

Perspectives and Updates on Regional Haze Planning from the Great Lakes Region

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Isle Royale NP, MI

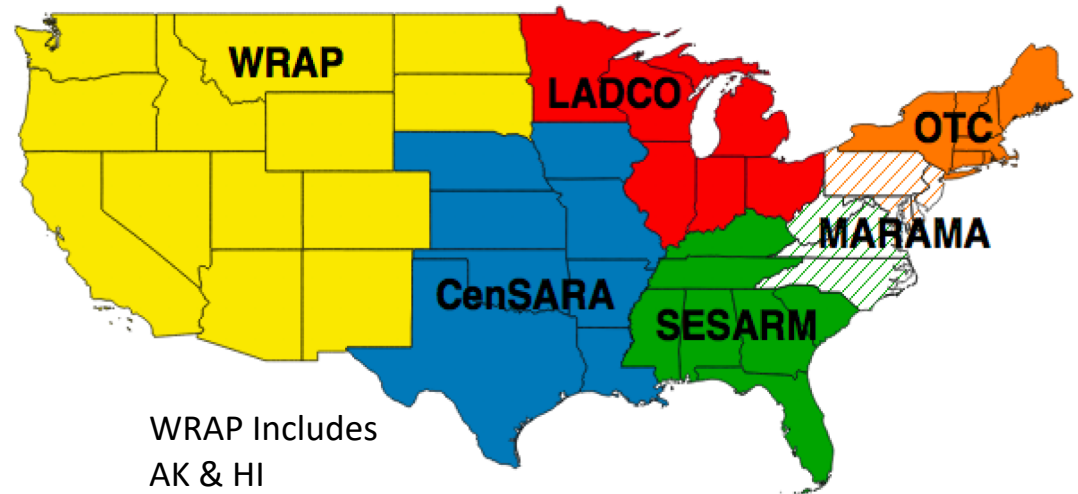


Boundary Waters Wilderness, MN

Multi-Jurisdictional Organizations



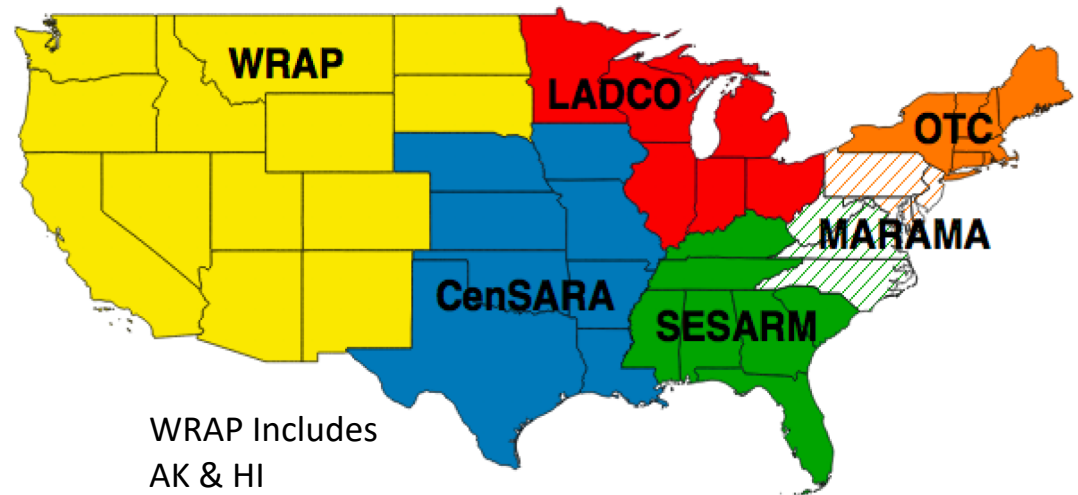
- MJOs are part of an air quality management apparatus in the U.S. that includes municipal, state, regional, and national air planning agencies working together to tackle our air pollution problems.



