

PM2.5 and Regional Haze Modeling Guidance Update



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Status of DRAFT Guidance

- Draft “Guidance for Demonstrating Attainment of Air Quality Goals for PM_{2.5} and Regional Haze”, January 2001
- Living document - may be revised as needed and posted on EPA’s website
<http://www.epa.gov/ttn/scram/>
- Will finalize guidance as part of PM_{2.5} implementation rule
- Will develop Mid-Course Review guidance if needed



What's in the Guidance

- Part I- Using Model Results
 - Attainment test
 - Annual PM2.5 NAAQS
 - 24 hr. PM2.5 NAAQS
 - Regional haze reasonable progress test
 - “Hot spot” modeling
 - Using weight of evidence
 - Data gathering needs
 - Required documentation



What's in the Guidance- con't

- Part II- Generating Model Results
 - Conceptual description
 - Modeling protocol
 - Selecting a model(s)
 - Choosing days
 - Selecting domain & spatial resolution
 - Developing met inputs
 - Developing emissions inputs
 - Evaluating model performance
 - Evaluating control strategies



What are Potential Updates?

- Seeking comments on potential changes
 - Future year of emission estimates to model
 - Base year design value for future year projections
 - Use of spatial fields of ambient concentrations as part of the “modeled” attainment test
- Seeking additional information to refine PM_{2.5} guidance (refine recommendations in the guidance based on real world experience)
 - Horizontal resolution
 - Number of days to model
 - Performance evaluation



Future year for modeling- PM2.5 NAAQS

- Three years of data used to determine whether or not area is attaining.
 - OPTIONS - Model 1st, 2nd, or 3rd year of the 3 year period or model all 3 years
 - 1st year- ensures design value will be low enough at the beginning of the 3 year period to attain the standard
 - 2nd year- best represents the average of the 3 year period
 - 3rd year- actual attainment year; if meeting the standard, can qualify for 2 one year extensions
 - All 3 years- best able to represent the form of the design value (3 year average)
 - In either case, emissions for three year period is needed to either “guarantee” attainment, or provide support for 1 year extensions.
 - Future year modeling dates should be coordinated between ozone and PM2.5



Future year for modeling- Regional Haze

- Similar issue exists for the Regional Haze further progress test
- First reasonable progress date is 2018
- Should future model year be 2014, 2015, 2016, 2017, or 2018?
 - Current guidance says 2016



Base Year Design Values for Future Year Projections- PM2.5 NAAQS

- The Speciated Modeled Attainment Test (SMAT) requires projection of a base year design value
 - $\text{Base year DV} * \text{modeled RRF's} = \text{future year DV}$
- The choice of the base year design value critically affects the future values
 - In some locations, the 1999-2001 and 2000-2002 PM2.5 design values differ by as much as 2 ug/m³



Base Year Design Values for Future Year Projections- PM2.5 NAAQS

- Current PM2.5 NAAQS guidance says to use the highest of the 3 DV periods straddling the emissions inventory year
- Current 8-hour ozone guidance says to use the higher of the single DV straddling the EI year or the DV used for designation
- There are several possible solutions, but a common policy should be applied
- Base period for regional haze is set as a five year period and is prescribed as 2000-2004



Use of spatial fields in “Speciated Modeled Attainment Test”

- Spatial fields can be used to provide an estimate of PM_{2.5} and PM_{2.5} species values in all locations
- Spatial fields are likely needed for the PM_{2.5} NAAQS attainment test due to the limited number of speciation monitors
 - RRFs are needed for each PM_{2.5} species at all FRM sites
- Application of SMAT using spatial fields has revealed challenges in applying the test
 - Estimating species in areas with strong spatial gradients
 - Matching reconstructed STN mass with FRM mass
- Spatial fields are probably not needed for Regional Haze
 - Reasonable progress is calculated at Class I areas
 - There are speciation (IMPROVE) monitors for all Class I areas
 - IMPROVE reconstructed mass calculations are well tested



Refining the PM_{2.5} Guidance

- Horizontal resolution
 - 36 km vs. 12 km vs. 4km
 - What resolution is necessary for modeling urban scale secondary and/or primary PM_{2.5}?
 - Guidance recommends 12km for secondary and 4km for primary PM
 - Regional Haze
 - Guidance recommends at least 36km resolution
 - How does model resolution affect relative reduction factors?
- Number of days to model
 - Is it necessary to model a full year?
 - Is it more important to model a full year or to use finer resolution?
 - It may be necessary to model a full year for regional haze
 - Number of Class I areas and temporal variability of 20% best and worst days



Refining the PM_{2.5} Guidance

- Performance evaluation
 - What is “acceptable” performance for PM and PM components?
 - PM performance is generally not as good as ozone
 - It will take time to establish performance goals
 - Based on experience (EPA, RPO, State/local)

