International and Interstate Air Pollution Transport: The Role of Emissions in Ozone NAAQS Attainment on the U.S.-Mexico Border

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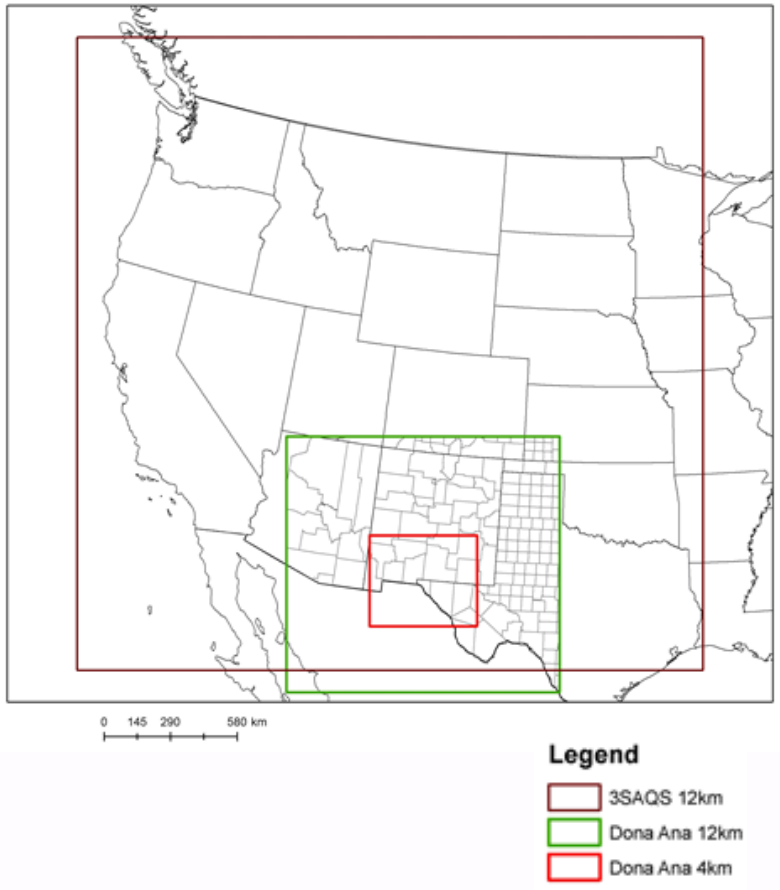
SNMOS Background and Objectives

- The southern Doña Ana County region has the highest ozone levels of any area in New Mexico
- 2011 Design Values at two monitor locations put the county in nonattainment of the 2015 8-hour O3 NAAQS
- One step towards developing a non-attainment SIP is to understand the causes of high ozone in Doña Ana County
- SNMOS objectives:
  - Study the factors contributing to high ozone in Doña Ana County
  - Investigate future emissions scenarios that will produce attainment of the ozone standard

Project Approach

- SNMOS builds off of the Western Air Quality Study (WAQS)
- Model 2011 New Mexico ozone season: May 1 – August 31
- Modeling Plan
  - Prepare base year emission inventories
  - Run/evaluate/refine WRF/SMOKE/CAMx for 2011 base year
  - Prepare 2025 future year emissions
  - Run SMOKE/CAMx for future year
    - Modeled Attainment Test
    - Emissions sensitivity/control runs
    - Source apportionment to diagnose causes of high ozone in Doña Ana County



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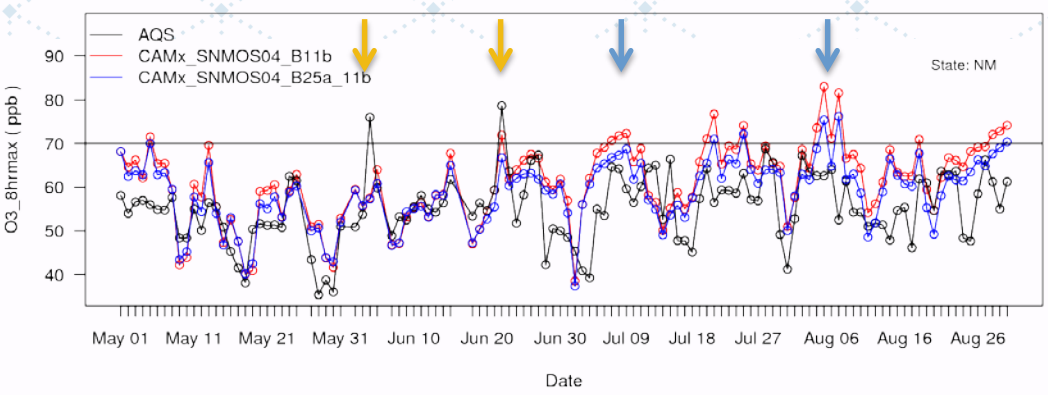
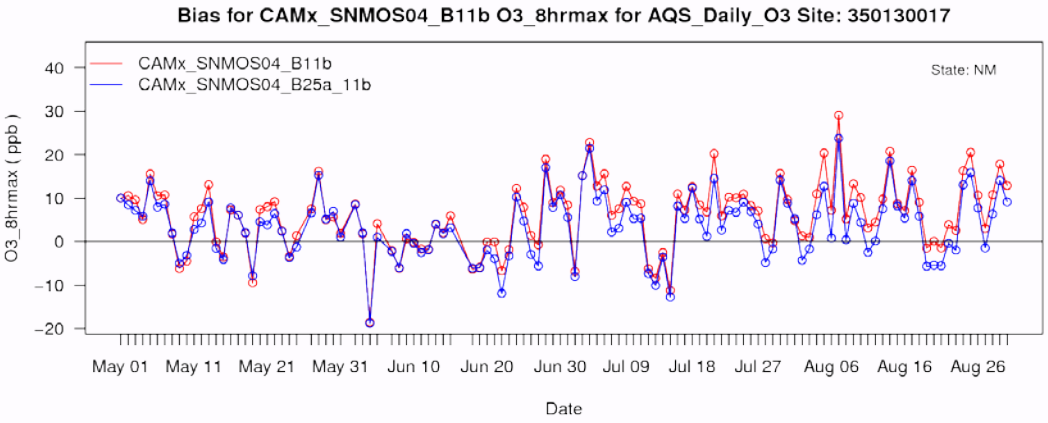
SNMOS CAMx Modeling

