As an Oil and Gas Director, Why Does Ozone Matter to Me???

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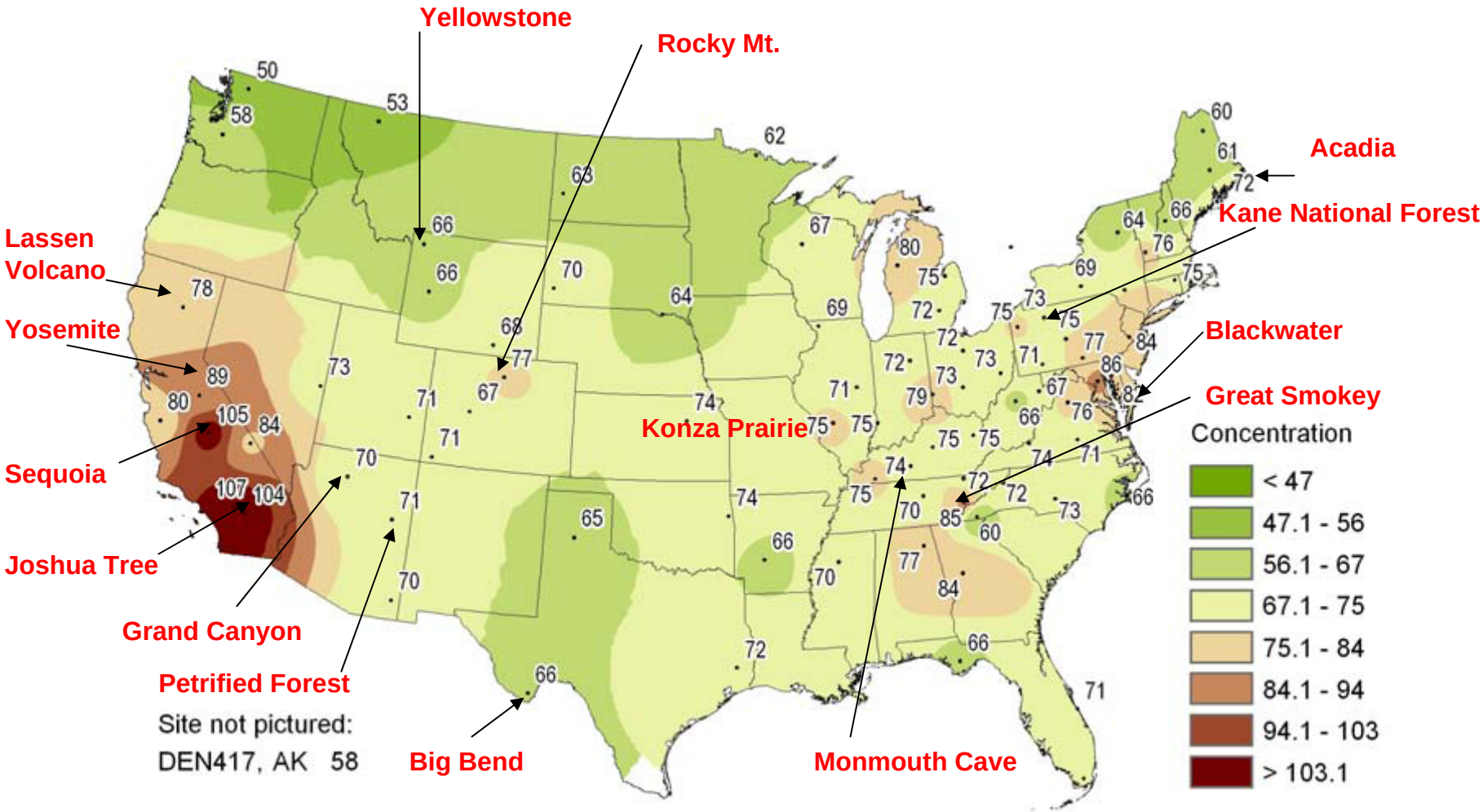
Ozone National Ambient Air Quality Standard (NAAQS)

- EPA is required to establish a primary ozone national ambient air quality standard (NAAQS) to protect public health
- Statistical Standard: 3-year average of the fourth-highest daily maximum 8-hour average
- EPA lowered the O_3 NAAQS from 80 to **75 ppb** in March 2008
- EPA is reconsidering the March 2008 O_3 NAAQ
  - Proposed a range of **60 – 70 ppb**
  - EPA proposed a new secondary standard to protect vegetation
  - Final rule anticipated **July 29, 2011**
- O_3 NAAQS is up for review again in 2014
- If an area is above the ozone standard, then state (or tribe) needs to develop a State Implementation Plan (SIP) to demonstrate compliance with the ozone standard

Why is Ozone Important to Me?

