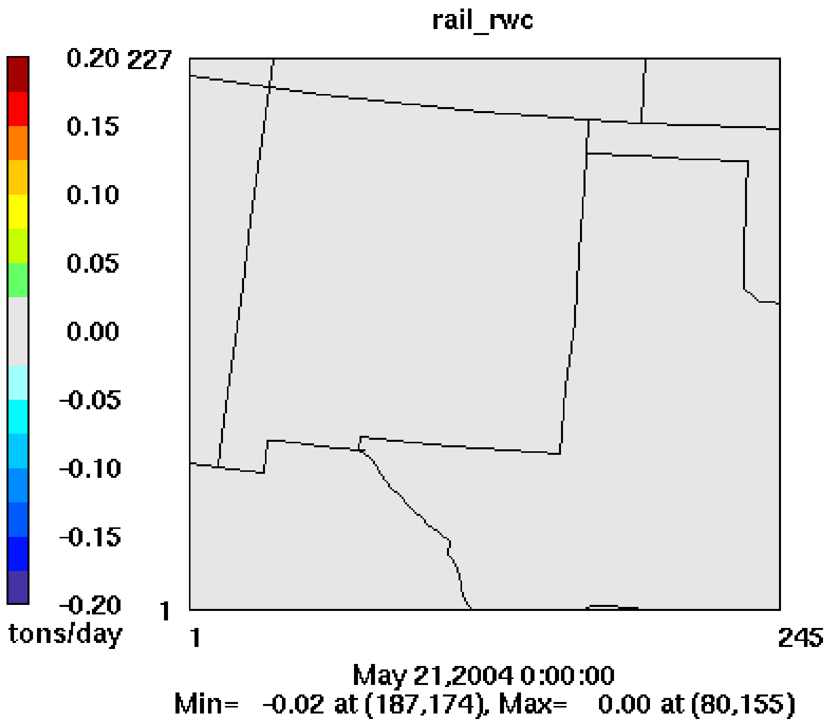


RAIL AND RWC EMISSIONS

Delta NOx (2023 – 2014)



Delta VOC (2023 – 2014)



CAMX 2014 BASE CASE MODELING AND MODEL PERFORMANCE EVALUATION

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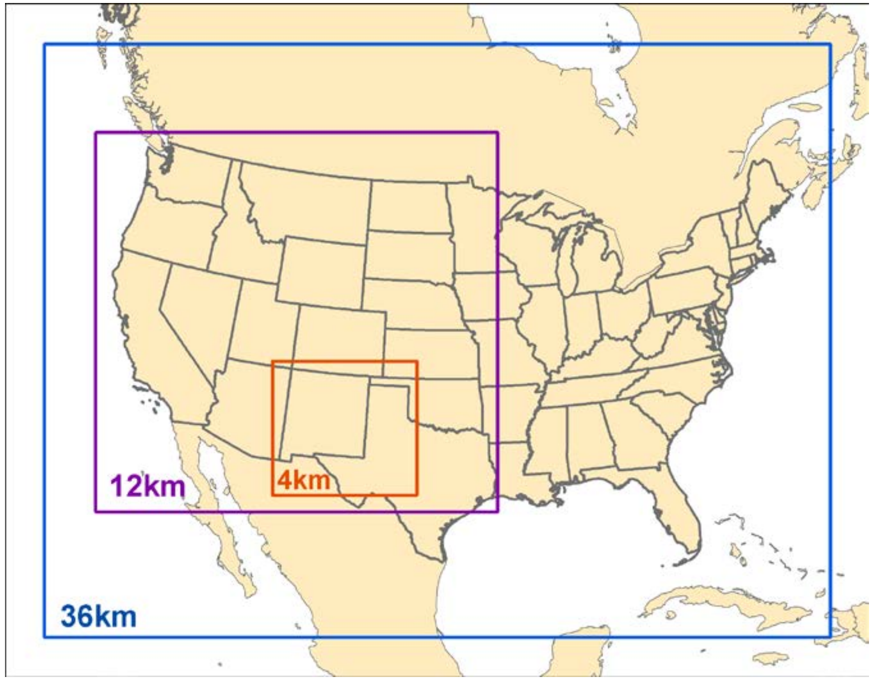
CAMX 2014 BASE CASE – FINAL MODEL CONFIGURATION

- Episode: May-August 2014
  - 16-day spin-up before first high ozone day in NM
    - o 68 ppb on May 17
- 36/12/4-km Modeling Domains
  - o 36/12-km domains same as WRAP Regional Haze
  - o New 4-km New Mexico domain
- Boundary Conditions (BC) from WRAP 2014 GEOS-Chem
- Four Meteorological Diagnostic Sensitivity tests
  - o Selected WRF/NAM with Kv=CMAQ
- WRAP 2014v2 base year emissions
  - o EPA NEI2014v2 w/ western state updates
- EPA 2016v1 platform 2023fh emissions for Future Year



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CAMX CONFIGURATION

- Very similar to WRAP CAMx 36/12-km Regional Haze set-up
  - o Addition of 4-km NM Domain

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Science Options	CAMx	Comment
Model Codes	CAMx v7.0	Latest version of CAMx made publicly available May 2020 (www.camx.com)
Horizontal Grid Mesh	36/12/4-km	
36-km grid	148 x 112 cells	36US domain
12-km grid	227 x 215 cells	12WUS2 domain. Includes buffer cells
4-km grid	245 x 227 cells	New Mexico 4-km domain. Includes buffer cells
Vertical Grid Mesh	25 vertical layers, defined by WRF	Layer 1 ~20 m. Model top at 50 mb (~19 km). Layer collapsing from 35 vertical layers in WRF
Grid Interaction	36/12/4 km two-way nesting	
Initial Conditions	Start on May 1, 2014	First high ozone day is May 17, 2014
Boundary Conditions	WRAP 2014 GEOS-Chem	For 36US domain lateral boundaries
Emissions		
Emissions Processing	SMOKE, SMOKE-MOVES2014, MEGAN	WRAP/WAQS 2014v2 emissions and EPA 2023fh for future year
Sub-grid-scale	Plume-in-Grid (PiG)	NOx > threshold
Chemistry		
Gas Phase	CB6r4	(Yarwood et al., 2010)
Meteorological Processor	WRFCAMx	Compatible with CAMx v7.0
Horizontal Diffusion	Spatially varying	K-theory with Kh dependence
Vertical Diffusion	CMAQ-like Kv	Evaluated YSU Kv scheme
Diffusivity Min	Kv-min = 0.1 to 1.0 m^2/s in lowest 100 m	Urban land use fraction
Deposition Schemes		
Dry Deposition	Zhang dry deposition scheme	(Zhang et. al, 2001; 2003)
Wet Deposition	CAMx -specific formulation	rain/snow/graupel
Numerics		
Gas Phase Chemistry Solver	Euler Backward Iterative(EBI)	EBI fast and accurate solver
Vertical Advection	Implicit scheme ate	Emery et al., (2009a,b; 2011)
Horizontal Advection	Piecewise Parabolic	Colella and Woodward (1984)

2014 BASE CASE MPE

- Used AMETv1.4 MPE tool
- Model evaluated against EPA AQS Surface Air Quality Data for 2014
- Model performance compared with standard PGM goals and criteria values (Emery et al., 2016)
- “Goals” : statistical value that the best model can be expected to achieve
- “Criteria” : statistical value that majority of models have achieved