Sunland Park MDA8 Ozone Time Series





- Model performance acceptable, but overall high bias for ozone
  - Model performs well in May-June, but has high bias in July-August
- On highest observed MDA8 days, model underestimates ozone
- CAMx run with ERA WRF performed better than CAMx run with NAM WRF when MDA8 ozone > 60 ppb
  - Selected CAMx run with ERA WRF as 2011 Base Case
- At Doña Ana monitors, 10 highest modeled days do not correspond to 10 highest observed days

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SNMOS Base11b Emissions Modeling Platform

Non-O&G

- EPA 2011NEIv2 Platform
  - Technical Documentation available from EPA
- Same categories as WAQS 2011 Base11b
- WAQS Phase 2 O&G for 2011

Mexico

- Mexico NEI 2008

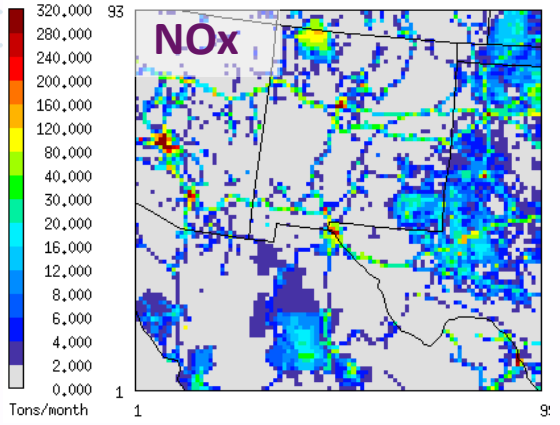
Natural

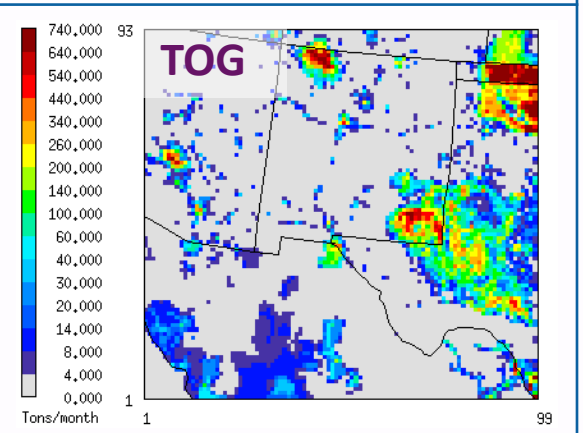
- MEGANv2.10 biogenic with 2011 SNMOS WRF meteorology
- PMDETAIL fires version 2 daily 2011 inventory
- Daily lightning NO calculated with 2011 SNMOS WRF meteorology