- Most of the US will be nonattainment for the ozone NAAQS at the lower proposed ozone standard
  - Almost all of the US will be nonattainment at 60 ppb
  - 93% of National Parks will be nonattainment at 60 ppb (2006-2008 CASTNET sites)
- New and existing oil and gas development will have to address the lower ozone standard with air permitting and Environmental Impact Statements (EIS).
  - More emissions controls and higher cost to operations
  - Limitations or preclusions to growth
  - Air permits and EIS will take longer and be harder to get
- If EPA establishes an ozone NAAQS less than or close to background levels, most of the U.S. will not be able to comply regardless of the level of controls on U.S. sources

CASTNET Data Indicate Many Rural Areas *Will* Exceed a 60-70 ppb NAAQS[1]



[1V]Values are three-Year Average of Fourth Highest Daily Maximum 8-Hour Average Ozone Concentrations (ppb) in various National Parks for 2006–2008

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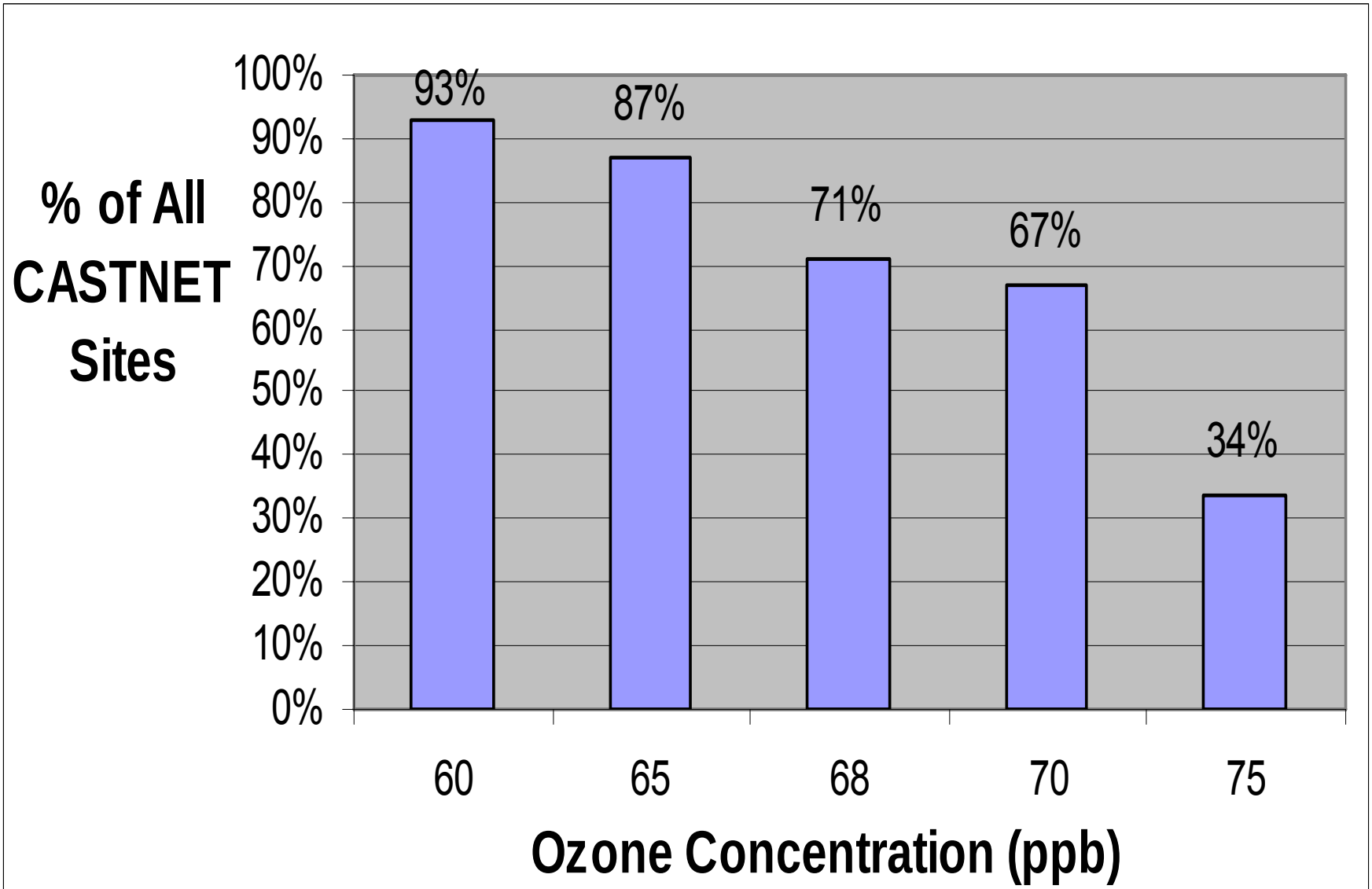
% of CASTNET Sites Above Ozone Concentration (2006-2008)