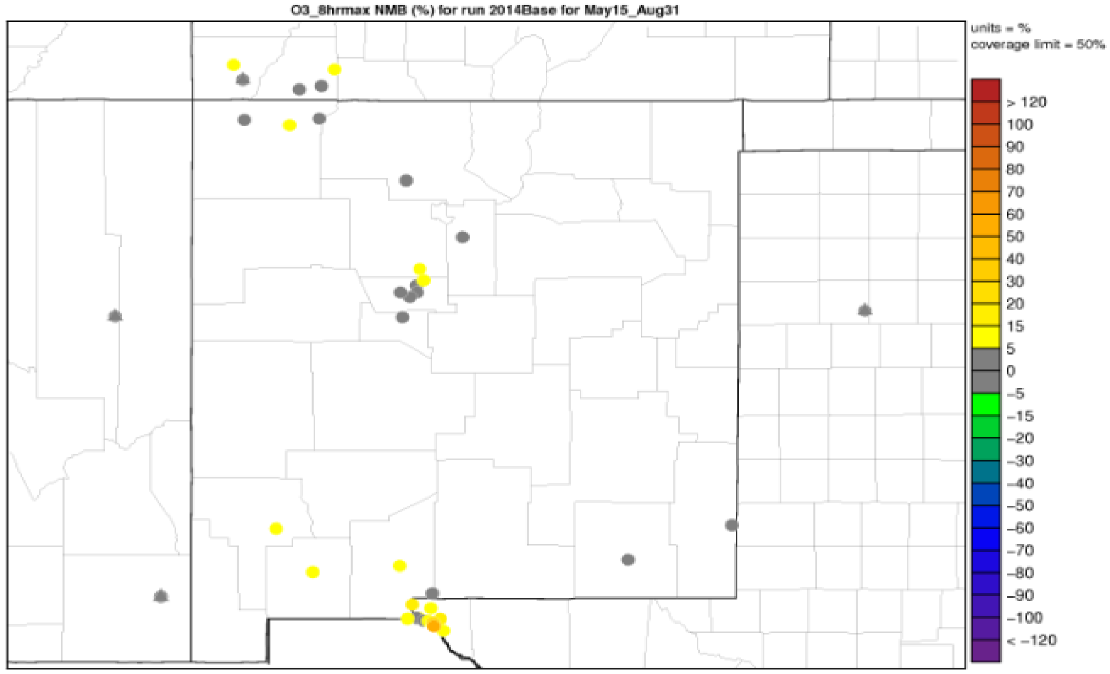
Species	**NMB**		**NME**	
	Goal	**Criteria**	**Goal**	**Criteria**
1-hr & MDA8 Ozone	<±5%	<±15%	<15%	<25%

RAMBOLL

OZONE EVALUATION ACROSS 4KM DOMAIN

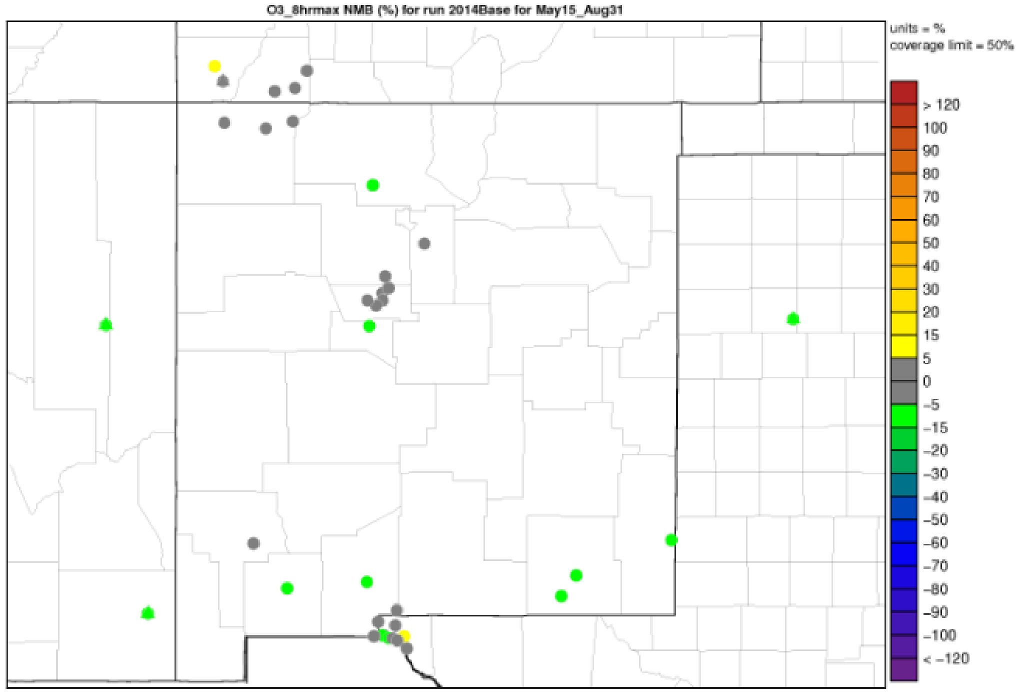
- Throughout the domain at most of the sites model is achieving performance goal with NMB <±5%.
- Few remaining sites are within the performance criteria with NMB <±15%, where model is overpredicting lower concentrations and underpredicting higher concentrations.

MDA8 O3 no cut-off



CIRCLE=AQS_Daily_O3; TRIANGLE=CASTNET_Daily;

MDA8 O3 with 60 ppb cut-off

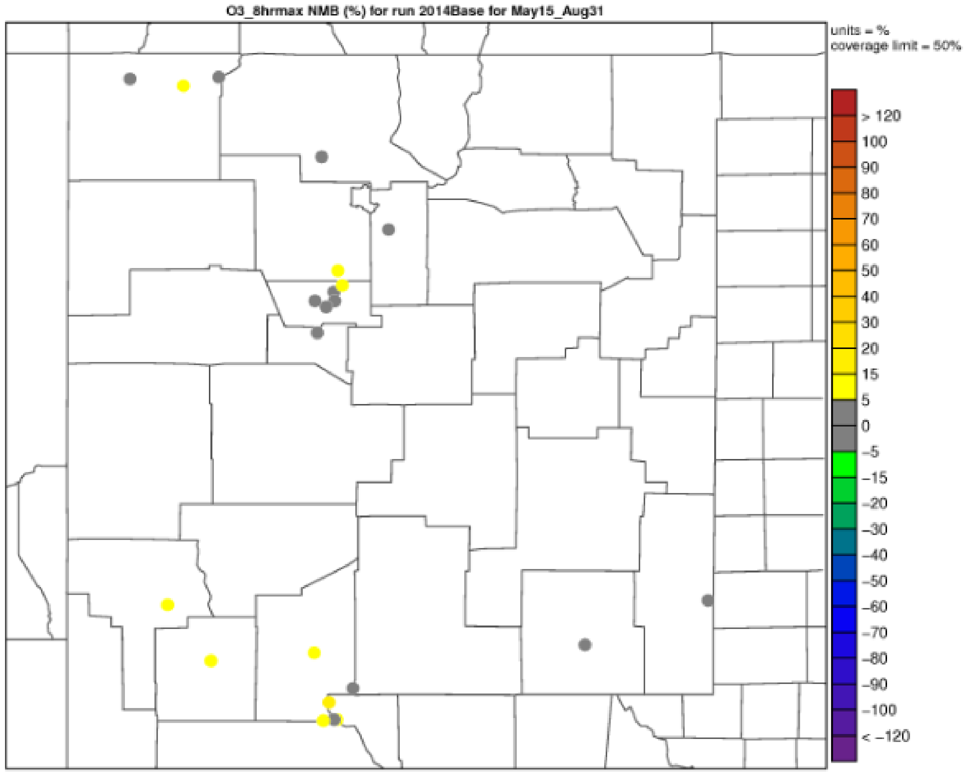


CIRCLE=AQS_Daily_O3; TRIANGLE=CASTNET_Daily;

