U.S. EPA Background Ozone Workshop

FEBRUARY 24-25, 2016

PHOENIX, ARIZONA

Overview and Key Questions

9:15 AM – 10:00 AM

Purpose of Workshop

EPA recognizes that, periodically, sources other than domestic manmade emissions of ozone precursors can contribute appreciably to monitored ozone (O3) concentrations.

- These “background ozone” contributions may in limited instances have implications for implementation and eventual attainment of the new O3 standard, although there is no indication that background O3 alone will prevent attainment of the new standard.

EPA is seeking input from states, tribes, and other interested stakeholders on issues related to this background O3 that are relevant to attaining the 2015 O3 NAAQS in a manner consistent with the provisions of the Clean Air Act (CAA).

EPA will evaluate the need for further guidance and/or rules to address background O3 after conducting the workshop.

- EPA is opening a non-regulatory docket through the end of March for submission of comments.
- See docket ID no. EPA-HQ-OAR-2016-0097 at the Federal Register Portal: http://www.regulations.gov

Workshop Format and Agenda

EPA will introduce key topics and provide current EPA perspective on each topic, based on the white paper. Goal will be to reserve a majority of the agenda time for each topic for clarifying questions and feedback on topic specifics.

Agenda:

- Overview and key questions (i.e., this session) – 45 min
- Estimates of background O3 nationally – 60 min
- Exceptional event considerations – 45 min
- Nonattainment area boundaries and rural transport areas – 45 min
- International transport considerations – 30 min

After the afternoon break, there will be an extended period for synthesis comments on background O3.

Workshop Logistics

For the sessions up to the afternoon break, we will begin with a short presentation by EPA staff. We will take clarifying questions first and then open the floor for topic-specific feedback.

- Please raise your name card or hand.

If you would like “podium time” for the afternoon “synthesis” session please let EPA know during the lunch break. Based on the number of interested speakers, agenda time will be assigned. Podium time can be used to:

- Provide recommendations to EPA
- Present a limited number of slides; additional slides can be submitted to the non-regulatory docket.

EPA plans to docket a summary of the meeting.

- Please state your name and affiliation before speaking as an aid to note takers.

Key Questions from the White Paper

Do stakeholders think that EPA has properly characterized background O3 in relation to the level and form of the 2015 NAAQS? (Sessions 1 and 2)

- Are there additional analyses or modeling simulations that could be folded into the assessment?
- Are there alternate definitions of background O3 that also concern stakeholders?
- What improvements would help better characterize background O3 levels across the U.S.
- What are stakeholders' perspectives on existing efforts to reduce background O3 entering the U.S.?

Do stakeholders think EPA has properly characterized the statutory mechanisms by which background O3 issues could be addressed as part of implementation of the 2015 NAAQS? (Sessions 3, 4, and 5)

- Has EPA identified all of the CAA mechanisms available to address areas influenced by background O3?
- What other approaches (consistent with CAA provisions) could be considered?
- Are sufficient tools, data, and guidance available to make the necessary demonstrations?
- Do states want additional assistance from the EPA to develop the necessary demonstrations?

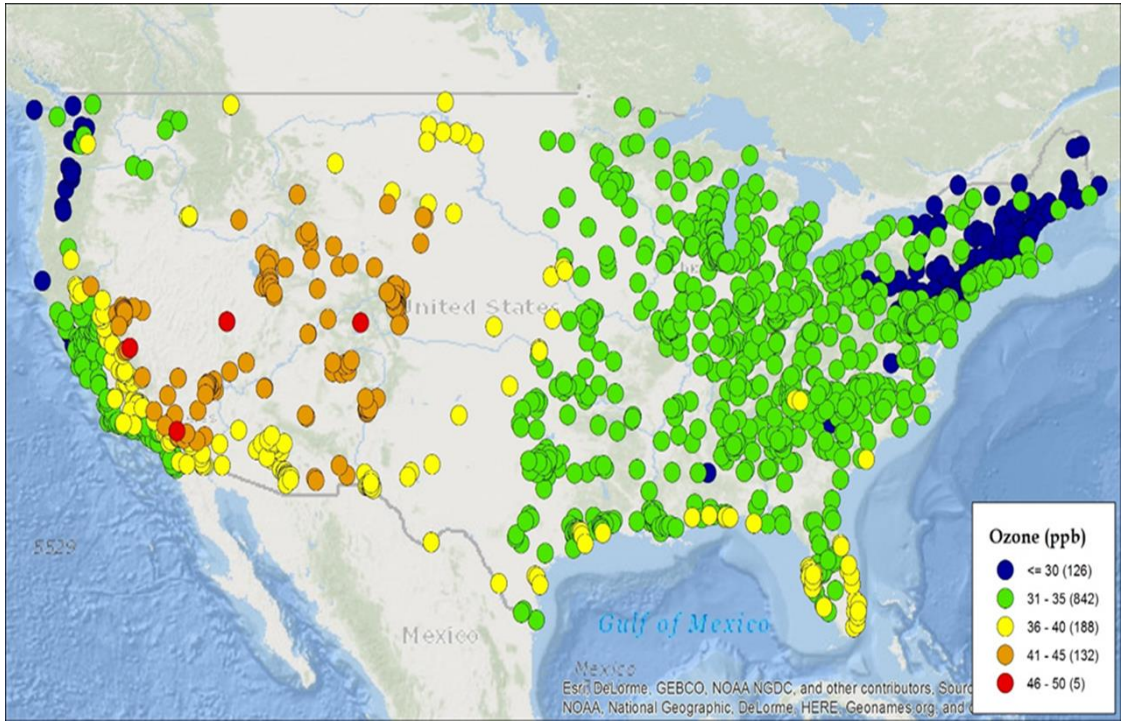
Background O3: Challenges

There are a several challenges involved in a constructive discussion of background O3 and its implications:

- Definitions can vary.
- Impacts can vary across space and time.
- Difficult to measure. Estimates requires modeling.
- Models, while valuable, are imperfect.

- Background formed by a variety of sources.
- Role of sources vary across space and time.
- Multiple background sources often interact.

- CAA provisions vary by background type.
- Attribution demonstrations desirable (difficult).
- Resource limitations exist (at all levels).