State Implementation Plan (SIP)

- Include methods that the state will use to come into attainment
- Under a nonattainment SIP states can require:
  - Reasonably Available Control Technology (RACT) for existing sources
  - Lowest Achievable Emission Rates (LAER) on new and modified sources
    - Cost is not a consideration
  - Emissions offsets for all emissions increases
    - Obtaining offsets may be very difficult for new developments or already heavily controlled areas
- The requirements in the SIPS must be enforceable by states, tribes, and EPA
- SIPs involve very complex air quality analyses
  - Require photochemical modeling to demonstrate the proposed methods for reducing ozone formation will work
  - Monitoring to confirm SIP is working

Impacts to Oil and Gas Industry

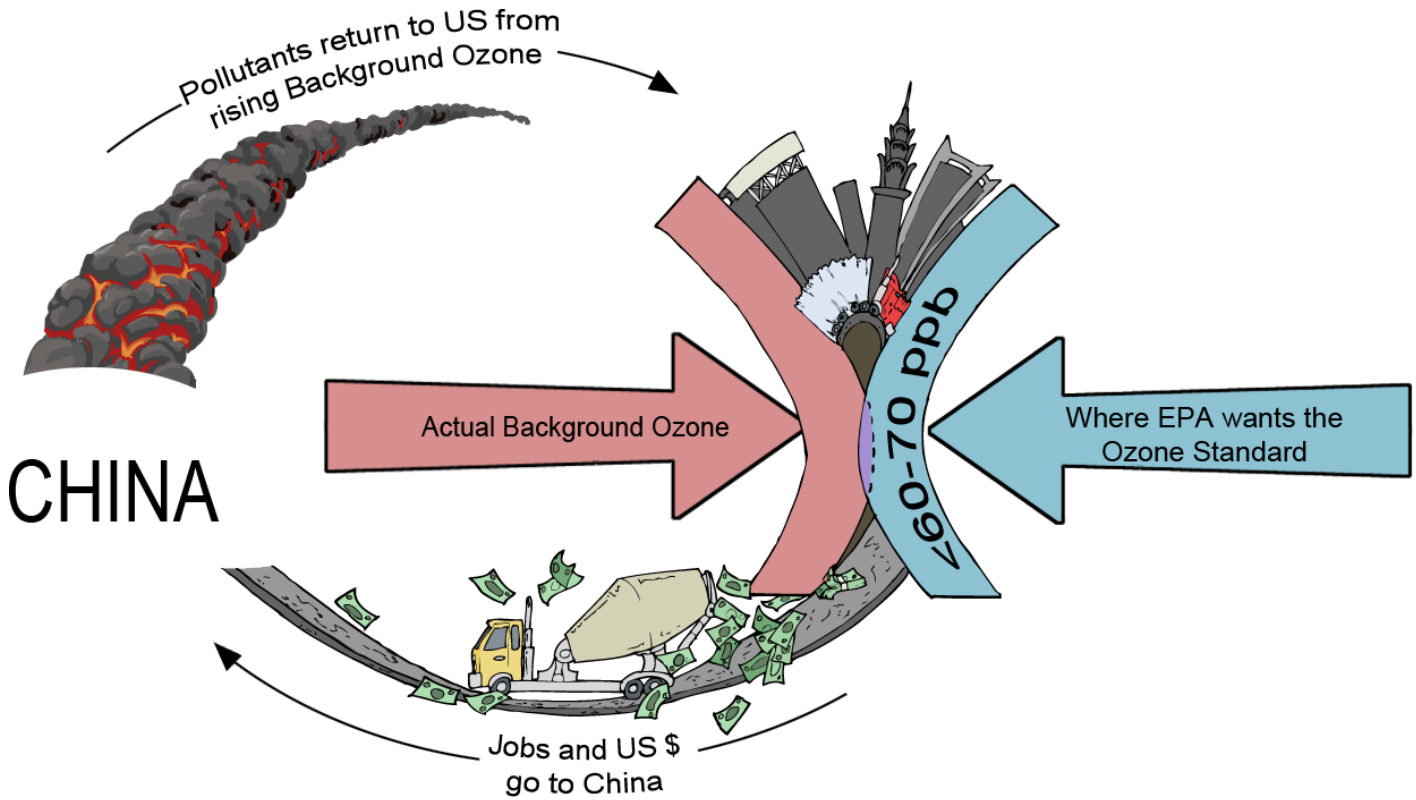
- Added cost from controls
- Emissions offsets may preclude or limit growth
- Much tighter regulations and emission limits
- Air permits will be more complex and take longer
- Delays in oil and gas development = loss of royalties, taxes, wages, and economic value to the state
- Complex ozone modeling for Environmental Impact Statements for development on Federal lands.
  - Expensive and time consuming
  - Equivalent to SIP quality regional air quality analyses
  - More to challenge or appeal
- More monitors are being installed = more nonattainment areas