OZONE EVALUATION ACROSS NM DOMAIN

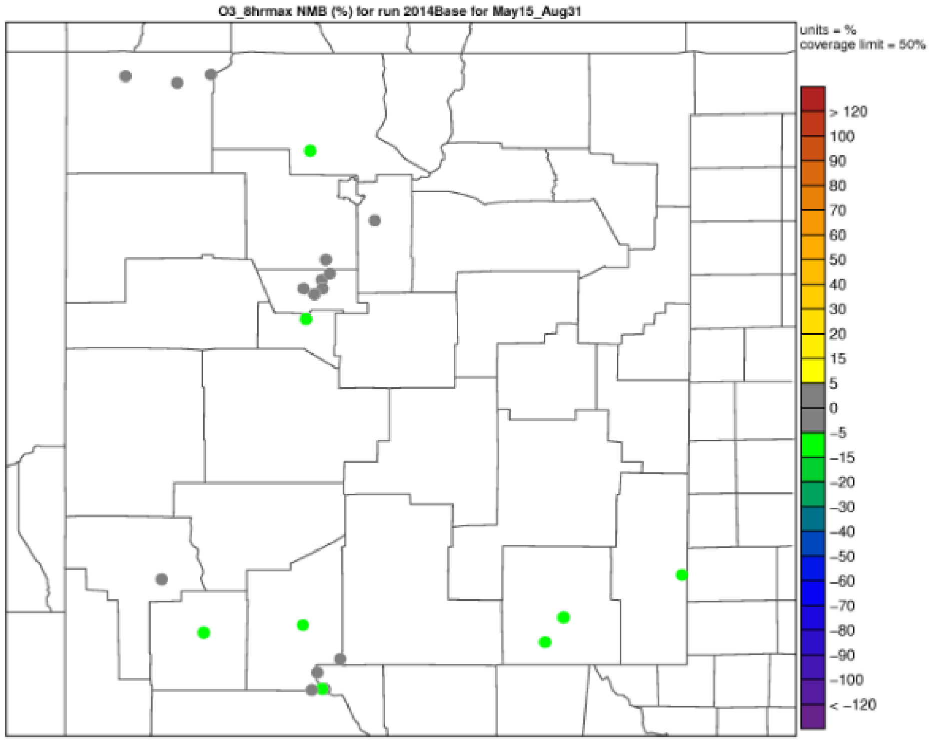
- Overall majority of sites in New Mexico are achieving performance goal (<±5%) and criteria (<±15%)
- Most of the southern New Mexico sites are underpredicting MDA8 concentrations higher than 60 ppb

MDA8 O3 no cut-off



CIRCLE=AQS_Daily_O3; CASTNET_Daily=No Data;

MDA8 O3 with 60 ppb cut-off



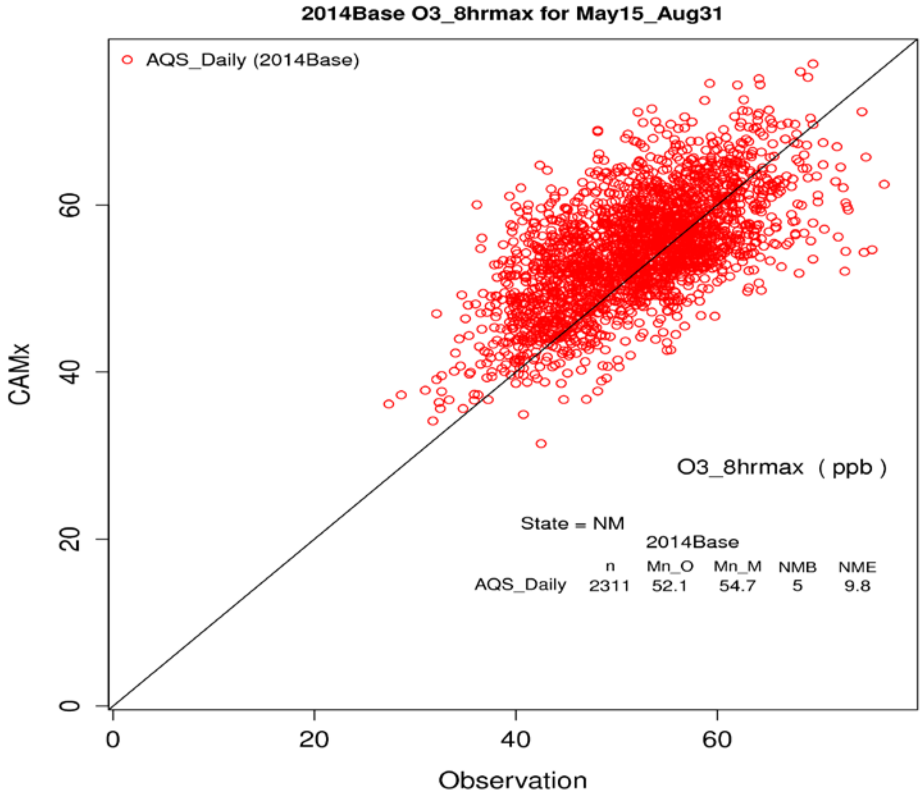
CIRCLE=AQS_Daily_O3; CASTNET_Daily=No Data;

RAM

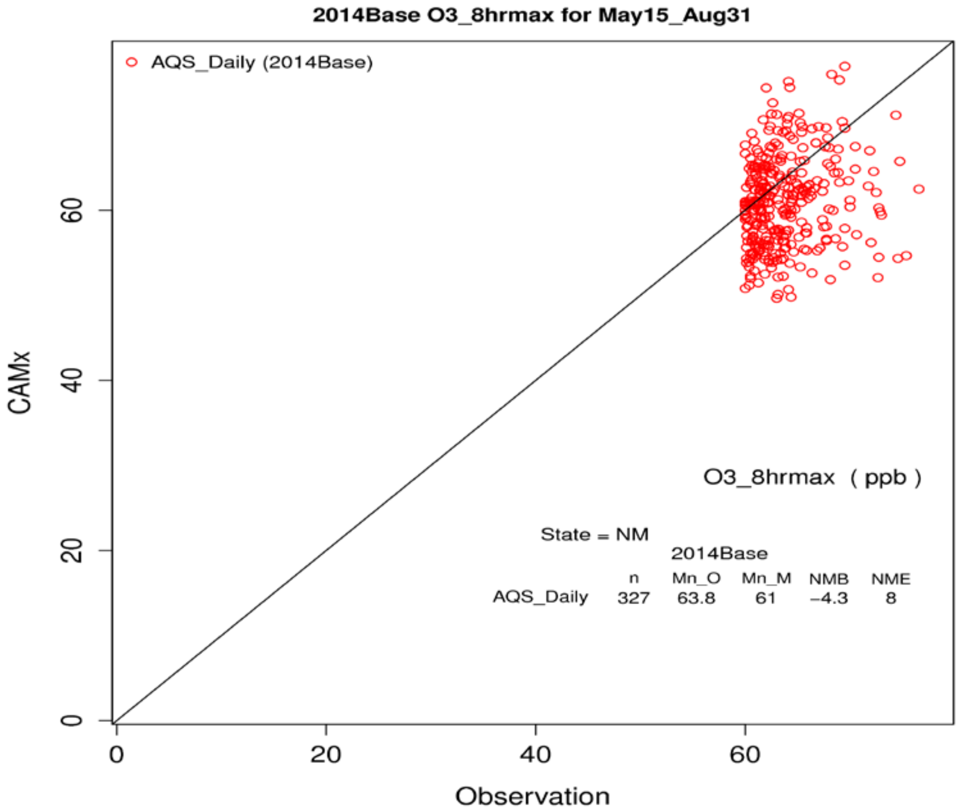
SCATTER PLOTS ACROSS AQS SITES IN NM

Domain wide all AQS sites MPE statistics w/ and w/o 60 ppb cut-off NMB (5.0%, -4.3%) and NME (9.8%, 8.0%) metrics are within performance goals (NMB<±5% and NME<15%).