This map shows estimates of seasonal mean U.S. background ozone concentrations at surface monitoring locations from a 2007 CMAQ simulation. (Figure 1 in the White Paper)

Definition and Sources

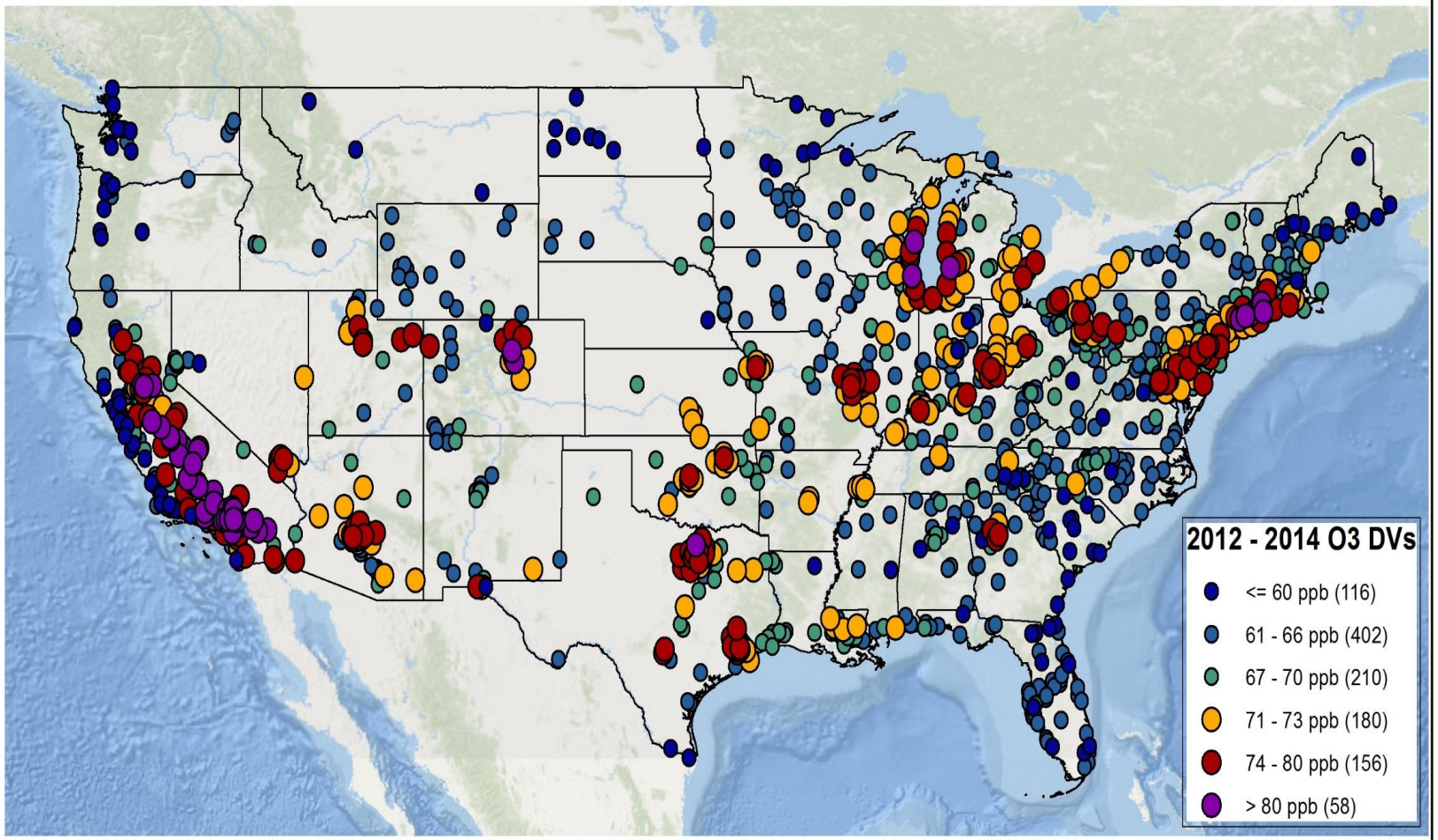
U.S. background (USB) is defined to be any O3 formed from sources other than U.S. manmade ozone precursor emissions (NOx, VOC, CH4, and CO).

The following processes (sources) can contribute to USB O3 values across the U.S.:

- Natural global O3 in troposphere (precursor emissions from biogenic and geogenic sources)
- Transported O3 from the stratosphere (O3 formed by natural processes in the stratosphere)
- Transported O3 from international sources (manmade O3 precursor emissions from outside the U.S.)

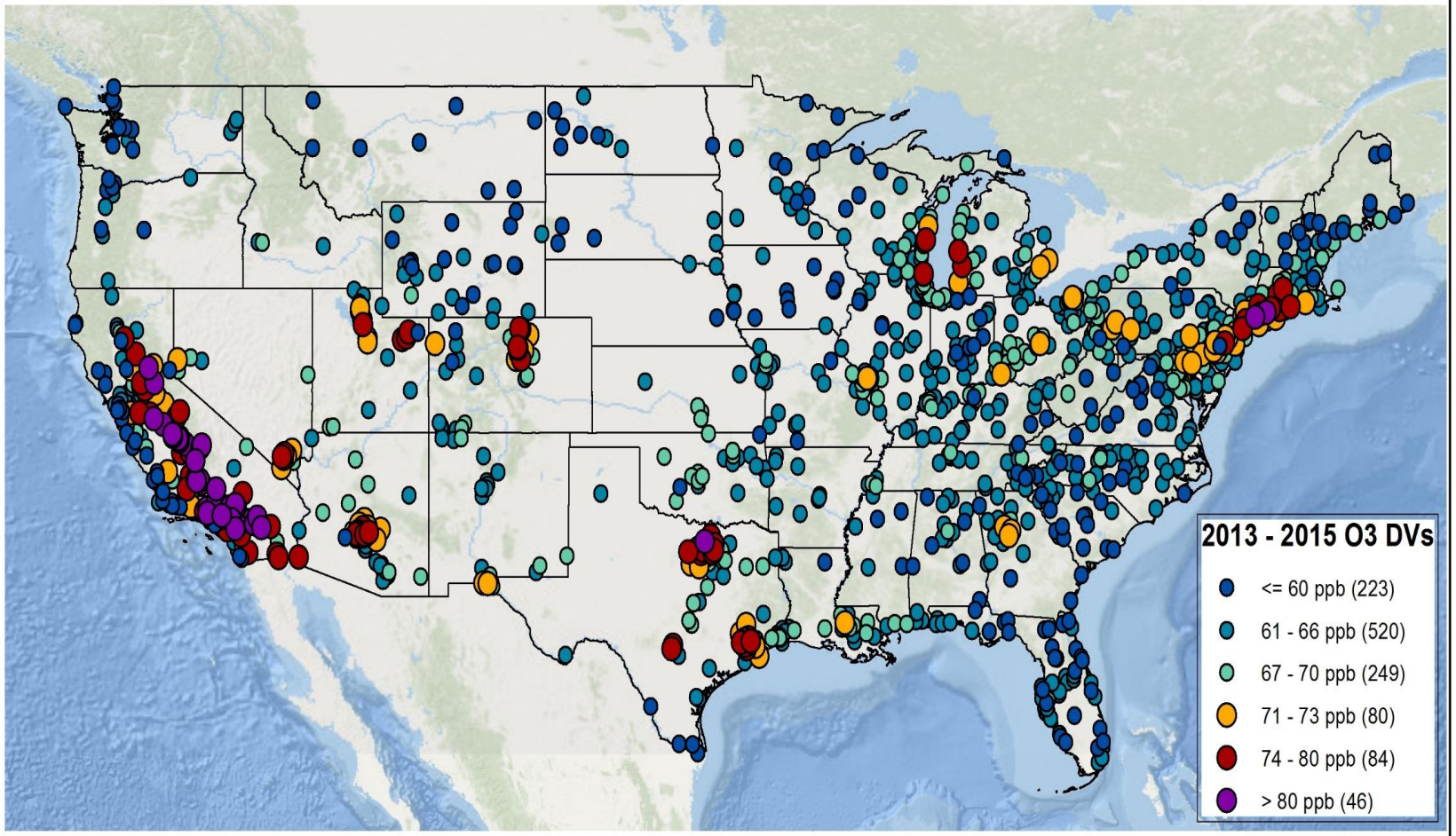
EPA intends for today's workshop to focus only on USB issues. Separate mechanisms exist to discuss the role of local O3 production and interstate ozone transport in O3 NAAQS implementation.

