Modeling Committee Update

OTC Fall Meeting

November 19, 2014
Crystal City, VA
Overview

1. 2014 Ozone Season
2. Tagged Source Modeling
3. Boundary Conditions
4. 2011 Modeling Platform Update
OTR Problematic Locations

Number of Years the 4th High Ozone > 75ppb

1997-2012
- 15 of 16 years
- 16 of 16 years

2012-2014
- 2 of 3 years
- 3 of 3 years
2014 Ozone 4<sup>th</sup> Highest 8-hour Value

![Map showing ozone levels in different regions with color coding for different concentration ranges.]

- **< 71 ppb**
- **71 to 75 ppb**
- **76 to 84 ppb**
- **> 84 ppb**
2013 Ozone 4th Highest 8-hour Value

- < 71 ppb
- 71 to 75 ppb
- 76 to 84 ppb
- > 84 ppb
2012 Ozone 4th Highest 8-hour Value

- < 71 ppb
- 71 to 75 ppb
- 76 to 84 ppb
- > 84 ppb
2014 Ozone Design Values

3-Year average of the 4th high concentration for 2012, 2013, 2014

- < 71 ppb
- 71 to 75 ppb
- 76 to 84 ppb
- > 84 ppb
Change in OTR Violations 2012-14

2010-2012

2011-2013

2012-2014
Potential Effect of New Standards

Number of OTR Monitors with 4th High Ozone Exceeding Thresholds

Note: The dashed red line represents the total # of monitors in the OTR
Proposed CASAC range for secondary ozone
NAAQS = 7 to 15ppm-hrs

W126 ppm-hours

- < 7
- 7 to 10
- 11 to 14
- 15 to 20
- > 20

2012
2013
2014P

2012-14P Design Values
Why Models Differ from Monitors

• Are the models wrong?
• Actually they are doing pretty well – but they don’t predict variations in future weather
• Models use typical high-ozone weather & emissions
Why Models Differ from Monitors

• Maryland’s “clean” summer of 2014
  ▪ Given the same weather (2007/2011) and currently committed to emissions, the models say “clean” data is not yet assured
    ▪ Favorable weather patterns have lead to lower measured ozone in Maryland

• Notice Connecticut’s recent summers of high ozone
  ▪ Models say it shouldn’t be this bad
  ▪ Unfavorable weather patterns for its location
A Look at Weather Patterns

• Modeled trajectories during high ozone periods can produce insights on weather patterns
• Modeled trajectories show where the air came from over the 3 previous days
• Start at places with high ozone and go backward through time
• Consider what is at the ground and at a higher elevation
Common Trajectories

**Corridor Flow**

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 27 Aug 14
EDAS Meteorological Data

8/27/2014
Westport CT  88ppb
Edgewood MD  72ppb

**Transport Flow**

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 18 Jul 12
EDAS Meteorological Data

7/18/2012
Westport CT  83ppb
Edgewood MD  84ppb
Common Trajectories

**Corridor & Transport**

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 20 Jun 12
EDAS Meteorological Data

**Local Only**

NOAA HYSPLIT MODEL
Backward trajectories ending at 2000 UTC 22 Aug 12
EDAS Meteorological Data

6/20/2012
Westport CT 89ppb
Edgewood MD 89ppb

8/22/2012
Westport CT 72ppb Exceeded in CT
Edgewood MD 65ppb
## A Look at Trajectories

### Common Trajectories During High Ozone Days

<table>
<thead>
<tr>
<th></th>
<th>Local</th>
<th>Corridor</th>
<th>Mixed Corridor &amp; Transport</th>
<th>Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>7</td>
<td>10</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>2013</td>
<td>1</td>
<td>7</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>2014</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>High 8Hr Ozone</td>
<td>82 / 76</td>
<td>88 / 78</td>
<td>99 / 106</td>
<td>86 / 86</td>
</tr>
</tbody>
</table>

**Westport CT**  **Edgewood MD**
CAMx/OSAT Contribution Modeling

• CAMx is a photochemical model similar to CMAQ
  - Currently being used by EPA and LADCO

• OSAT is a modeling tool associated with CAMx. (ISAM associated with CMAQ)
  - Allows source emission tagging
  - Calculates ozone contribution associated with each source tag
  - Common tags include:
    • Statewide emissions
    • Source sector emissions i.e., OnRoad
Fairfield CT 2007 Ozone Contributions

By Sector

- **55% Mobile**
- **8% EGU**

By State

- **CT** 12%
- **NY** 27%
- **NJ** 9%
- **PA** 8%
- **MD** 3%
- **VA** 3%
- **Other OTR** 2%
- **SESARM** 3%
- **LADCO** 4%
- **Canada** 2%
- **Boundary** 19%

**By Sector**

- **BIOGENIC** 7%
- **Area** 7%
- **NonEGU** 4%
- **EGU** 8%

**By State**

- **64% OTR +VA**
- **19% Boundary**
- **17% Other**
Harford MD 2007 Ozone Contributions

By Sector
- Mobile: 53%
- EGU: 11%
- Boundary: 20%
- Other: 6%

By State
- MD: 40%
- Others: 6%
- VA: 7%
- Other OTR: 4%
- SESARM: 6%
- LADCO: 4%
- NY: 2%
- NJ: 2%
- PA: 7%

62% OTR + VA
20% Boundary
18% Other
What are Boundary Conditions?

- **Boundary Conditions** are what transports across the edges of the modeling domain
  - Western US and portions of Canada
  - Inter-continental transport
  - In-domain emissions that leave the domain and re-enter
  - Stratospheric intrusions

![Diagram](image-url)
Boundary Conditions

- Boundary conditions represent a large portion of ozone contribution in the OTR
- Generally outside of our ability to control
- Becomes more important with lower ozone levels
2011 Platform: July 7 Boundary Conditions

On July 7\textsuperscript{th}, 2011, generally had westerly winds

\textbf{Boundary conditions affect the entire modeling domain}

Plots showing ozone attributed to each boundary at 2 PM local time

***Preliminary CAMx v6.10 (University of Maryland, Dan Goldberg)***
Emissions at the model domain boundaries, are becoming more important when trying to show future attainment.

**Preliminary results from CAMx v6.10 installed at the University of Maryland, Dan Goldberg**
Reducing boundary conditions by 10% translates into 1-2 ppb ozone lower along the Northeast corridor.
2011 Modeling Platform Plan

Level 1A (Testing):

- EPA modeling data for 2011 & 2018 (v1)
  - Tier 3 Mobile Standards,
  - State/Federal On-the-books for other sectors

Level 1B (Initial 2018 Screening):

- Upgrade EGUs with ERTAC
- Other sectors upgraded with improved growth factors using EMF (MARAMA)
- OnRoad will use EPA 2018 v1

Levels 2 and 3 will reflect platform improvements
Modeling Timeline

**Fall 2014 – Nearing Completion**

- **Level 1A Screening/Testing** with:
  - 2011 EPA Modeling Meteorology and Inventory (v2)
  - Research Boundary Conditions and Biogenics
- **Level 1B preparation**
  - ERTAC 2018 Integration

**Winter 2014-2015**

- **Level 1B preparation**
  - Emission Projection using EMF (for OTR)
  - Nested Grids in OTR

**Spring 2015**

- **Level 1B preparation**
  - 2018 EPA v2 Modeling Inventory (for outside OTR)
- **Level 1B Screening Modeling** begins for Base Cases
Questions

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