MDA8 O3 without cut-off



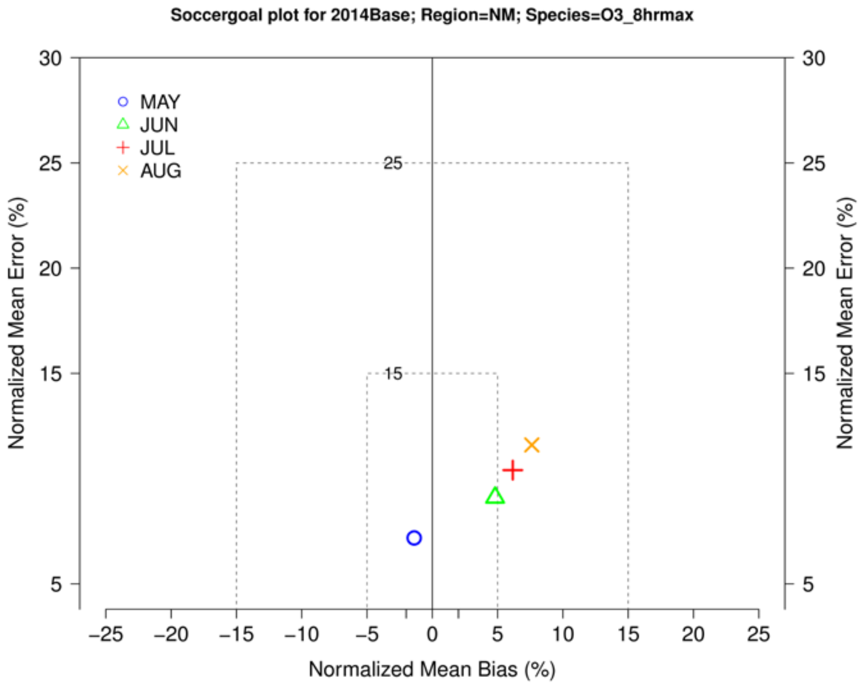
MDA8 O3 with 60 ppb cut-off



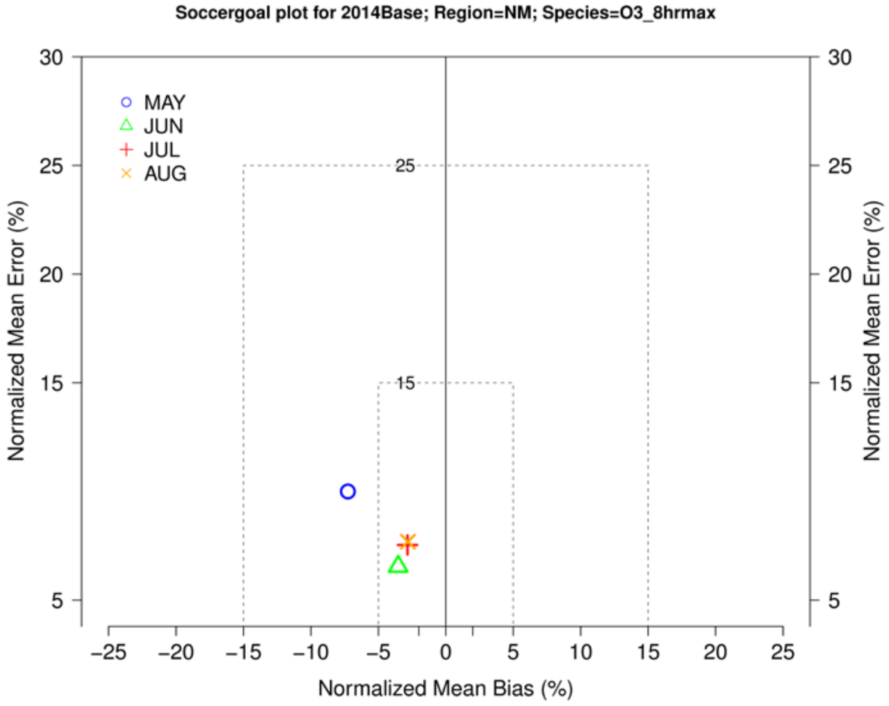
MONTHLY SOCCER PLOT FOR ALL NM AQS SITES

- May only includes only 15 days (i.e., May 15 -30) and has higher underestimation
- Using all ozone data slight overestimation with Jul and Aug bias falling between goal and criteria
- With 60 ppb observed MDA8 ozone cut-off slight underestimation bias that achieved goal in Jun-Jul-Aug
- All monthly average error metrics are within performance goal.

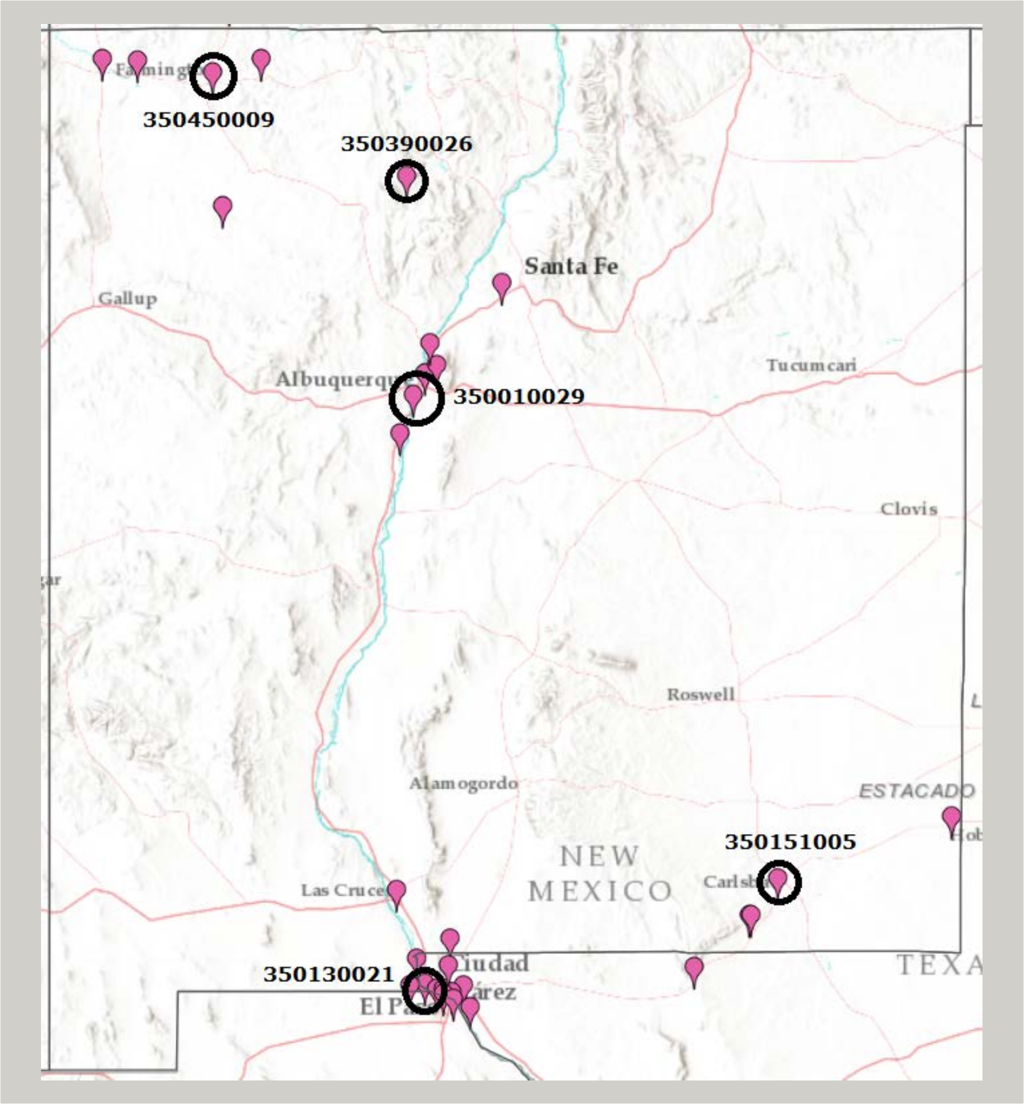
MDA8 O3 without cut-off



MDA8 O3 with 60 ppb cut-off



NM Analysis Sites



- Compared MDA8 ozone from 2014Base case modeling with a few selected AQS sites in NM