Official 2012-2014 O3 Design Values by Site



While 2014-2016 design values will likely be used in the designation determinations (Oct 2017), it is useful to look at the most recent official design values to establish the context for discussing USB issues.

Preliminary 2013-2015 O3 Design Values by Site



It is also useful to look at the most recent preliminary design values to establish the context in which USB issues should be discussed. Note that in many locations 2015 had lower O3 concentrations than 2012.

Background Ozone Estimates

10:00 AM – 11:00 AM

Estimation Methods (Ambient Monitoring)

While some surface monitoring locations in the inter-mountain western U.S. can be substantially affected by USB O3, multiple analyses have shown that even the most remote O3 monitoring locations in the U.S. are at least periodically affected by U.S. manmade emissions.

- As a result, the EPA believes that it is inappropriate to assume that monitored O3 levels at a remote surface site (e.g., Grand Canyon NP or Yellowstone NP) can be used in an absolute sense as a proxy for USB O3.
- Measurements can be used in a relative sense to assess trends (i.e., some sites are more influenced by USB than others).

Measurements of O3 above the surface (e.g., from sondes, profilers, or aircraft) can provide useful information about the influx of O3 from upwind locations and can be valuable toward informing USB concentrations.

- However, data tend to be sparse. Further, surface conditions may differ.

Often difficult to use ambient data for attribution.

Estimation Methods (AQ Modeling)

Because of the limitations in quantifying USB contributions solely from monitoring data, photochemical grid models have been widely used as a means to estimate the contribution of background sources to observed surface O3 levels.

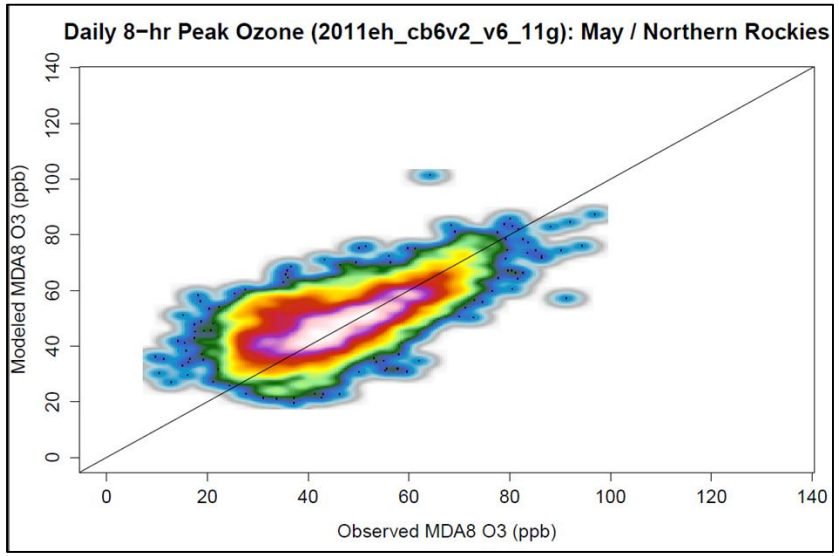
Numerous modeling simulations have estimated various definitions of background ozone. Two primary modeling methodologies have been used

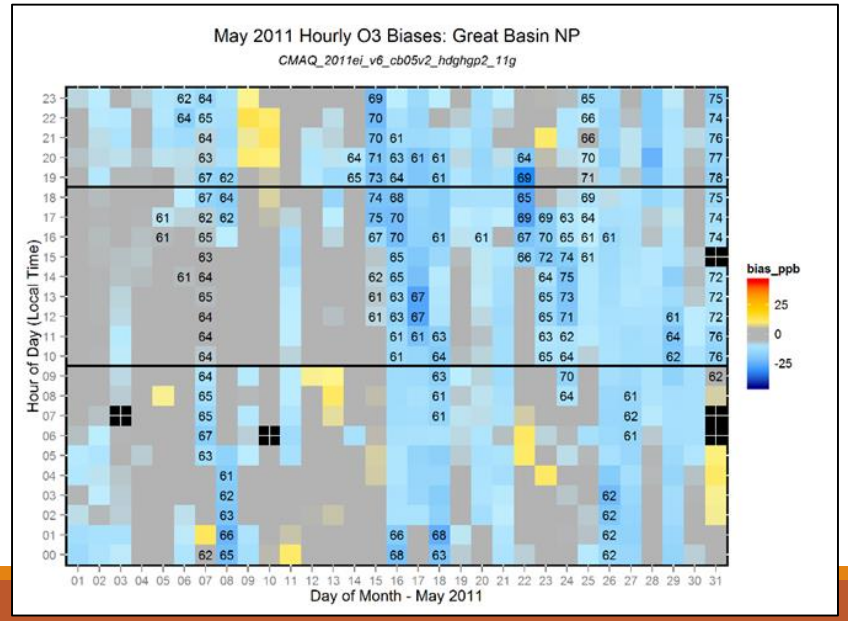
- Zero out / emissions perturbation
- Source apportionment modeling

Note that model estimates of USB are limited by the biases, errors, and uncertainties inherently associated with modeling simulations.

- Evaluating model performance in context of estimating USB is important (next slide).
- Potential model/data improvements discussed later in presentation.