- Propose to have a model performance workshop
 - Discuss and show real world examples of performance measures
 - Which statistics are most meaningful (NME vs. MNE vs. FE)
 - New and innovative ways to look at performance
 - Spatial and temporal patterns
 - Longer term averaging
 - Discuss issues with comparisons to ambient data
 - Use the information to help refine the performance chapter in the modeling guidance



Next Steps

- Compile newest information from current modeling projects
- Performance evaluation workshop
- Refine details of SMAT
- Update and finalize the modeling guidance
 - Goal of Spring 2004



Clear Skies Modeling- Visibility

- Clear Skies modeling technical support document is posted at:

http://www.epa.gov/clearskies/air_quality_tech.html

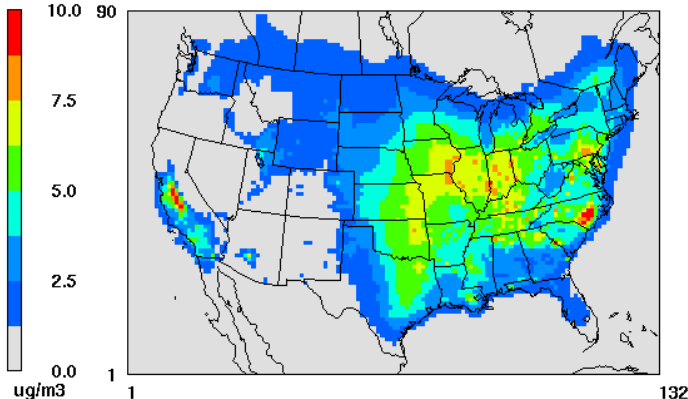
- Appendix H contains calculations of visibility improvement (in dv) for many Class I areas
 - Calculations were based on IMPROVE measurements from 1996 only
 - Visibility improvement based on emissions changes from 2001-2010 and 2001-2020

Nitrate PM

CMAQ-2001

Layer 1 PM_NITRn

n=CCTM_csi1_36.monthlyavg.conc.01

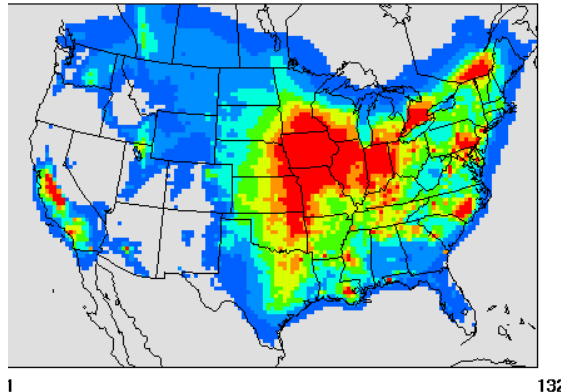


January 1, 1996 1:00:00
Min= 0.0 at (3,59), Max= 11.4 at (115,40)

CMAQ-2002

Layer 1 PM_NITRr

r=CCTM_csi2_36.monthlyavg.conc.01

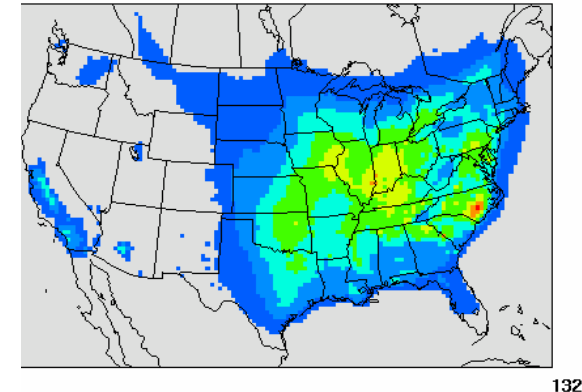


January 1, 1996 1:00:00
Min= 0.0 at (2,58), Max= 17.2 at (115,40)

CMAQ-Sept03

Layer 1 PM_NITRz

CMAQ RLS03 CSC
z=CCTM3_SE3_36.combine.conc.01.avg



January 1, 1996 1:00:00
Min= 0.000 at (3,59), Max= 8.862 at (115,40)

(January avg., 1996)