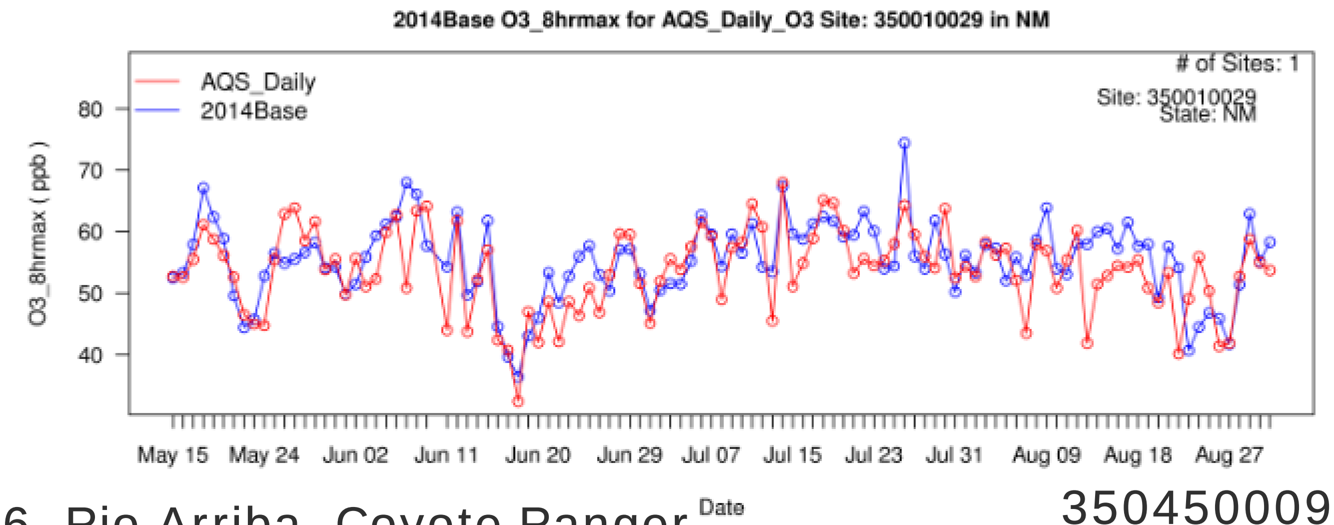
Site ID	Site Name	County	Latitude	Longitude
350450009	Bloomfield	San_Juan	36.74	-107.98
350390026	Coyote Ranger	Rio_Arriba	36.19	-106.70
350010029	South Valley	Bernalillo	35.02	-106.66
350130021	Desert View	Dona_Ana	31.80	-106.58
350151005	Carlsbad	Eddy	32.38	-104.26

OZONE EVALUATION ACROSS NM DOMAIN

350010029

Bernalillo

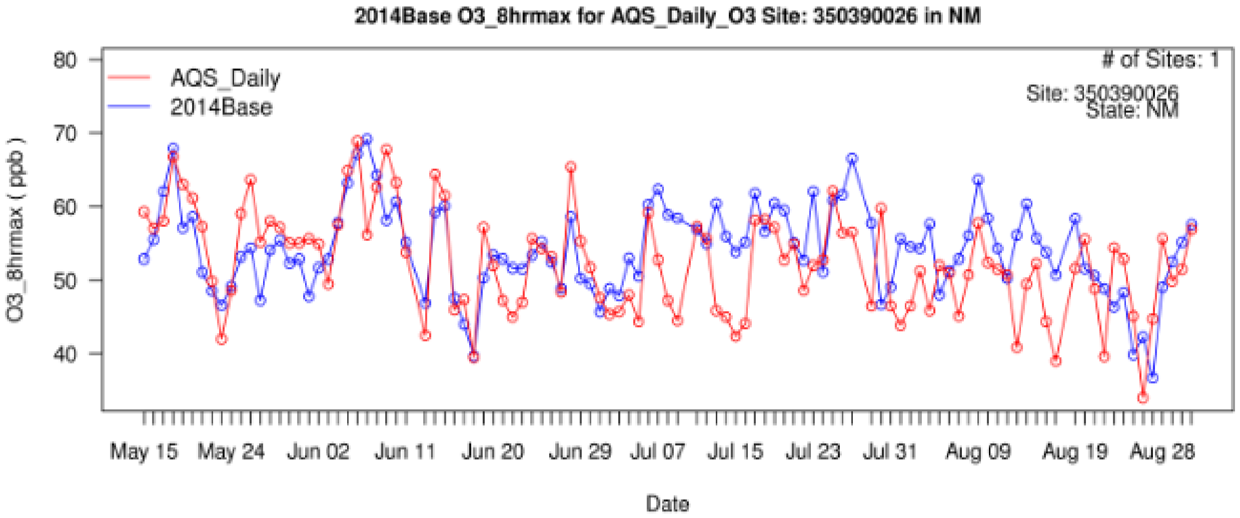
South Valley



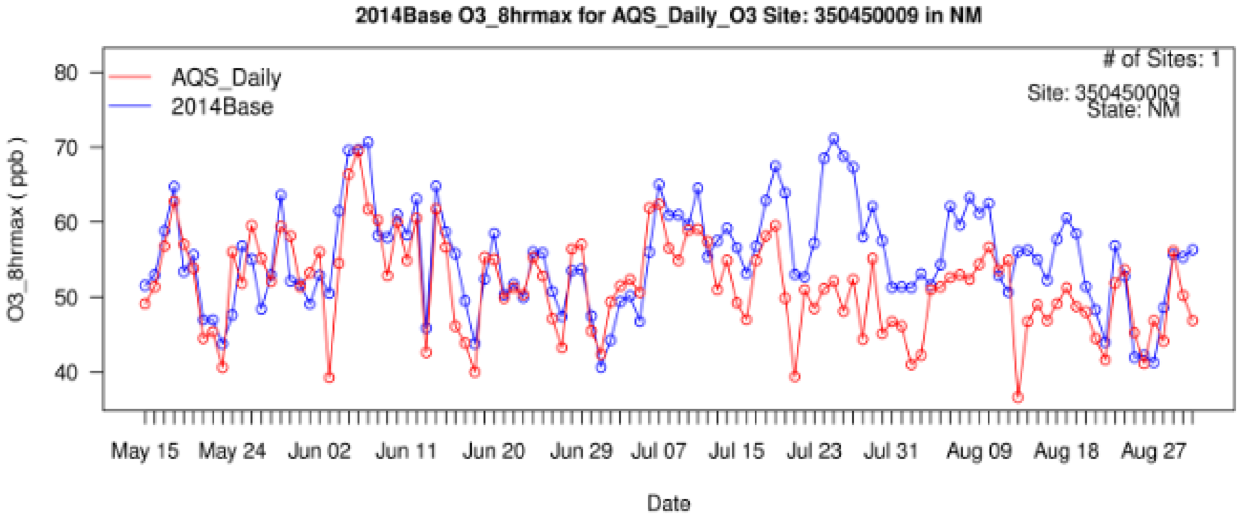
Model performing well at Bernalillo county site.