Estimation methods (AQ modeling)





Assessing model performance:

- Seasonal/National mean bias, error, correlation
- Regional/Monthly mean bias, error, correlation *(upper left)*
- Site-specific/Hourly mean bias, error, correlation *(lower left)*
- Diagnostic assessments of specific events / features

Again, model estimates of USB are influenced by the biases, errors, and uncertainties inherently associated with modeling simulations.

- Estimates will vary by model application.
- Simulations need to properly represent boundary conditions, vertical mixing, fire emissions, fire plume rise, fire plume chemistry, and horizontal transport to capture USB.

Recent Estimates of USB

EPA ISA summarized peer-reviewed literature through 2012 and concluded:

- Seasonal mean background levels are highest in the inter-mountain western U.S.;
- Seasonal mean background levels are highest in the spring and early summer;
- Background impacts can occur on episodic and non-episodic scales (higher in discrete events); and
- Models compare reasonably w.r.t. seasonal mean estimates, but daily estimates are imprecise.

Subsequent to the ISA, several additional analyses have been completed.

- Because of varying scales (time/space), definitions, and model methodologies, it is difficult to synthesize the results into a condensed package of conclusions.

Region	Spring mean observed MDA8 O_3 (ppb)	Spring mean base model MDA8 O_3 (ppb)	Spring mean model USB MDA8 O_3 (ppb)	Summer mean observed MDA8 O_3 (ppb)	Summer mean base model MDA8 O_3 (ppb)	Summer mean model USB MDA8 O_3 (ppb)
California	58 (+/- 12)	52 (+/- 11)	38 (+/- 7)	69 (+/- 14)	66 (+/- 18)	37 (+/- 9)
West	54 (+/- 9)	53 (+/- 7)	42 (+/- 6)	55 (+/- 11)	55 (+/- 11)	40 (+/- 9)
North Central	47 (+/- 10)	47 (+/- 8)	33 (+/- 6)	50 (+/- 12)	51 (+/- 14)	27 (+/- 7)
Northeast	48 (+/- 10)	45 (+/- 7)	33 (+/- 7)	45 (+/- 14)	45 (+/- 13)	24 (+/- 7)
Southeast	52 (+/- 11)	51 (+/- 7)	32 (+/- 7)	52 (+/- 16)	54 (+/- 9)	29 (+/- 10)

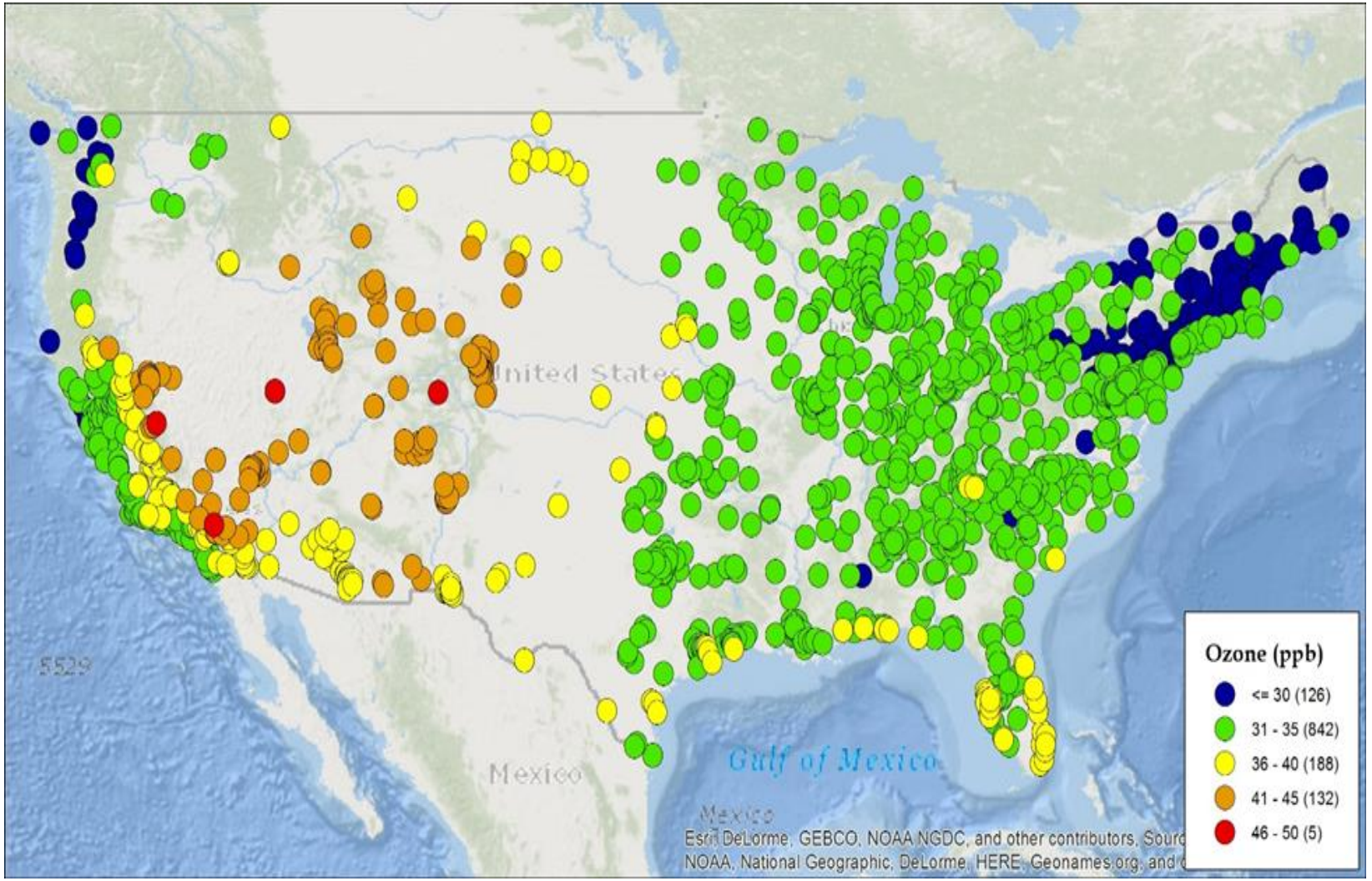
Subset of information from Table 3-1 of ISA. Summary of Zhang et al. (2011) estimates of seasonal mean MDA8 O_3 observations, seasonal mean model concentrations from the GEOS-Chem global model, and GEOS-Chem estimates of seasonal mean USB O_3 at selected CASTNET sites by region.