- LADCO and the MJOs are funded primarily by U.S. EPA grants to the states under Section 105 of the Clean Air Act.
- MJOs serve as regional liaisons between the state/local/tribal air agencies, U.S. EPA Regional Offices, and U.S. EPA national offices.
- MJO boards are made up of the air agency directors in the region

MJO Scope

- Technical support for regional air quality studies
- Forums for intra-region planning discussions
- Contract facilitation and management
- Training
- Advocate for regional planning needs in national workgroups and committees
- Facilitate communications between MJOs, and with EPA.
- LADCO is more technically oriented than most MJOs; and less policy oriented than some MJOs



LADCO Background



- Formed in 1989 to bring Michigan, Indiana, Illinois, and Wisconsin together to address high ground level ozone in the region
 - Ohio joined in 2004; Minnesota joined in 2012
- Air pollution science, training, and planning support for the state (and tribal & local) air management agencies in the region
- Provides a forum to discuss regional air pollution issues
- Technical lead in the region for continental to urban-scale atmospheric modeling: meteorology, emissions, and chemistry-transport
 - LADCO does not provide policy guidance, only technical guidance and support
 - LADCO produces decision support information via modeling and monitoring data analyses that our states use for air quality management plans (SIPs)

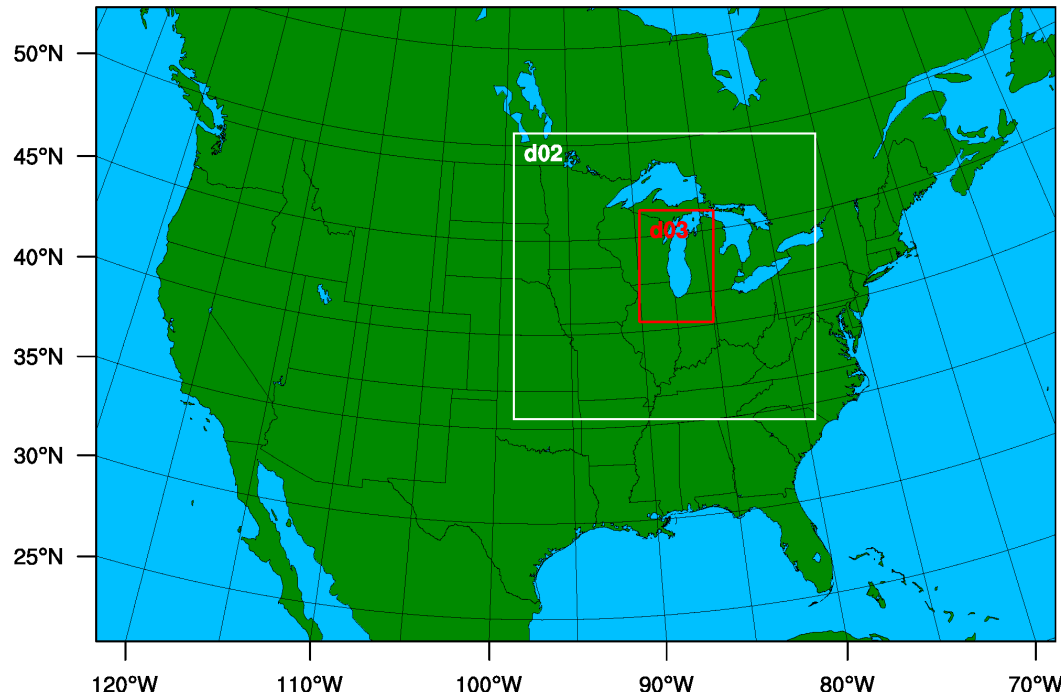
LADCO Technical Support



- LADCO is unique in the MJO space because we do most of the regional met, emissions, and air quality modeling in-house
- LADCO technical staff
 - Zac Adelman (Exec Director) - organization management, emissions and air quality modeler
 - Donna Kenski, PhD (Data Scientist) – coordinates surface monitoring program through the region, monitoring data analysis, observational trends analysis; GIS expert
 - Mark Janssen (Emissions Director) – national leader in developing emissions inventories and ancillary data; SMOKE modeler; coordinates regional data warehousing and distribution; Linux system admin
 - Tsengel Nergui, PhD (Atmospheric Modeler) – WRF, CMAQ, CAMx modeling, data analysis