Model overpredicting lower concentrations at both Rio Arriba and San Juan county sites.

350390026, Rio Arriba, Coyote Ranger



350450009, San Juan, Bloomfield

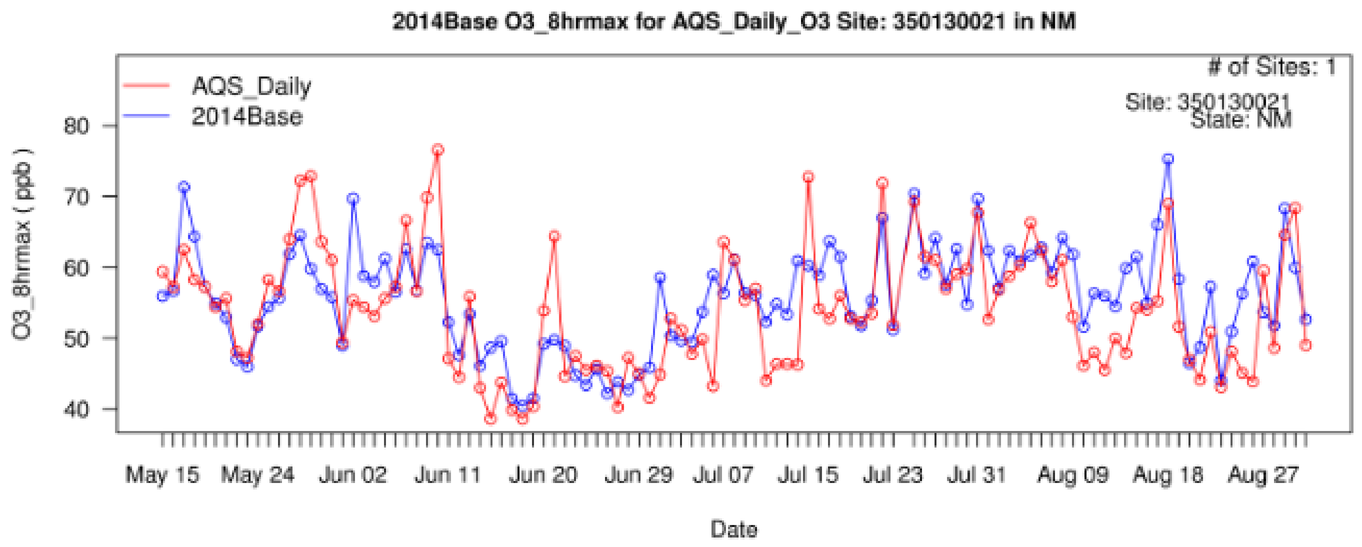


OZONE EVALUATION ACROSS NM DOMAIN

350130021

Dona Ana

Desert View

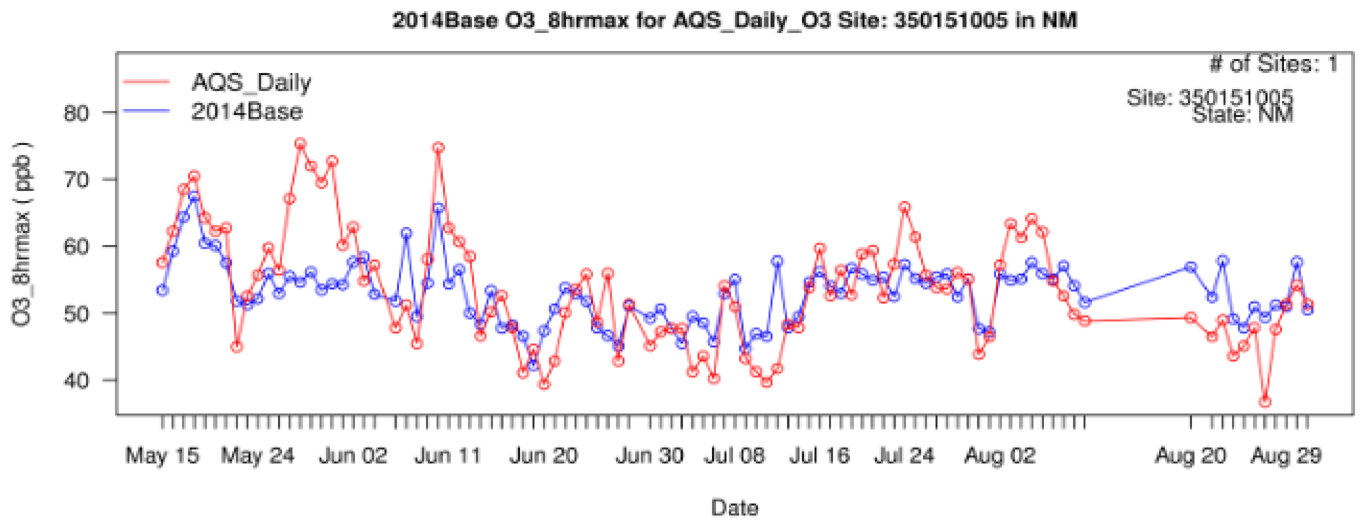


Model able to predict peaks during August month.

350151005

Eddy

Carlsbad



Model underpredicting the May 27-31st exceedance event.

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SITE SPECIFIC METRICS

Site ID	Site Names	NMB No Cut-Off	NMB w/ 60 ppb Cut-Off
350010023	Del Norte	1.7	-3.88
350010024	South East Heights	3.1	-2.37
350010029	South Valley	3.1	-2.79
350010032	Westside	1.1	-3.4
350011012	Foot Hills	13.6	1.98
350130008	La Union	17.4	-1.56
350130017	Sunland Park Yard	9.0	-3.55
350130020	Chaparral	4.8	-4.65
350130021	Desert View	3.2	-5.11
350130022	Santa Teresa	8.2	0.14
350130023	Solano	6.1	-6.47
350151005	Carlsbad	-1.1	-12.3
350171003	Chino Copper Smelter	9.1	-0.99
350250008	Hobbs Jefferson	2.1	-9.87
350290003	Deming Airport	6.2	-5.04
350390026	Coyote Ranger District	3.3	-5.43
350431001	Bernalillo	8.1	3.84
350450009	Bloomfield	7.2	2.47
350450018	Navajo Lake	2.2	-0.61
350451005	Sub Station	1.4	3.28
350490021	Santa Fe Airport	3.8	-1.69
350610008	Los Lunas	0.8	-6.53

	Below Performance Goal
	Between Performance Goal and Criteria
	Exceeds Performance Criteria

NEW MEXICO REGIONAL EVALUATION REGIONS

Site ID	Site Name	County	Lat	Lon
350130022	Santa Teresa	Dona Ana	31.79	-106.68
350130017	Sunland Park Yard	Dona Ana	31.80	-106.56
350130021	Desert View	Dona Ana	31.80	-106.58
350130008	La Union	Dona Ana	31.93	-106.63
350130020	Chaparral	Dona Ana	32.04	-106.41
350290003	Deming Airport	Luna	32.26	-107.72
350130023	Solano	Dona Ana	32.32	-106.77
350151005	Carlsbad	Eddy	32.38	-104.26
350171003	Chino Copper Smelter	Grant	32.69	-108.13
350250008	Hobbs Jefferson	Lea	32.73	-103.12
350610008	Los Lunas	Valencia	34.81	-106.74
350010029	South Valley	Bernalillo	35.02	-106.66
350010024	South East Heights	Bernalillo	35.06	-106.58
350010032	Westside	Bernalillo	35.06	-106.76
350010023	Del Norte	Bernalillo	35.13	-106.59
350011012	Foot Hills	Bernalillo	35.19	-106.51
350431001	Bernalillo	Sandoval	35.30	-106.55
350490021	Santa Fe Airport	Santa Fe	35.62	-106.08
350390026	Coyote Ranger District	Rio Arriba	36.19	-106.70
350450009	Bloomfield	San Juan	36.74	-107.98
350451005	Sub Station	San Juan	36.80	-108.47
350450018	Navajo Lake	San Juan	36.81	-107.65