Recent Estimates of USB

EPA source apportionment and zero out modeling confirmed earlier studies and also concluded that:

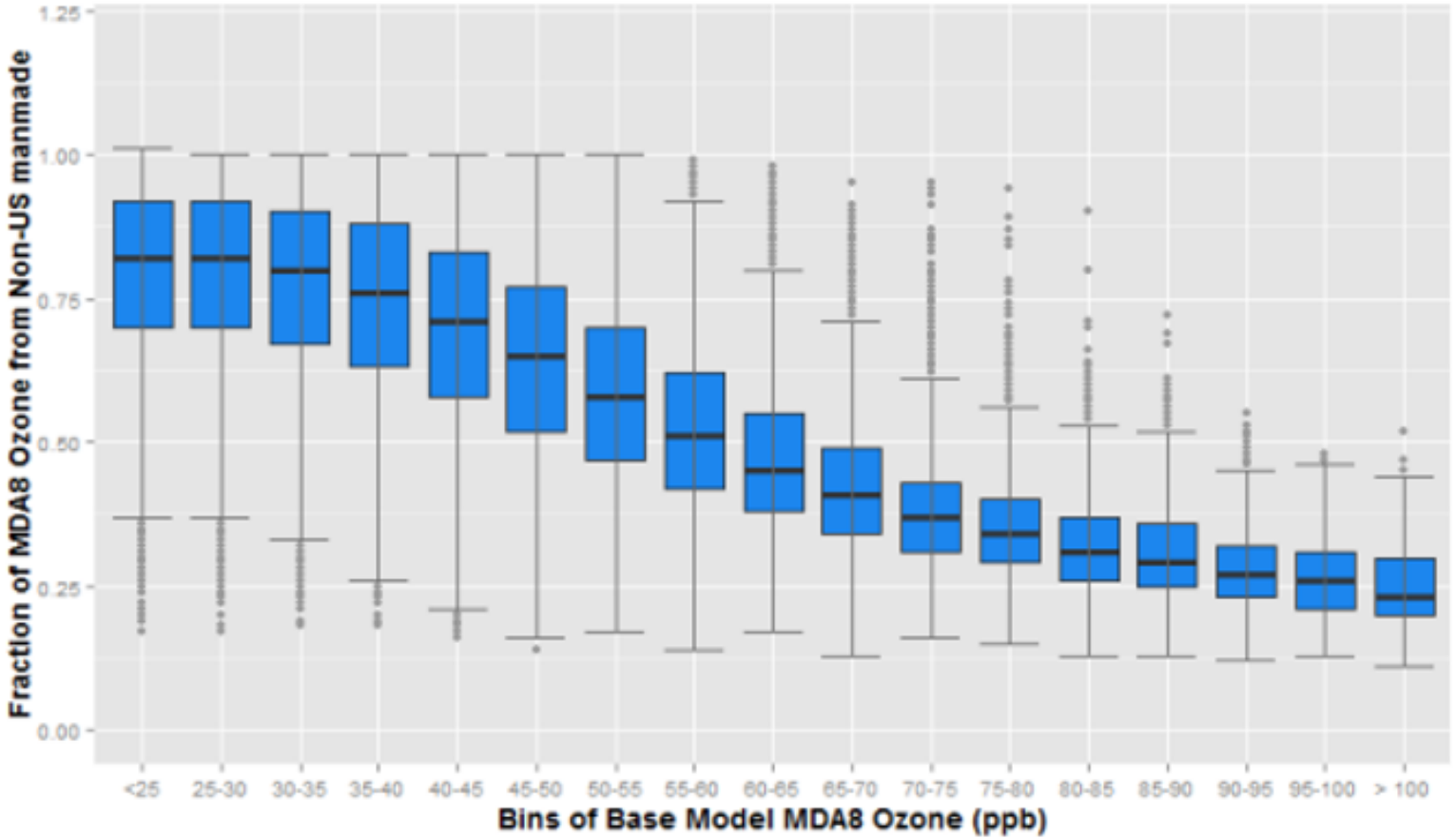
- USB can comprise an appreciable fraction of MDA8 O3 across the U.S., with the largest relative contributions at higher-elevation, rural locations in the inter-mountain western U.S. in the spring and early summer seasons (Slide 17);
- U.S. manmade emission sources are generally the dominant contributor to the modeled exceedances of the 2015 O3 NAAQS, nationally and within individual regions across the country (Slide 18); and
- Analyses suggest that there can be infrequent events where MDA8 O3 concentrations approach or exceed 70 ppb largely due to the influence of USB sources like a wildfire or stratospheric intrusion (Slide 18).
- There is no indication that USB O3 concentrations alone will prevent attainment of the 2015 O3 NAAQS.

Recent Estimates of USB



Map of 2007 CMAQ-estimated seasonal mean USB O3 concentrations (ppb) from zero out modeling. Figure 1 of the White Paper.