Ancillary Emissions Data

- Same as WAQS 2011 Base11b modeling

SNMOS 12-km 2011 Emissions





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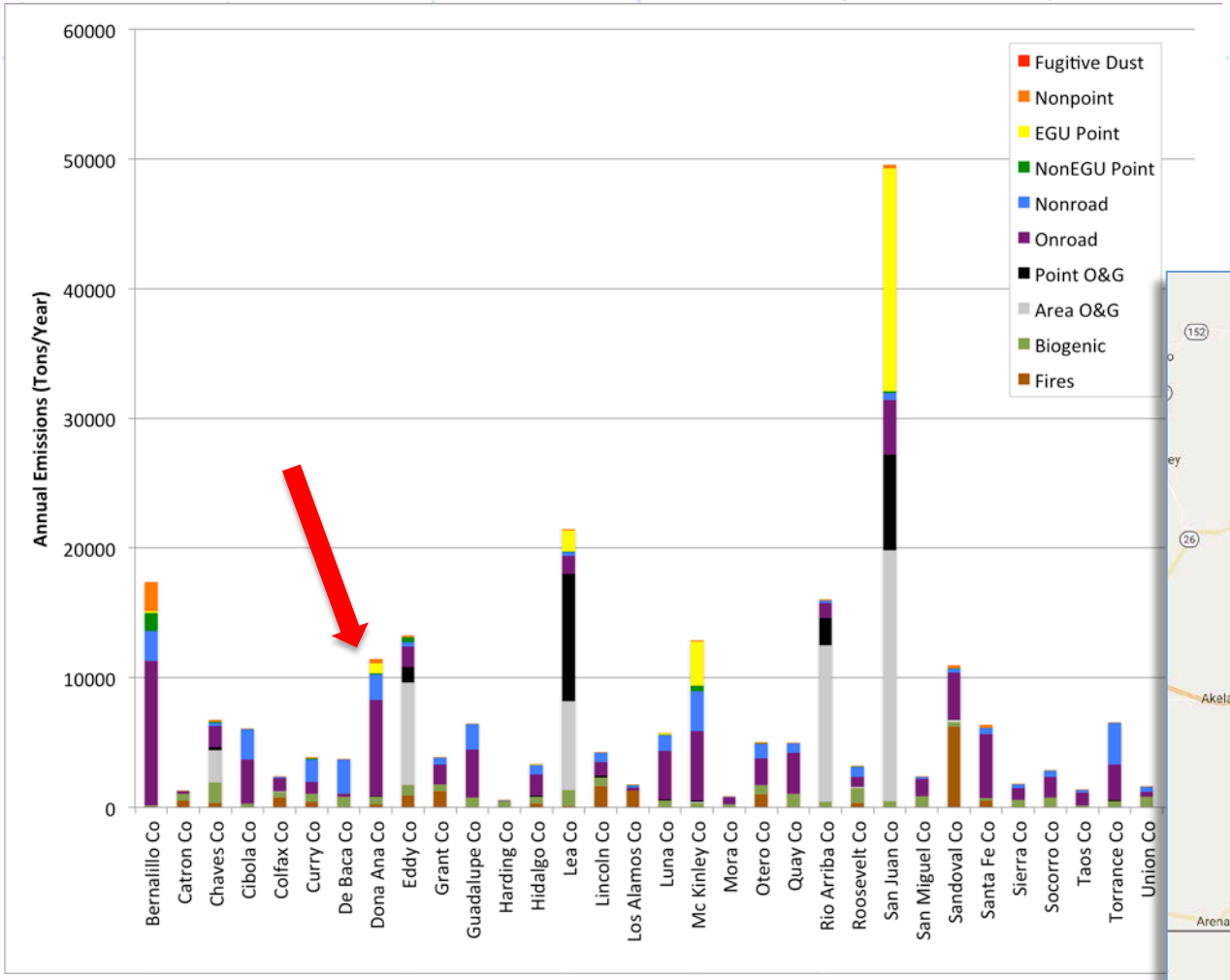
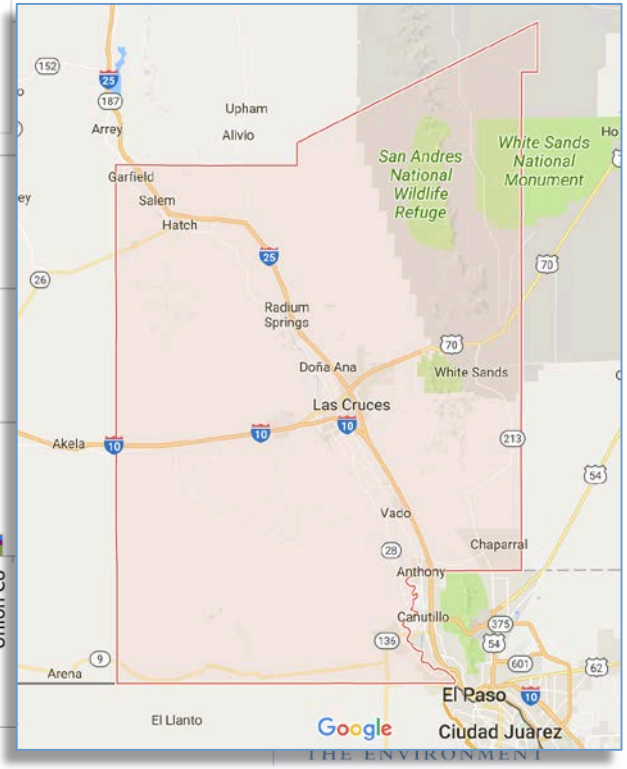
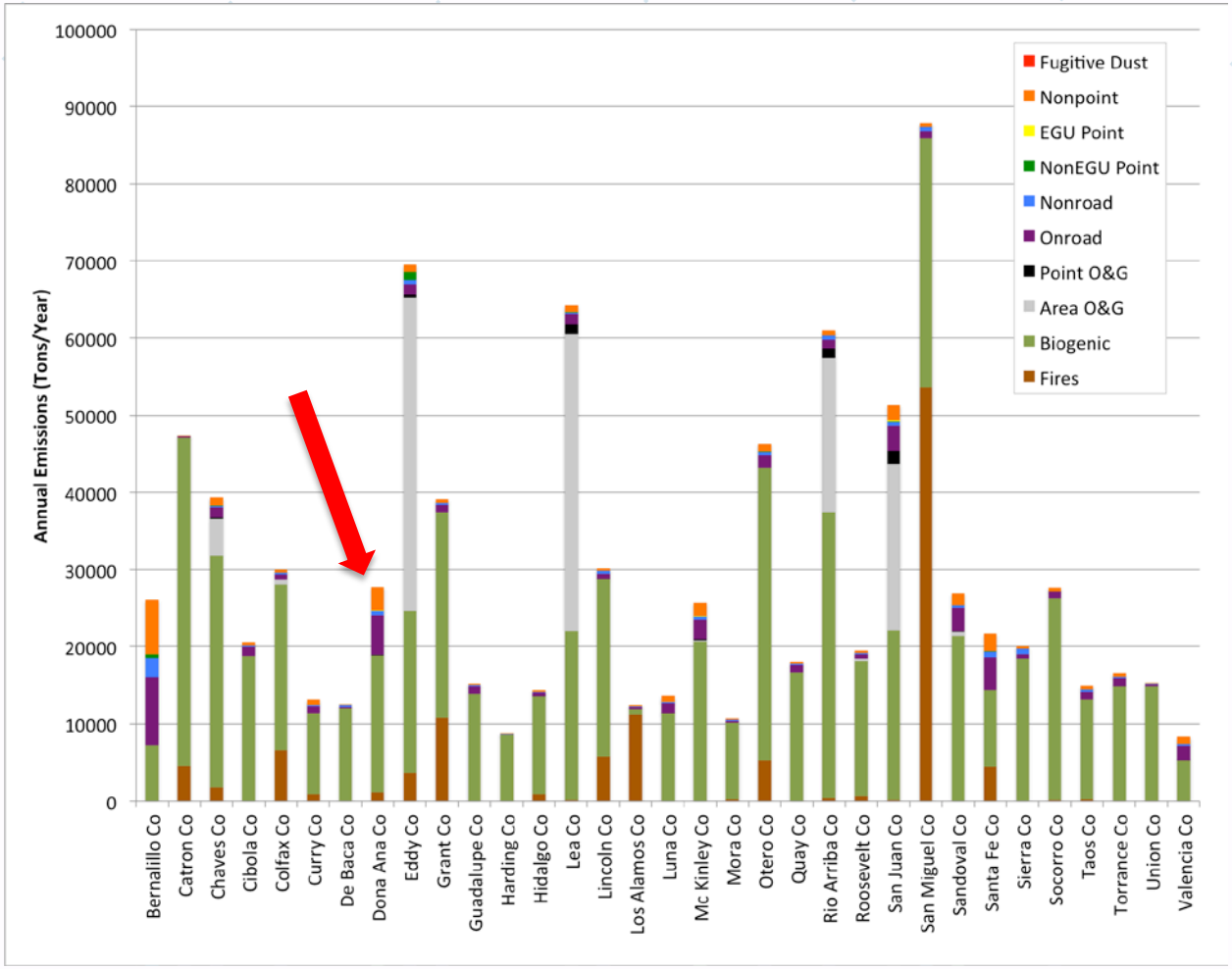
SNMOS Base11b NOx Emissions
New Mexico Counties