Ozone Policy Relevant Background (PRB)

- EPA defines Policy Relevant Background (PRB) as concentration that would occur in the US in the absence of anthropogenic emissions in continental North America (US, Canada, and Mexico)
- EPA assesses risks to human health and environmental effects from O_3 levels in excess of PRB
- If EPA establishes an ozone NAAQS less than or close to PRB, most of the U.S. will not be able to comply regardless of the level of controls on U.S. sources
- EPA claims that exceedances due to PRB can be dealt with during implementation of the rule.
  - However, the only regulatory tool for "excluding" high monitored PRB ozone events from ozone non-attainment designation is the "**Exceptional Events**" requirements of 40 CFR 50.14 which is not a workable approach

Background Ozone is naturally occuring or from non-North American human sources which are outside of US control

EPA's Proposal

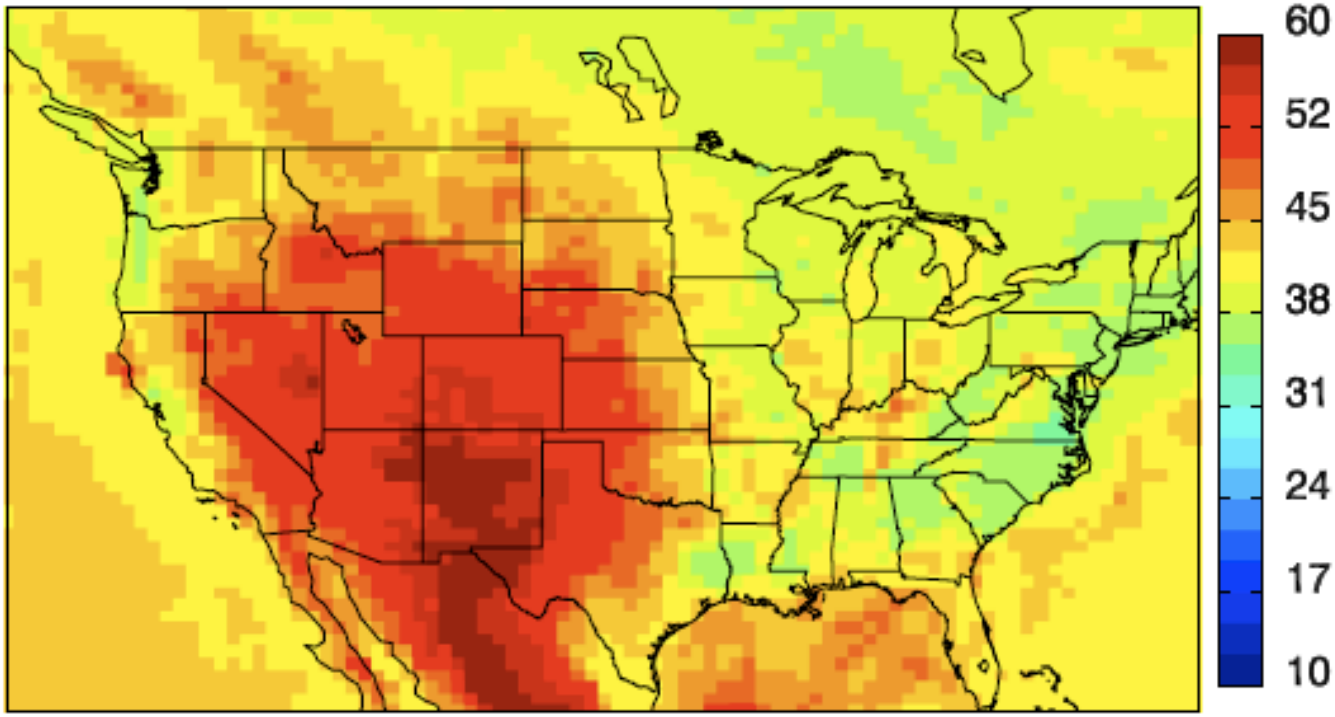