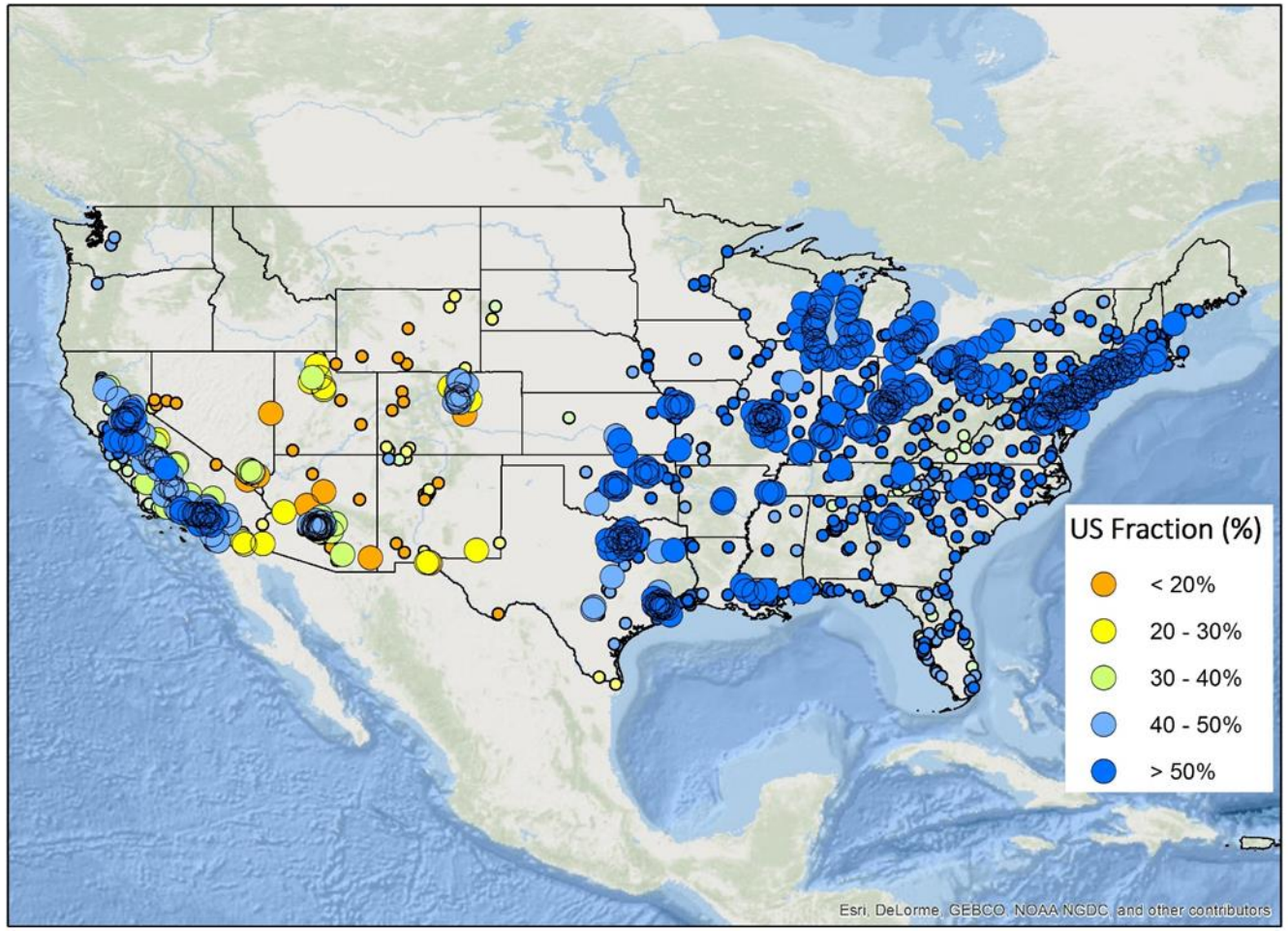
Recent Estimates of USB



Distributions of the relative proportion of USB O3 to total O3, from 2007 CAMx source apportionment modeling, binned by model MDA8 O3. Same as Figure 2b of the White Paper.

Combining 2012-14 O3 DVs with Model Attribution

(2017 source apportionment modeling from the proposed Cross-State Air Pollution Update Rule)



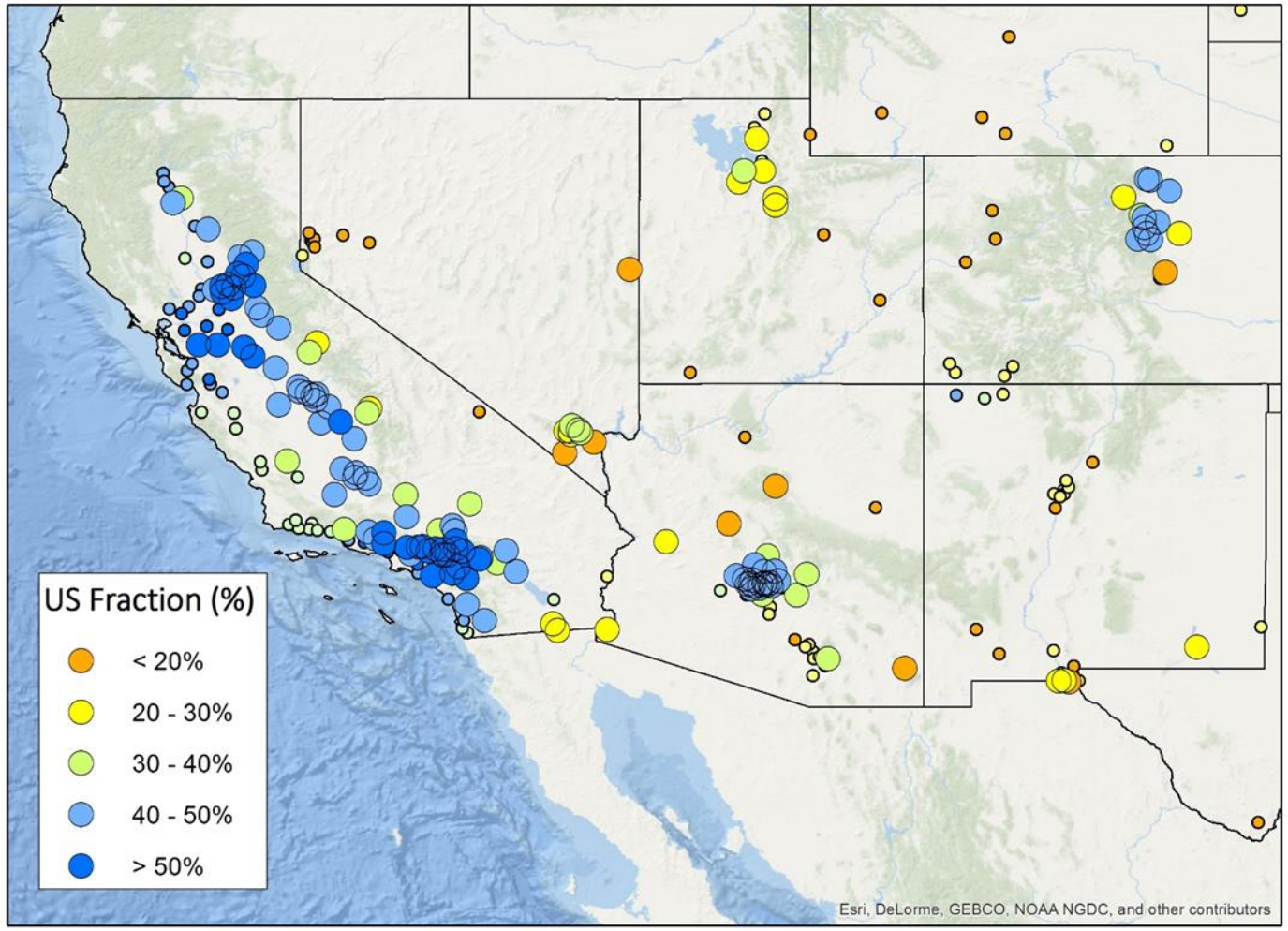
- In order to establish the context for discussing the role of USB in NAAQS attainment, Table 2 of the white paper combined by O_3 monitoring site:
  - 2012-2014 O3 design values,
  - 2011 NEI county NOx emissions,
  - 2017 estimates of US contribution.

- Figure (left) is a visual representation of Table 2 of the white paper:
  - Larger circles represent DVs > 70.
  - Color coding of the circles displays fractional importance of U.S. manmade emissions on high days.
  - Not intended to imply thresholds re: significance of USB in any particular area.