Doña Ana County NOx is primarily from restricted road onroad mobile



SNMOS Base11b VOC Emissions
New Mexico Counties



- Doña Ana County VOC is primarily from biogenic
- O&G production in counties east are the largest anthropogenic VOC sources in the state

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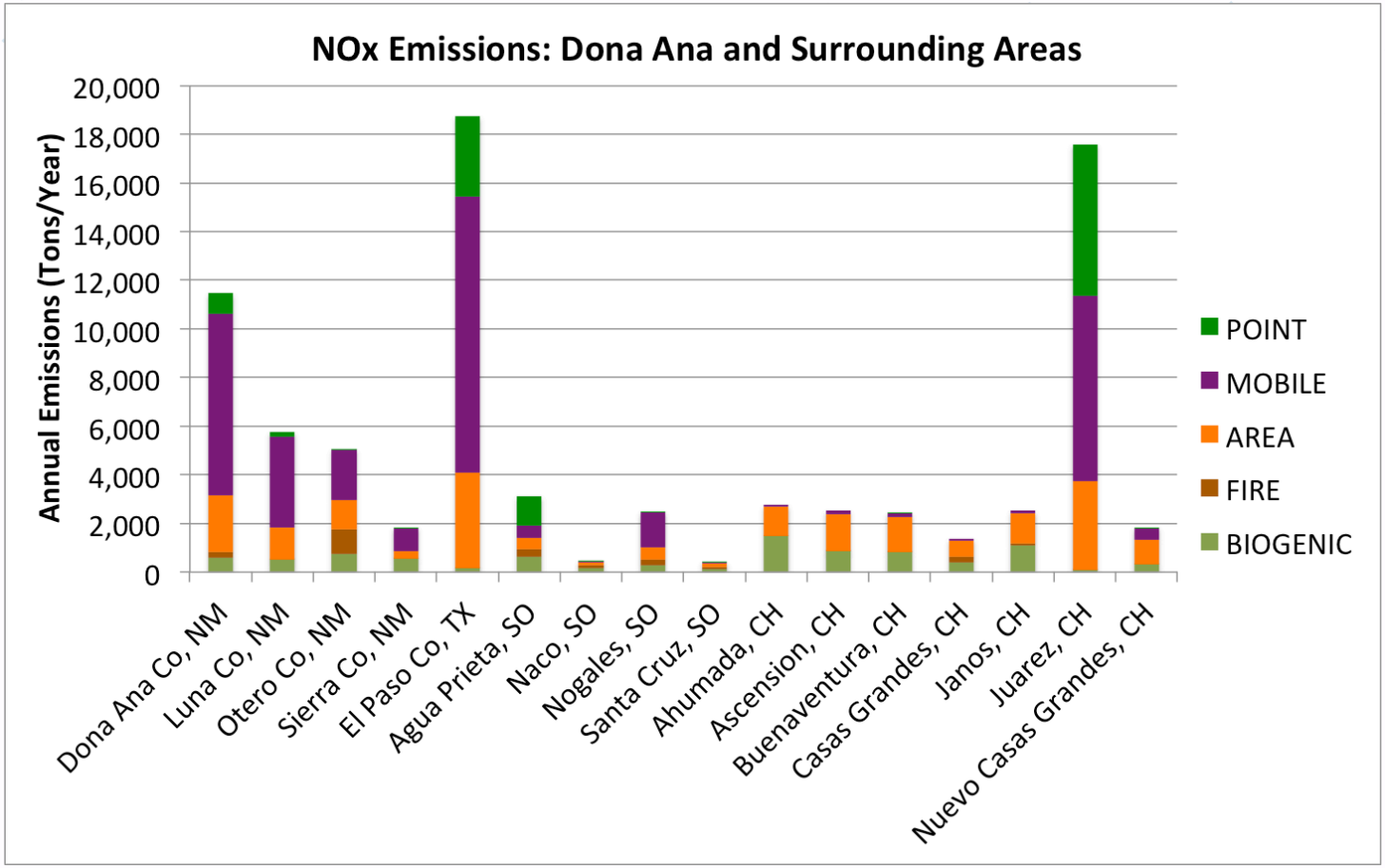
SNMOS Base11b NOx Emissions
Doña Ana County Vicinity