Why Ozone Policy Relevant Background Matters

- Background ozone concentrations are currently estimated to be as high as 60 ppb (monthly average) and the model is still under predicting
  - These levels are approaching the level of the proposed standard
  - States will not be able to demonstrate compliance through a SIP is exceedances are from PRB ozone
- EPA used a PRB estimate of an estimate of 15 – 35 ppb as the basis for demonstrating the health benefits for reducing the level of the ozone standard.
  - Current modeling is showing 2 to 3 times this level and the model is under predicting.
- Using a more realistic estimate of PRB reduces benefit of a lower ozone standard
  - At the higher PRB levels being shown now, there is little to no demonstrated health or environmental benefit.

Recent GEOS-CHEM Modeled PRB for 2006 (Zhang et al, 2011)

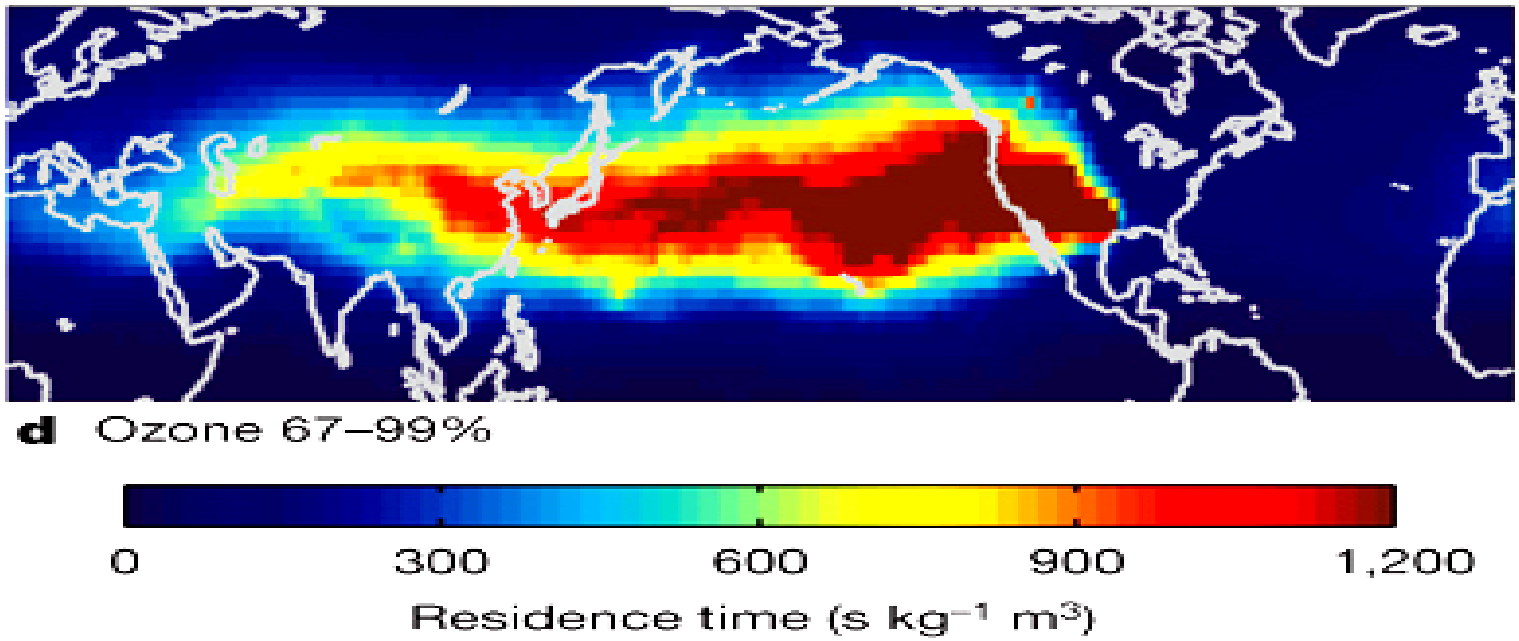
Latest modeling which is still under predicting!