- This ***illustrative*** analysis suggests regional differences in the role of USB:
  - East: Large local/regional influence
  - California/West: Next slide

Combining 2012-14 O3 DVs with Model Attribution

(2017 source apportionment modeling from the proposed Cross-State Air Pollution Update Rule)



- Same figure zoomed to western U.S.
- This ***illustrative*** analysis suggests regional differences in the role of USB and NAAQS attainment:
  - California: Urban areas have large impact from own-state sources, but higher elevation sites, and near-border sites can be more affected by background.
  - Inter-mountain western U.S.: Urban areas can have large impact from own-state sources, but nearby sites can be strongly influenced by background as well. Some rural, high-elevation areas can be near / above the NAAQS w/ lesser U.S. contributions.

Estimated Trends in USB / Efforts to Reduce USB

Ambient data analyses have shown that mid-tropospheric O3 concentrations in remote areas, within the U.S. and globally, may have been increasing over the past two decades at a rate of approximately 0.4 ppb/year within an overall uncertainty range of 0.1 to 0.7 ppb/year. (Cooper et al., 2012; Lin et al. 2015)

- Whether this trend continues is largely dependent upon global changes in emissions of methane, as well as changes in other manmade O3 precursor emissions outside of the U.S., which are highly uncertain.

EPA has a variety of efforts to better understand and eventually reduce impacts from international sources:

- Variety of present/future field studies to collect USB-relevant data (CARB, KORUS-AQ, FIREX)
- International conventions: LRTAP / HTAP, Canada, Mexico
- Global Methane Initiative
- Climate Co-benefits: SLCF and GHG

Additional Research/Data Needs

We need more monitoring data to help characterize background O3 and better evaluate the accuracy of model-based estimates of USB.

- Need more measurements of vertical O3 profiles.
- Network of O3 LIDAR vertical profiles (e.g., NASA TOLNET).
- More ground-based O3 and precursor measurements in rural areas.

We need more comprehensive model evaluation studies using new monitoring data to assess contributions to background O3.

- Do global models accurately estimate BC inflow?
- Do regional models accurately simulate natural O3 (e.g., fires & biogenics)?
- Do regional models accurately simulate vertical mixing of O3?
- Need projections of future trends in global O3.

We need more state/federal planner/researcher collaborations to improve modeling and data analysis for O3 transport, wild fires, and stratospheric intrusion.

Discussion Questions

Do stakeholders think that EPA has properly characterized background O3 in relation to the level and form of the 2015 NAAQS?

Are there additional analyses or modeling simulations that could be folded into the assessment?

Are there alternate definitions of background O3 that also concern stakeholders?

What improvements would help better characterize background O3 levels across the U.S.

What are stakeholders' perspectives on existing efforts to reduce background O3 entering the U.S.?

Designations and Exceptional Events

11:15 AM – 12:00 PM

Anticipated Ozone Area Designations Schedule

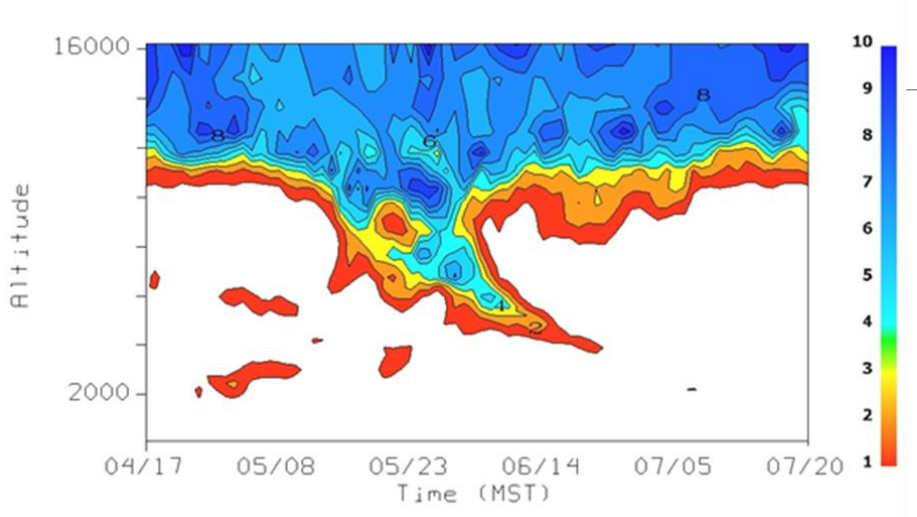
October 1, 2016	Deadline for State/Tribal Recommendations
October 1, 2016	Deadline for Exceptional Event Demos for 2013-2015 events
May 31, 2017	Deadline for Exceptional Event Demos for 2016 events
June 2, 2017	Deadline for 120-day Letters
August 7, 2017	EPA-requested Deadline for State/Tribal responses
October 1, 2017	Deadline for Administrator-signed Designations
May 31, 2018*	Deadline for Exceptional Event Demos for 2017 events

** relevant only for designations not finalized in 2017*

Background Ozone and Exceptional Events

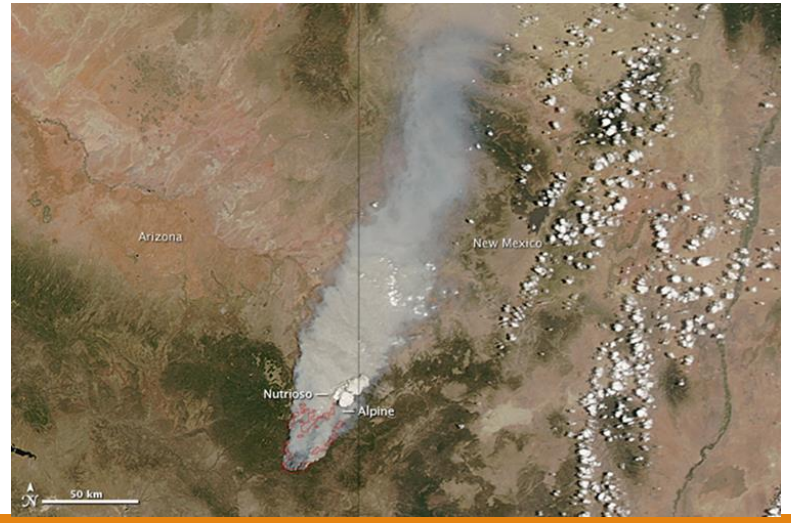
Stratospheric Ozone Intrusions

- During certain meteorological conditions, discrete plumes of stratospheric air can be displaced far into the troposphere and impact ground-level O3 concentrations.



Wildland Fires

- During certain meteorological conditions, NOx and VOC emissions from fires can contribute to increased ground-level O3 concentrations.



Exceptional Event Demonstrations

EPA Regions routinely work with states/tribes to prioritize assistance and review of those events most likely to affect:

- Attainment status (e.g., decision to designate “attainment” rather than “nonattainment”)
- Classification (e.g., distinction as “Moderate” rather than “Serious”)

EPA proposed revisions to the Exceptional Events Rule on November 10, 2015

- Intended to make the demonstrations more manageable for the air agency seeking to exclude data and for the EPA office reviewing and acting on these demonstrations.
- EPA intends to finalize in Summer 2016.