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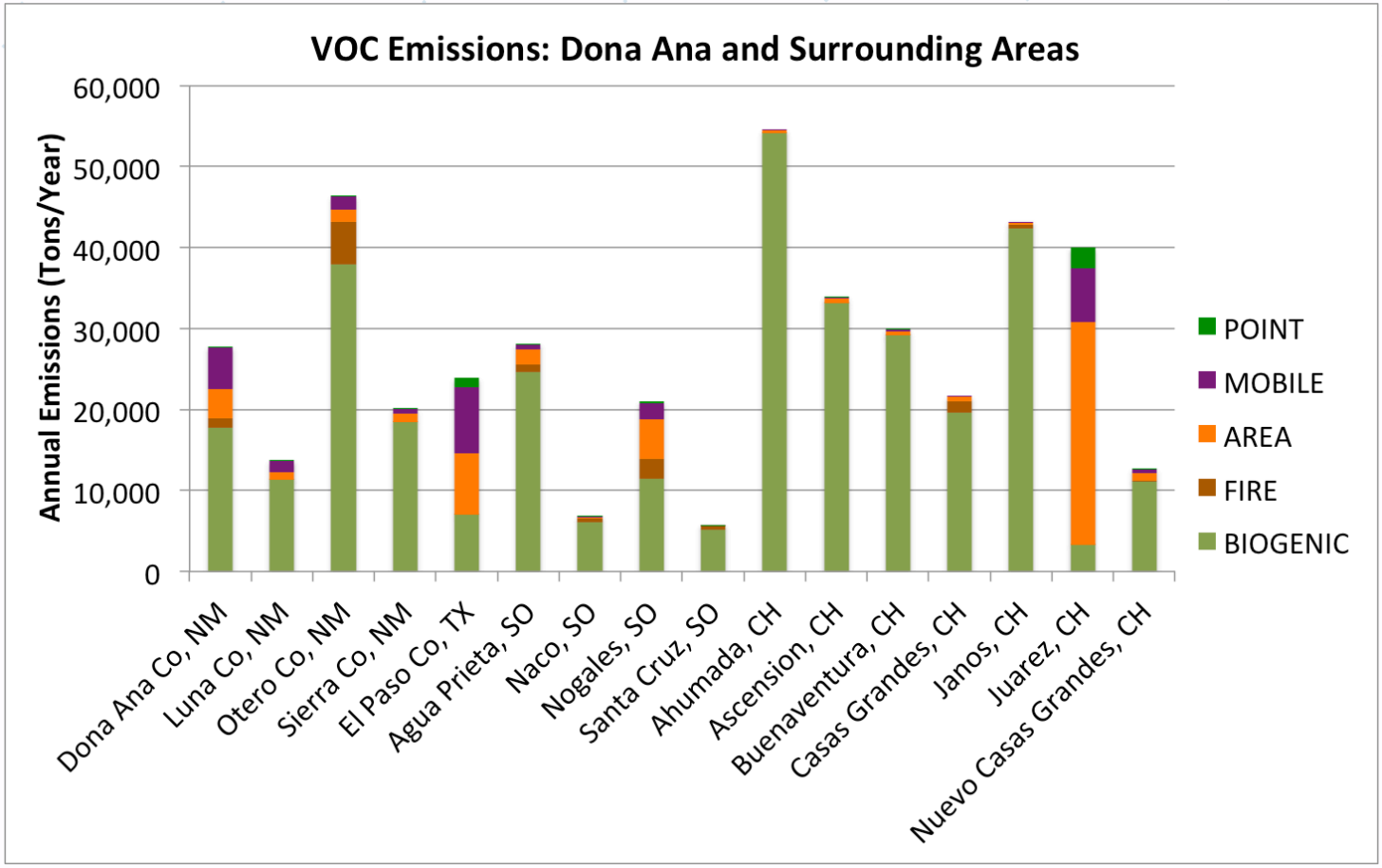
SNMOS Base11b VOC Emissions
Doña Ana County Vicinity



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SNMOS Future Year Emissions Modeling

Non-O&G

- EPA 2011NEIv2 Platform
- 2025 projection year
- Same categories as 2011 base (including O&G)
- WAQS Phase 2 O&G for 2011 and 2020