South NM sites
Bernalillo county
North NM sites

	No Cut-Off		With Cut-Off	
Region	NMB(%)	NME(%)	NMB(%)	NME(%)
North NM	4.3	9.1	0	6.4
Bernalillo	4.3	9.4	-2.8	7.1
South NM	5.8	10.5	-6.1	8.5

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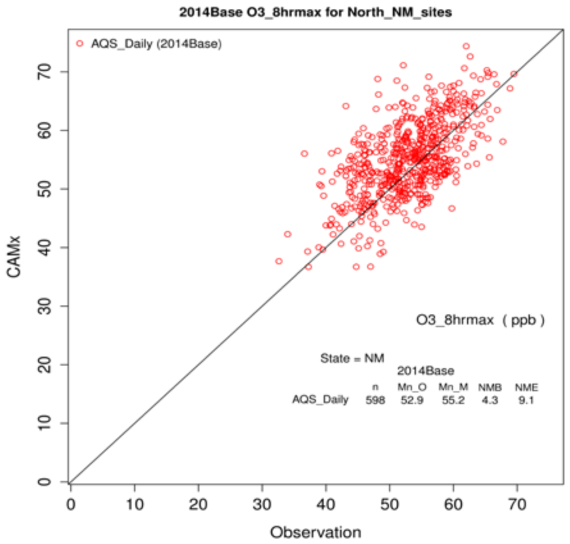
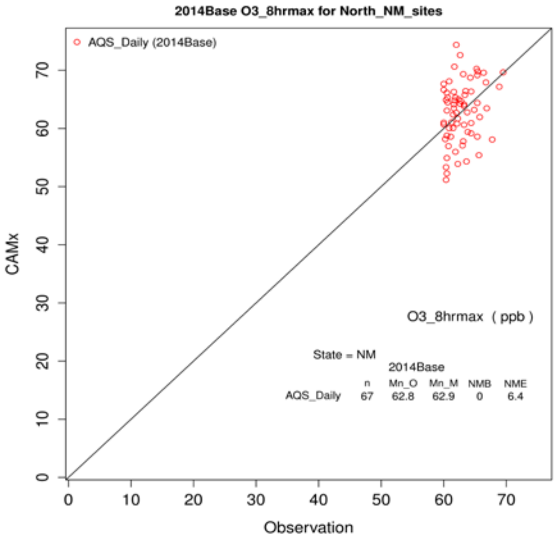
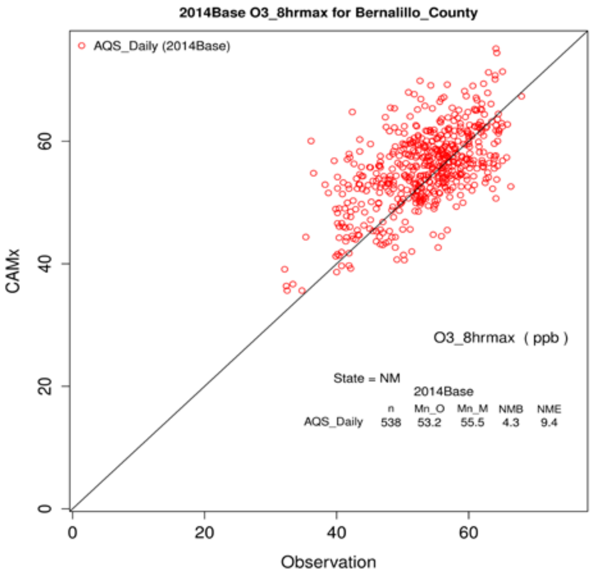
REGION BASED SCATTER PLOTS

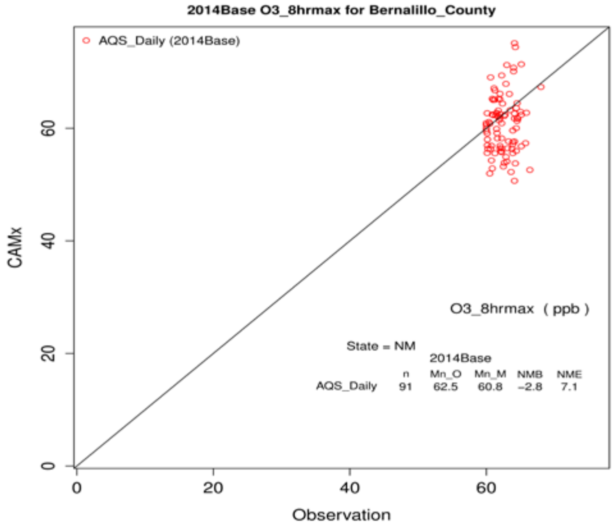
North NM



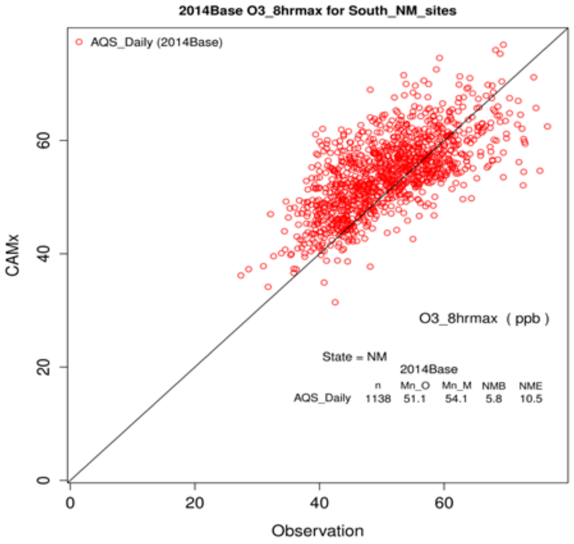


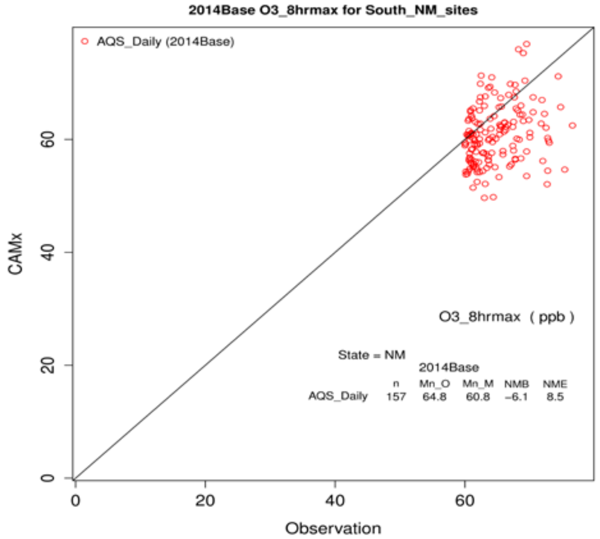
Bernalillo





South NM





RAMBOLL

MPE FOR OZONE DESIGN VALUE PROJECTION

- EPA-recommended approach for making future year ozone Design Value (DV) projections uses the PGM base year top 10 highest MDA8 ozone concentrations to develop Relative Response Factors (RRF)
- The RRF is applied to the measured base year (BY) ozone design value (DVb) to projected a future year (FY) ozone design value (DVf)

$$RRF = \sum Model_{FY} / \sum Model_{BY}$$

$$DVf = DVb \times RRF$$

- The ozone model performance for the 10 highest modeled base year MDA8 ozone is therefore important
  - An alternative projection approach to the EPA-default is to use the top 10 highest modeled base year MDA8 ozone that meet a MPE requirement (e.g., within ±10%)