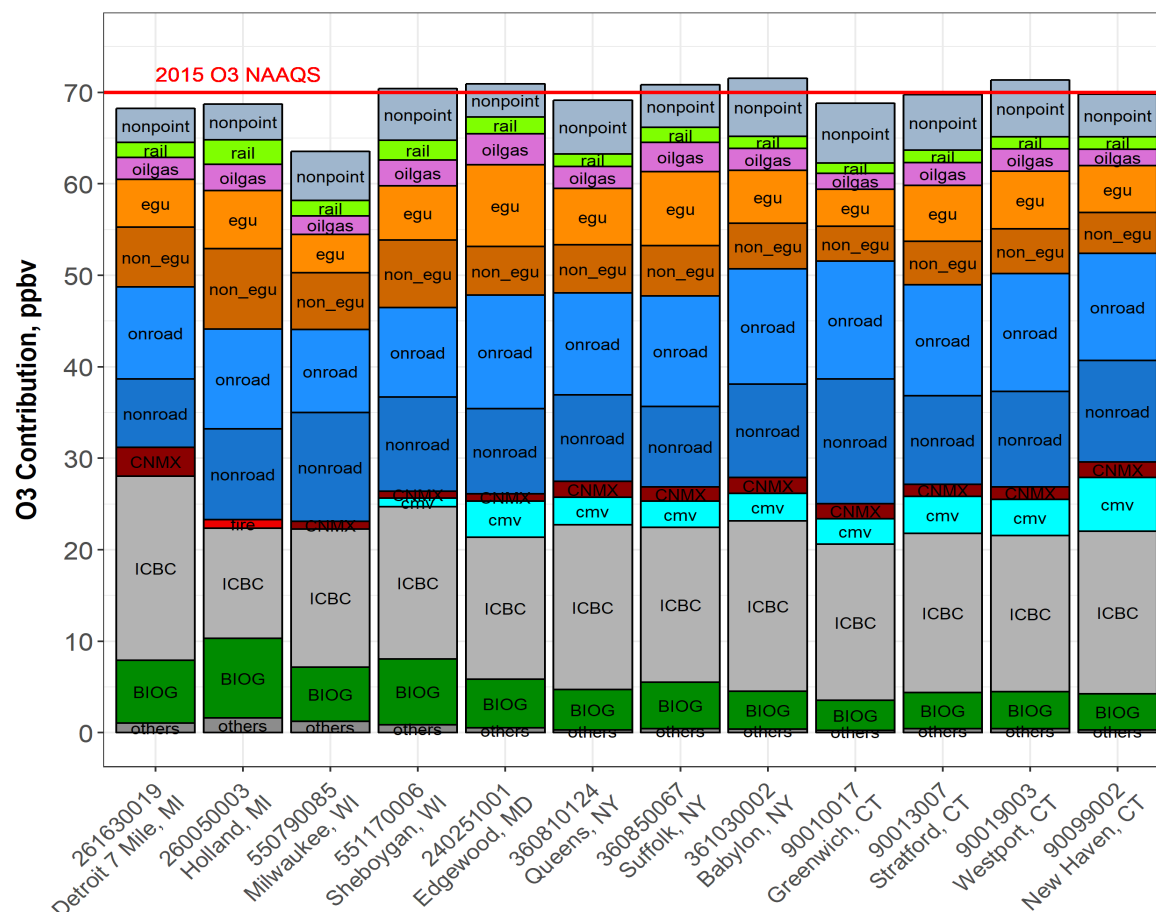
Status of LADCO Modeling

- LADCO modeling is driven by Clean Air Act obligations
- Since ~2011, using EPA emissions inventories (NEI) as the basis of our modeling
- 36/12-km national domains for regional haze
- 12/4/1.33 km regional → local modeling for ozone
- Next modeling case will use 2016 as the base year; projections to 2020, 2023, and 2028



Status of LADCO Modeling

- WRF meteorology, current work on refining the model configuration for lake breeze ozone
- SMOKE emissions with CB6 chemistry
- ERTAC EGU point source projections
- CAMx with APCA and OSAT for source attribution
- CMAQ (TBD)



MDA8 O₃ (ppbV) (with WATER) inventory sector contributions to DVs₂₀₂₃ at key monitors in the LADCO 2023 simulation

U.S. National Modeling Efforts



- Regional modeling in the U.S. is now fairly centralized
- With the exception of CA and TX, most states are relying on EPA to generate emissions data; many states/regions are also using EPA meteorology
 - Most states either don't have to do modeling on a regular basis, or if they do, they rely on their MJO to coordinate; few states do modeling in-house
- EPA is the primary source of regional model BCs (downscaled from global or hemispheric models)
- Non-US inventories are obtained through EPA
- Some states/regions refine the base EPA data with local data
- Robust data sharing between EPA, regions, and states; typically the MJOs serve as regional data-sharing liaisons