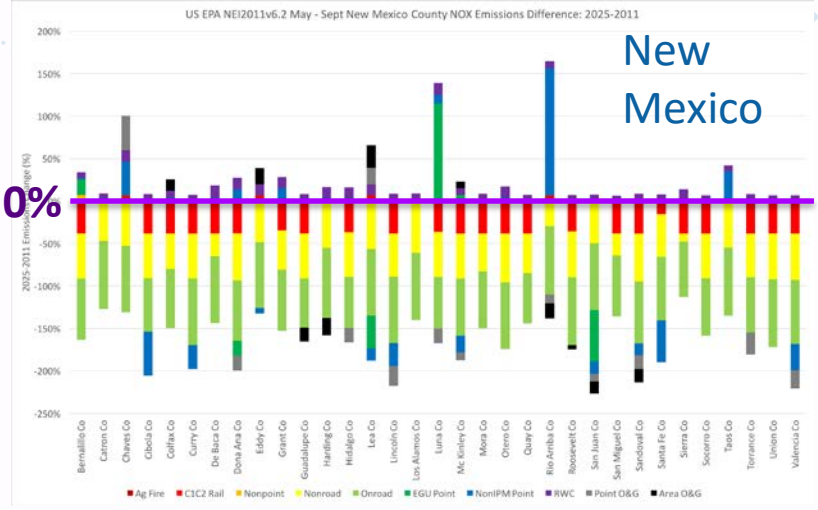
Mexico

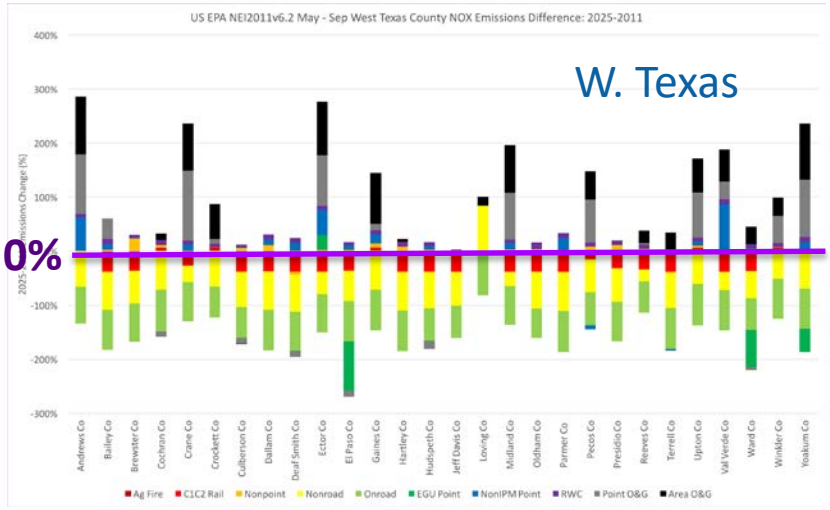
- 2025 projections off of the MNEI 2008

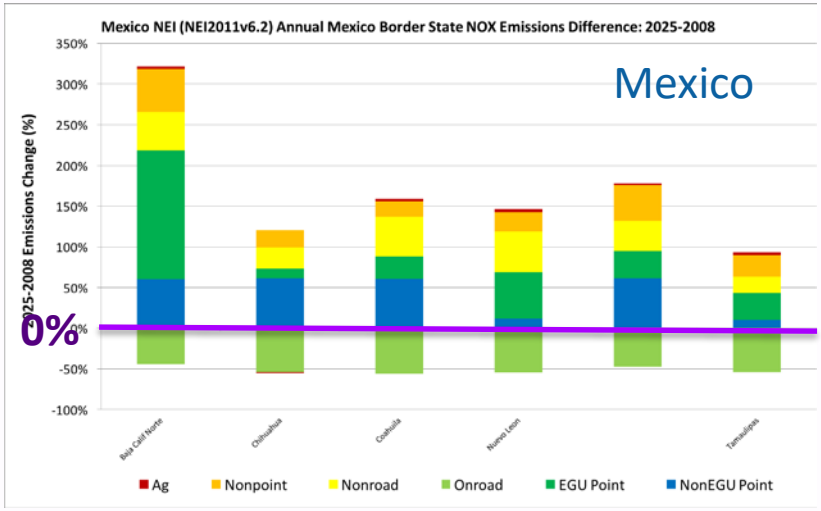
Biogenic, Fires, Lightning, Ancillary Data

- Same as SNMOS 2011 Base11b modeling

Percent Difference ([2025-2011]/2011)