- The 4th highest NA background ozone is typically 45-55 ppbv in the West, 35-45 ppbv in the East.
- Maximum over New Mexico reflects strong subsidence.
- Model evaluation indicates both peak O3 and frequency of occurrence are underestimated

Transport From Asia

- Increasing emissions from Asia are outpacing reductions in the U.S.
  - Asia NOx emissions increased 44% (55% in China) during 2001-2006 while ozone precursors from the U.S. decreased by more than a third in 1985-2008
- This figure shows the 15-day transport history of air masses with high ozone values (67-99 percentile).
  - It shows that air descending on the western US spent a significant period of time in the western Pacific and East Asia, where ozone and ozone precursors were picked up and lofted to the United States.



[1]Statements, data, conclusions presented are from Cooper et al. (2010).

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Sensitivity of Quantification of Risk Estimates PRB Assumption at Exact Attainment of a 74 ppb NAAQS (Average of 2002 and 2004 Air Quality Data) (Smith, 2007)

City	# of Deaths Estimated Using to 2002 GEOS-CHEM for PRB (15-30 ppb)	# of Deaths Estimated Using 40 ppb PRB Assumption	% Reduction in Estimated Deaths from Change in PRB Assumption
Atlanta	5.3	0.1	98%
Cleveland	31.7	2.6	92%
Detroit	30.2	0.7	98%
Houston	17.8	0.7	96%
Los Angeles	28.6	0.0	100%
Sacramento	9.5	0.1	99%
St. Louis	3.4	0.2	96%

Conclusion

- Most of the US will be nonattainment for the ozone NAAQS at the lower proposed ozone standard
- Oil and gas development will be slowed, limited, or precluded by the lower ozone NAAQS through the air permitting and EIS processes.
- PRB is important in the ozone regulatory setting process because it defines ozone levels that will not be affected by a U.S. regulatory program
- Recent research indicates that the concentration of PRB is approximately 60 ppb.
- If EPA establishes an ozone standard less than or close to PRB concentrations, then states, tribes and local agencies have no ability bring the area into compliance with the standard

References

- Cooper, O. R., Parrish, D. D., Stohl, A., Trainer, M., Ne´de´lec, P., Thouret, V., Cammas, J. P., Oltmans, S. J., Johnson, B. J., Tarasick, D., Leblanc, T., McDermid, I. S., Jaffe, D., Gao, R., Stith, J., Ryerson, T., Aikin, K., Campos, T., Weinheimer, A., and Avery, M. A., 2010, “Increasing springtime ozone mixing ratios in the free troposphere over western North America”, Nature, Vol. 463, 21 January, 2010, doi:10.1038, nature08708.
- Smith, A. and Gibbs, B. ,October 9, 2007, “Comments on EPA’s Proposed Rule to Revise the National Ambient Air Quality Standards for Ozone” (72 FR 37818), submitted as part of UARG comments, Docket # EPA-HQ-OAR-2005-0172-4183.1.
- Zhang, Lin and Jacob, Daniel J., February 25, 2011, “Evaluation of GEOS-Chem simulation of surface ozone and PRB calculations across the US” presentation, in preparation.