EPA Draft Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations

- Available for public comment 11/10/2015 to 2/3/2016.
- EPA intends to finalize with Exceptional Events Rule revision.

General Exceptional Events Support Information

- www.epa.gov/air-quality-analysis/treatment-data-influenced-exceptional-events

Example Exceptional Event Demonstrations

- www.epa.gov/air-quality-analysis/exceptional-events-submissions-table

Discussion Questions

Do stakeholders think EPA identified all of the CAA mechanisms available to address areas influenced by ozone-related exceptional events?

Assuming EPA finalizes proposed amendments to the Exceptional Events Rule, do stakeholders think there are sufficient technical tools, data, and EPA guidance available to make the demonstrations necessary to assess ozone-related exceptional events?

Do air agencies want or need additional assistance from the EPA to develop the demonstrations necessary to use the CAA's exceptional event exclusion authority?

Nonattainment Area Boundaries and Rural Transport Areas

1:15 PM – 2:00 PM

Nonattainment Authority and Guidance

EPA intends to issue guidance on assessing information relevant to determining appropriate nonattainment boundaries in February 2016.

Consistent with CAA section 107(d) and past practice, the boundaries of a nonattainment area must include:

- "…area that does not meet the ozone standards…" – identified by ozone air quality monitors that meet EPA-specified criteria
- "…nearby area that is contributing…" – identified through a multi-factor weight-of-evidence assessment

The guidance also addresses developing requests for the Administrator to determine that an area is a Rural Transport Area.

Rural Transport Authority and Guidance

Clean Air Act section 182(h) addresses two criteria for determining that an area is a Rural Transport Area:

- The nonattainment area cannot be adjacent to, or include any part of a metropolitan statistical area, as defined by the Office of Management and Budget; and
- The NOx and VOC emissions from sources within the area cannot make a significant contribution to ozone concentrations in the area itself, or in other areas.

EPA guidance regarding the “significant contribution” criterion recommends a multi-factor demonstration similar to the analysis that is used to identify an appropriate nonattainment boundary.

Rural Area Relief

Regulatory relief provided by Rural Transport Area determination

- If the air agency meets the requirements for the Marginal classification, the area is not subject to any of the mandatory ozone control requirements or attainment demonstration requirements associated with higher classifications.
- Note: Marginal area requirements include NSR, conformity, emissions statement rules, and emissions inventories.

Transportation conformity rule provides flexibility for all isolated rural areas. It does not depend on a RTA determination. (See 40 CFR 93.109(g) and "Transportation Conformity Guidance for 2008 Ozone Nonattainment Areas" EPA-420-B-12-045, July 2012, pp7-8).

- An isolated rural area is an area that that does not contain or is not part of any metropolitan planning area (i.e., no part of the area is covered by a metropolitan planning organization as designated under federal transportation planning regulations).
- A conformity determination is only required when a non-exempt FHWA/FTA project (e.g., construction of a new highway or widening of a major roadway) requires funding or approval.

Discussion Questions

Do stakeholders think there are sufficient technical tools, data, and EPA guidance available to make the demonstrations necessary to request that the Administrator determine that an area is a Rural Transport Area?

Do air agencies want or need additional assistance from the EPA to develop the demonstrations necessary to support RTA requests?

International Transport (CAA section 179B)

2:00 PM – 2:30 PM

179B Authority

EPA may approve a demonstration of attainment if the submitting state can satisfactorily demonstrate that “but for emissions emanating from outside of the United States” the area would attain the ozone standard.

Section 179B does not provide authority to:

- exclude monitoring data influenced by international transport from regulatory determinations related to attainment and nonattainment;
- classify an area with a lower classification than indicated by actual air quality; or
- relax any mandatory control measures associated with the area’s classification.

Where an international transport event meets the criteria in the Exceptional Events Rule it can be addressed by that rule.

Relief that can be granted under 179B includes:

- An area would not be subject to reclassification for failure to attain by its attainment deadline;
- If classified Severe or Extreme, failing to attain by the attainment date would not trigger a section 185 fee program.

Past EPA Guidance/Actions

General Preamble to implementing criteria pollutant provisions of the 1990 CAA Amendments (57 FR 13569, April 16, 1992)

- "…approved EPA modeling techniques should be used whenever possible."
- Acknowledges that "…adequate data may not be available in areas outside the United States." Therefore, modeling consistent with EPA's modeling guidance may not be possible in all cases.
- "Because very few areas are likely to be affected by the provision, EPA will determine on a case-by-case basis whether the State has satisfactorily made the required demonstration."
- Other demonstration methods referenced in the General Preamble include:
  - Using ozone episodes that do not involve international transport of emissions for modeling;
  - Running the model with boundary conditions that reflect general background concentrations on the U.S. side; and
  - Analyzing monitoring data if a dense network has been established.

El Paso (Texas) Ozone Plan approved in 2004, attaining but for emissions from for Ciudad Juárez, Mexico

- Air quality modeling was used for a "but for" attainment demonstration.
- Modeling included U.S. emissions, but not Mexican emissions, and showed the area to be in attainment when only U.S. emissions were present.
- Emission inventory data for Mexico was not available, so modeling of the entire shared airshed was not possible.

Discussion Questions

Does the EPA preliminary conceptual model of O3 attainment planning in areas impacted by foreign emissions/ozone align with stakeholder perspectives on the O3 planning process?

Do stakeholders think there are sufficient technical tools, data, and EPA guidance available to make the demonstrations necessary to invoke section 179B authority?

Do air agencies want or need additional assistance from the EPA to develop the demonstrations necessary to invoke section 179B authority?

Roundtable/Synthesis

2:45 PM – 4:15 PM

Discussion Questions

Does the EPA preliminary conceptual model of O3 attainment planning align with stakeholder perspectives on the O3 planning process?

Do stakeholders think EPA identified all of the CAA mechanisms available to address areas influenced by background O3?

What other approaches (consistent with CAA provisions) do stakeholders think should be considered to deal with background O3 in implementing the 2015 O3 NAAQS?

Do stakeholders think there are sufficient technical tools, data, and EPA guidance available to make the demonstrations necessary to invoke relevant CAA provisions?

Do air agencies want or need additional assistance from the EPA to develop the demonstrations necessary to invoke relevant CAA provisions?

Summary/Adjourn

Docket ID no. EPA-HQ-OAR-2016-0097 at Federal Register Portal: http://www.regulations.gov

Follow http://www3.epa.gov/ozonepollution/implement.html for future postings

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4:15 PM – 4:30 PM