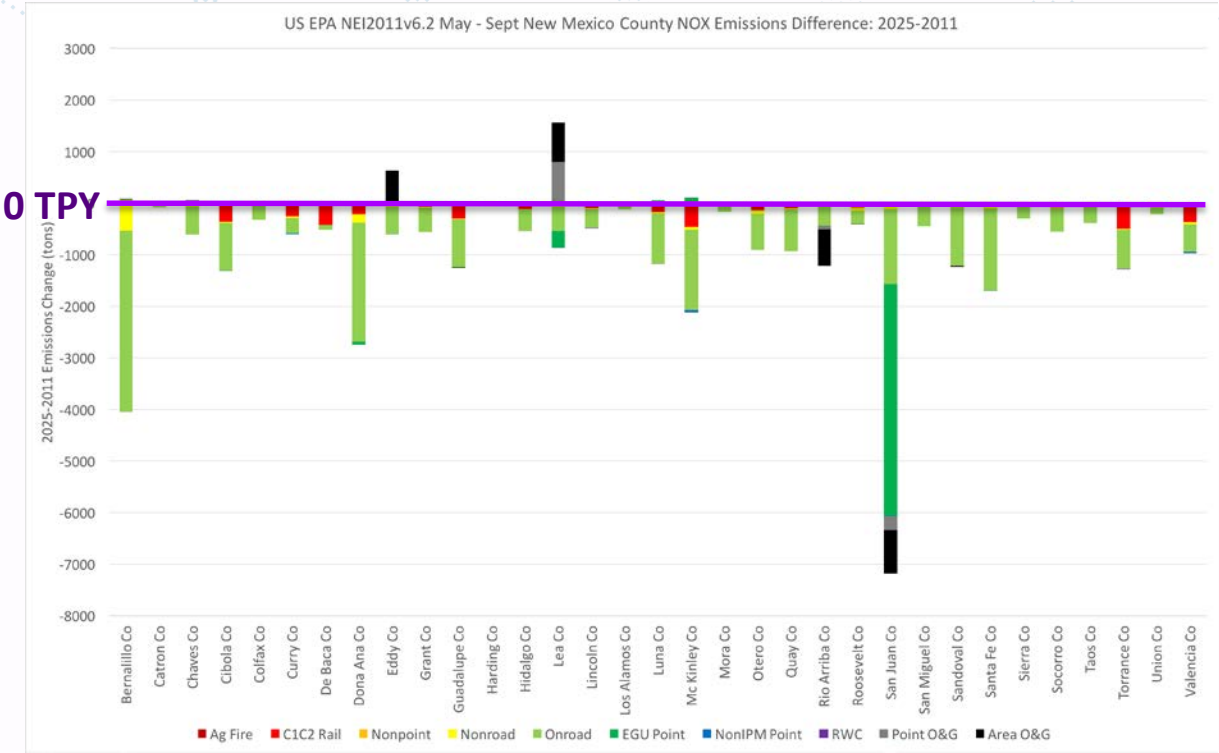




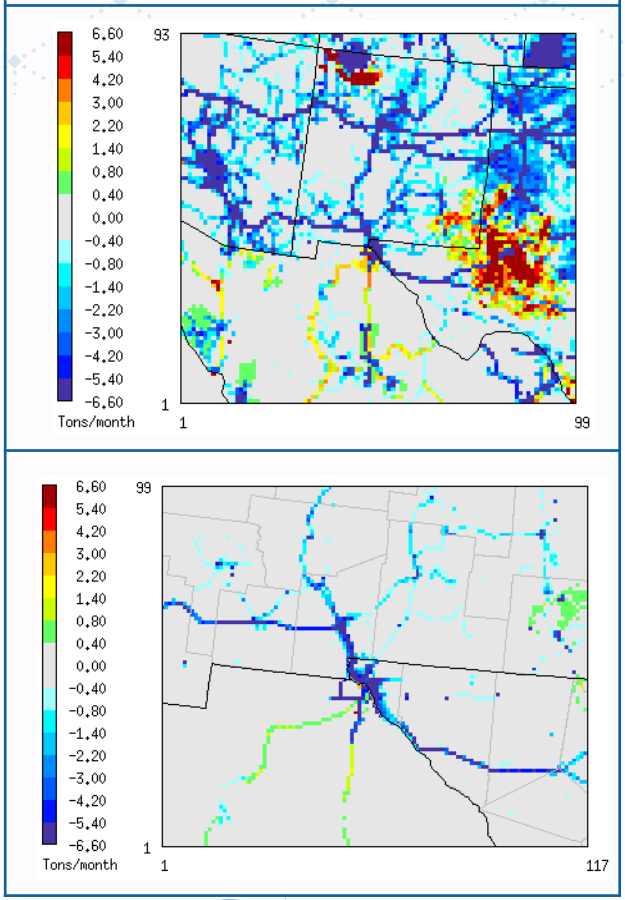
SNMOS 2025 Emissions Modeling

New Mexico 2011 and 2025 NOx Emissions Differences

Absolute Difference (2025-2011)