EVALUATION FOR TOP 10 HIGHEST MODELED MDA8 OZONE

Desert View	Obs	Prd	Bias	%
8/18/2014	69.0	75.3	6.3	9.1%
5/17/2014	62.5	71.3	8.8	14.1%
7/25/2014	69.3	70.4	1.2	1.7%
6/2/2014	55.4	69.7	14.3	25.8%
7/31/2014	67.7	69.7	2.0	2.9%
8/29/2014	64.6	68.3	3.7	5.8%
7/22/2014	71.9	67.0	-4.9	-6.8%
8/17/2014	55.3	66.0	10.8	19.5%
5/28/2014	72.3	64.5	-7.7	-10.7%
5/18/2014	58.3	64.3	6.1	10.4%
8/8/2014	61.0	64.2	3.2	5.2%
7/27/2014	61.0	64.1	3.1	5.2%
7/17/2014	52.8	63.7	10.9	20.7%
6/9/2014	69.9	63.5	-6.4	-9.2%
8/6/2014	62.4	62.8	0.4	0.7%
7/29/2014	59.0	62.6	3.6	6.1%
6/7/2014	66.6	62.6	-4.0	-6.1%
6/10/2014	76.6	62.5	-14.1	-18.4%
8/1/2014	52.6	62.4	9.7	18.5%
8/3/2014	58.8	62.3	3.6	6.1%

Carlsbad	Obs	Prd	Bias	%
5/18/2014	70.5	67.5	-3.0	-4.3%
6/10/2014	74.8	65.7	-9.0	-12.1%
5/17/2014	68.5	64.4	-4.1	-6.0%
6/7/2014	51.3	61.9	10.7	20.8%
5/19/2014	64.3	60.5	-3.8	-5.9%
5/20/2014	62.3	60.1	-2.2	-3.5%
5/16/2014	62.3	59.3	-3.0	-4.8%
6/3/2014	54.9	58.4	3.5	6.5%
8/23/2014	49.0	57.9	8.9	18.1%
7/12/2014	41.8	57.8	16.1	38.5%
6/2/2014	62.9	57.7	-5.2	-8.3%
8/30/2014	54.3	57.7	3.4	6.3%
8/5/2014	64.1	57.6	-6.5	-10.1%
5/21/2014	62.8	57.6	-5.2	-8.2%
7/24/2014	65.9	57.3	-8.5	-13.0%
8/8/2014	52.6	57.1	4.5	8.5%
8/20/2014	49.4	57.0	7.6	15.4%
7/19/2014	52.8	56.8	4.1	7.7%
6/12/2014	60.7	56.6	-4.1	-6.7%
7/16/2014	59.7	56.3	-3.4	-5.7%

Bloomfield	Obs	Prd	Bias	%
7/25/2014	52.1	71.1	19.0	36.4%
6/7/2014	61.7	70.6	8.9	14.4%
6/6/2014	69.5	69.7	0.2	0.2%
6/5/2014	66.4	69.6	3.2	4.8%
7/26/2014	48.1	68.8	20.7	42.9%
7/24/2014	51.1	68.5	17.4	34.0%
7/19/2014	59.5	67.5	8.0	13.4%
7/27/2014	52.4	67.3	14.9	28.5%
7/7/2014	62.4	65.0	2.6	4.2%
6/14/2014	61.8	64.8	3.0	4.9%
5/18/2014	62.8	64.7	2.0	3.1%
7/11/2014	59.0	64.5	5.5	9.3%
7/20/2014	49.9	63.9	14.0	28.1%
5/29/2014	59.4	63.6	4.2	7.1%
8/8/2014	52.4	63.3	10.9	20.8%
6/12/2014	60.5	63.1	2.6	4.3%
7/18/2014	58.1	62.9	4.7	8.2%
8/10/2014	56.6	62.5	5.9	10.4%
8/6/2014	52.6	62.1	9.5	18.0%
7/29/2014	55.1	62.1	6.9	12.6%

Yellow = 20 highest observed MDA8 ozone (dark yellow top 10)
Red = bias greater than ±10%
Blue = Added model days using ±10% MPE criteria

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CONCLUSIONS CAMX 2015 36/12/4-KM BASE CASE MPE

- Across all sites in New Mexico ozone performance meets the bias and error Performance Goals
  - Across all observations there is a slight overestimation but still meet bias goal (≤±5%)
  - Using just observed ozone above a 60 ppb cut-off, the goal is still met with an underestimation bias
- The northern NM and Bernalillo County subregions meet the ozone goals , but southern NM subregion bias falls between the performance goal and criterion
- Example evaluation for 10 highest modeled MDA8 ozone used to make ozone projections using EPA default approach found good overlap with observed highest MDA8 ozone:
  - At Desert View (Dona Ana County) 7 of top 10 modeled days were top 20 observed, 5 top 10 observed
  - At Carlsbad (Eddy County) 6 of top 10 modeled days were top 20 observed; 4 top 10 observed
  - At Bloomfield (San Juan County) 6 of top 10 modeled days were top 20 observed; 5 top 10 observed
- Although there were some periods of questionable model performance (e.g., late July in San Juan County and late May at Carlsbad), overall the model performance was quite reasonable and mostly achieved the performance goals and always achieved the performance criteria

CURRENT STATUS AND NEXT STEPS

CURRENT STATUS / NEXT STEPS

- Close to starting Task 6.1 CAMx 2023 Base Case Simulation
  - o NMED asked us to pause the 2023 modeling on August 26, 2020

Original NM OAI Modeling Study Work Plan Webinar Schedule

Webinar Number	Webinar Topics by Task	Date	Status
1.	1. Modeling Protocol and Work Plan 2.1 Evaluate Existing Met 4.1 Recommend 2014 and 2023 Emissions 4.2.1 Recommend 2014 & 2023 Mobile Source Emissions	May 2020	• Done • Done • Done • Done
2.	2.2 Additional Met Modeling 3.1 Evaluate BC Data 4.1 Summary of 2014 and 2023 Emissions	Jun 2020	• Done • Done • Done
3.	4.2.1 Summary of 2014 and 2023 Mobile Source Emissions 4.3 2014 Natural Emissions Results (e.g., Biogenic & LNOx)	Jul 2020	• Done • Done
4.	4.2.3 2014 & 2023 SMOKE-MOVES Results 4-km NM Domain 4.4 2014 & 2023 SMOKE Emissions Modeling Results 5 CAMx 2014 Base Case and Model Evaluation	Aug 2020	• Done • 12-km SMK-MVS • MPE Report
5.	4.5 FY Emissions Strategy Results 5. 2014 CAMx Base Case Modeling and MPE	Sep 2020	• Need data NMED • Report early Sep
6.	6.1 2023 CAMx Modeling Results 6.2 2023 Ozone Design Value Projections	Oct 2020	• September? • September?
7.	6.3 2023 Control Strategy Results 6.4 2023 Source Apportionment Modeling Results	Nov 2020	• Need data NMED • Not Done

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NEXT STEPS

- NMED issues a stop work on 2023 modeling; redirect effort to 2028 modeling
- NMED requests WESTAR/Ramboll provide scope-of-work, cost estimate and schedule for three new tasks:
  - Develop 2028 base case O&G emissions for New Mexico
  - Develop CAMx 36/12/4-km 2028 emissions using WRAP 2028OTBa2 database with updated 2028 O&G emissions for New Mexico and run CAMx 2028 36/12/4-km base case simulation
  - Receive 2028 New Mexico O&G control strategy emissions from NMED and conduct CAMx 2028 36/12/4-km NM O&G control strategy simulation and provide ozone results to NMED

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