Anthropogenic SOA

Biogenic SOA

0.6 ug/m³

Layer 1 PM_ORG_SAc

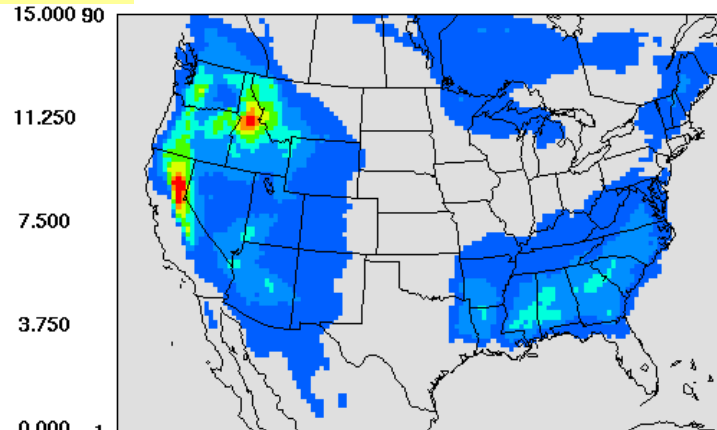
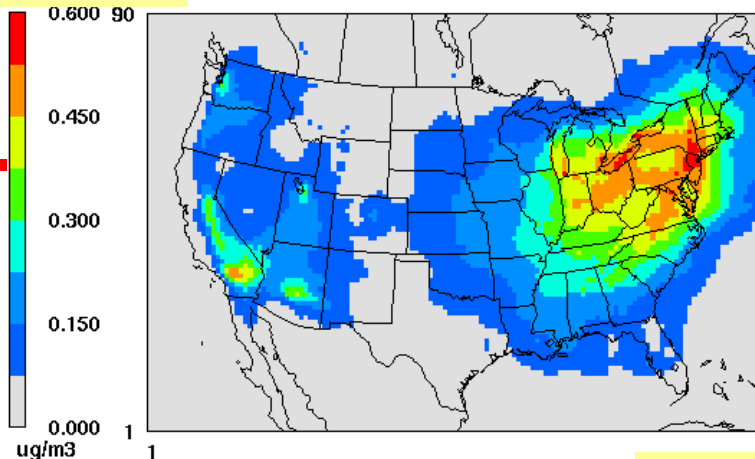
c=CCTM_csi2_36.monthlyavg.conc.07

15 ug/m³

Layer 1 PM_ORG_SBc

c=CCTM_csi2_36.monthlyavg.conc.07

CMAQ-
2002



0.2 ug/m³

July 1, 1996 1:00:00
Min= 0.001 at (43,3), Max= 0.616 at (103,103)

CMAQ RLS03

x=CCTM3_SE3_36.combine.conc.07.avg

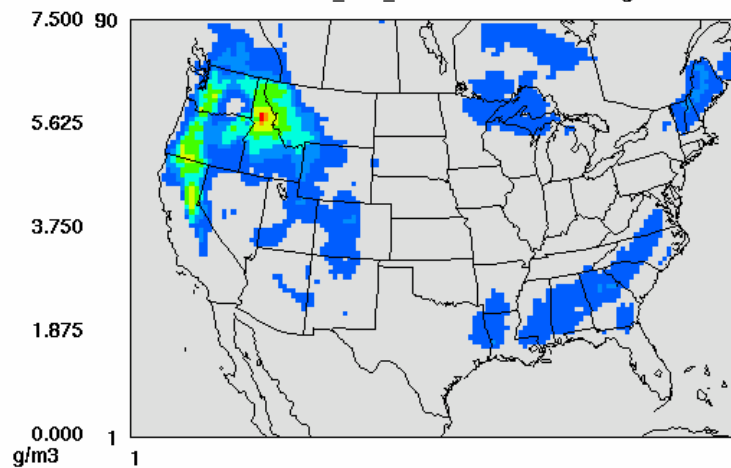
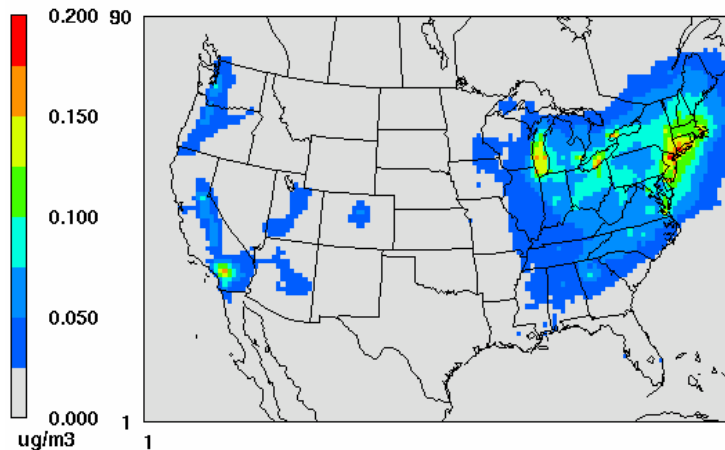
7.5 ug/m³

Layer 1 PM_ORG_SBx

CMAQ RLS03

x=CCTM3_SE3_36.combine.conc.07.avg

CMAQ-
Sept03



(July avg., 1996)