2025-2011 NOx Emissions



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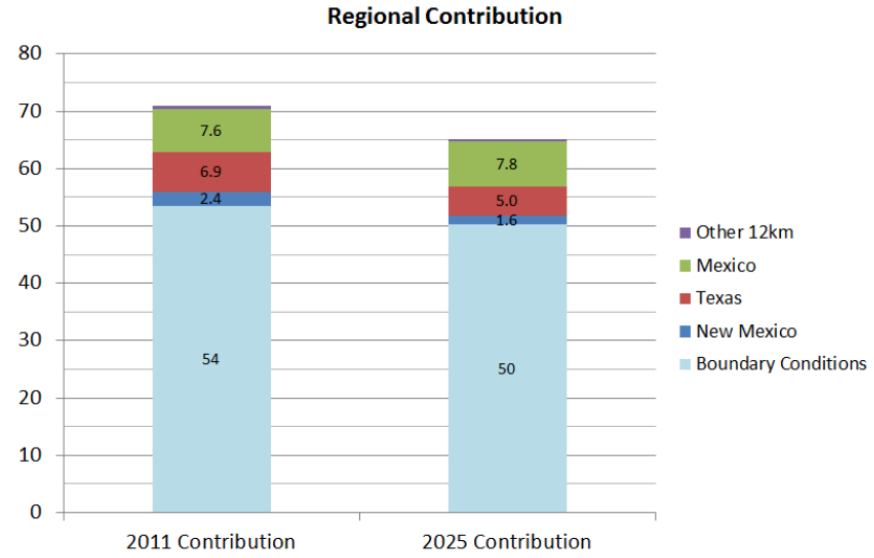
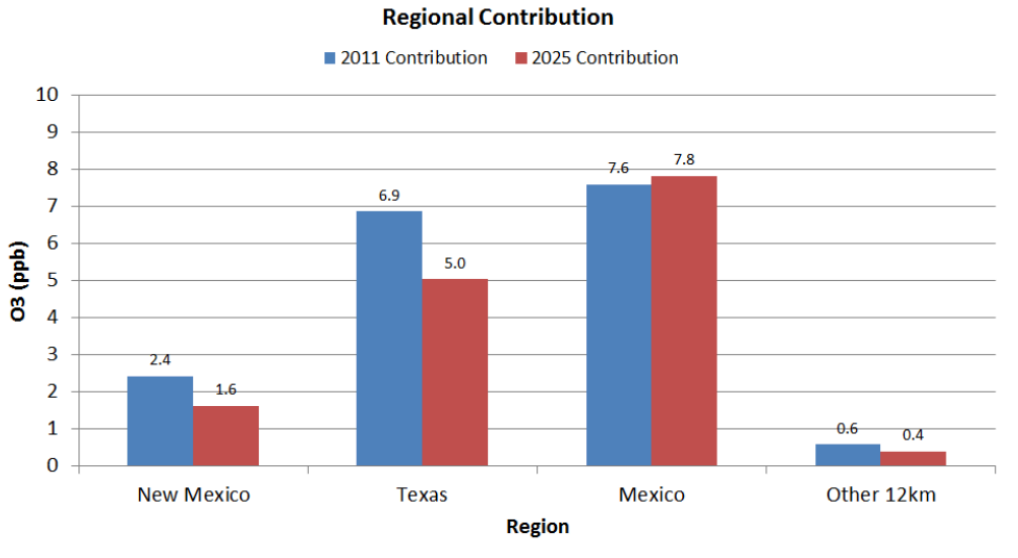
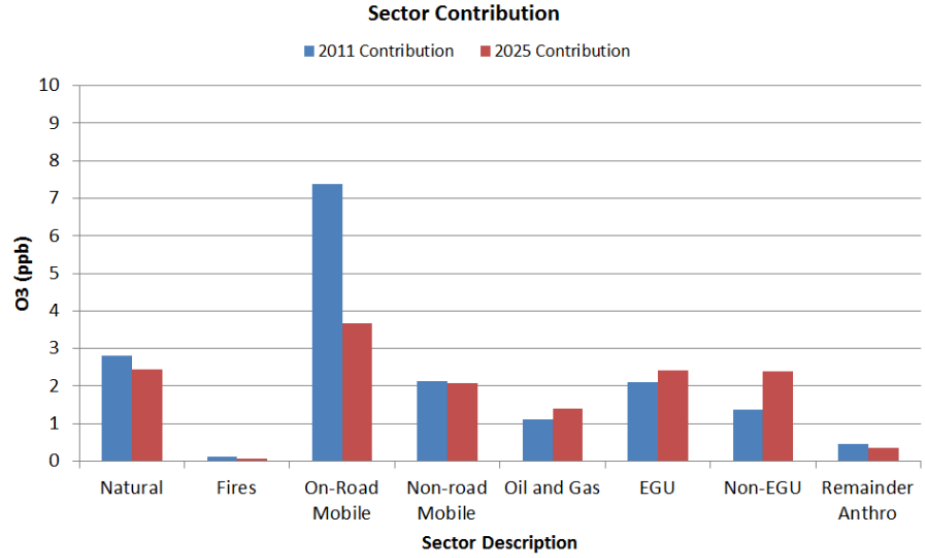
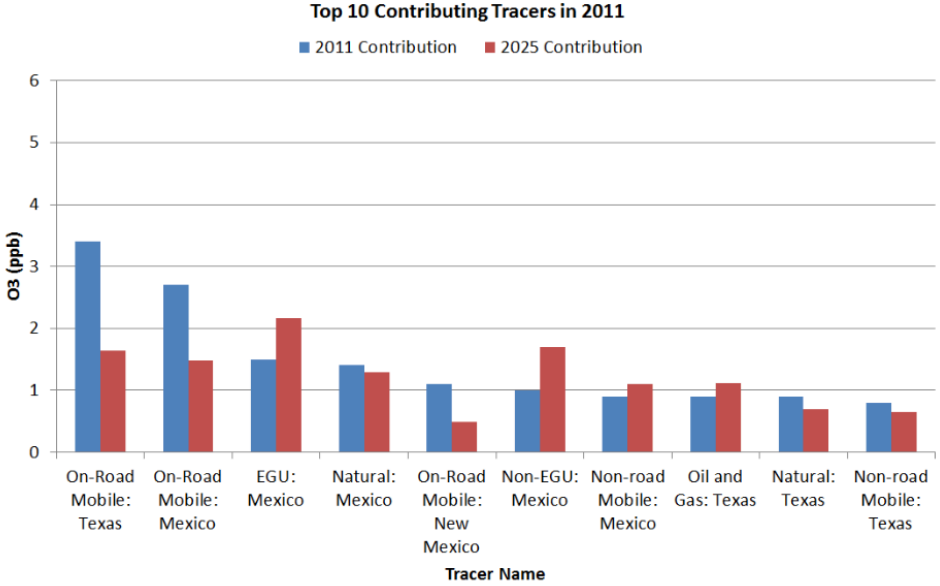
CAMx O3 Source Apportionment

Desert View Monitor – DVC: 71.0 ppb DVF: 65.1 ppb









Which Inventory Sectors Contribute to the Ozone NAA in Doña Ana County?

- Transported ozone contributes far more to the Doña Ana monitor DVs than NM sources in both 2011 and 2025
  - Boundary conditions are the largest contributor, then Mexico and Texas
  - Mexico contribution to Doña Ana monitor 2011 DVs ranges from 2.5 – 6.3 ppb with average of 4.9 ppb
- In 2011, onroad mobile (NM, TX, MEX), natural (MEX), and EGU (MEX) contribute most to DVs
- **CAMx air quality modeling indicates that but for the contribution of anthropogenic emissions from Mexico, the Desert View monitor would have attained the 70 ppb NAAQS in 2011**