U.S. National Modeling Efforts



- **Benefits to the centralized approach**
 - Limits redundancy and waste
 - Less expensive for the states to conduct regional scale modeling and analysis
 - Shorter pathway to control strategy development
 - Standardizes data across the country
 - Facilitates data sharing by reducing the number of datasets and contacts
 - EPA has a large, sophisticated modeling team
 - States and regions can focus on model validation, interpretation, and improvement
- **Limitations to the centralized approach**
 - Limited to EPA's choices of model/configurations
 - Propagation of errors and one set of assumptions
 - Fewer sets of model variations limit the number of model outcomes from which to learn/improve the practice, validate the model, and draw conclusions

Recent and Upcoming Studies



- 2008 O3 NAAQS (Moderate) Attainment Demonstration (February 2017)
- Lake Michigan Ozone Study (May/June 2017)
- Regional Mercury Deposition Monitoring (Ongoing)
- 2015 O3 NAAQS Transport SIP Modeling (August 2018)
- 2008 O3 NAAQS (Serious) Attainment Demonstration (Fall 2019)
- Round 2 Regional Haze Planning (Summer 2019)
- 5-year Regional Monitoring Network Review (last completed 2015, next review 2020)

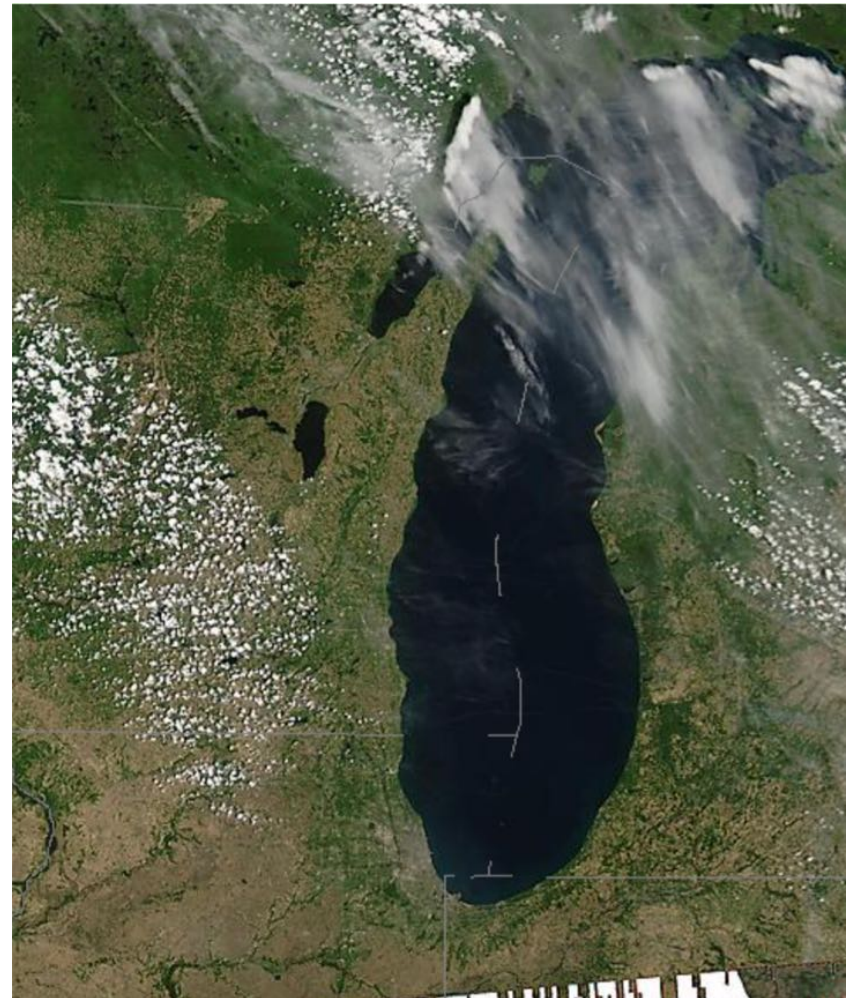
Lake Michigan Ozone Study



May – June 2017
Western Shore of Lake Michigan

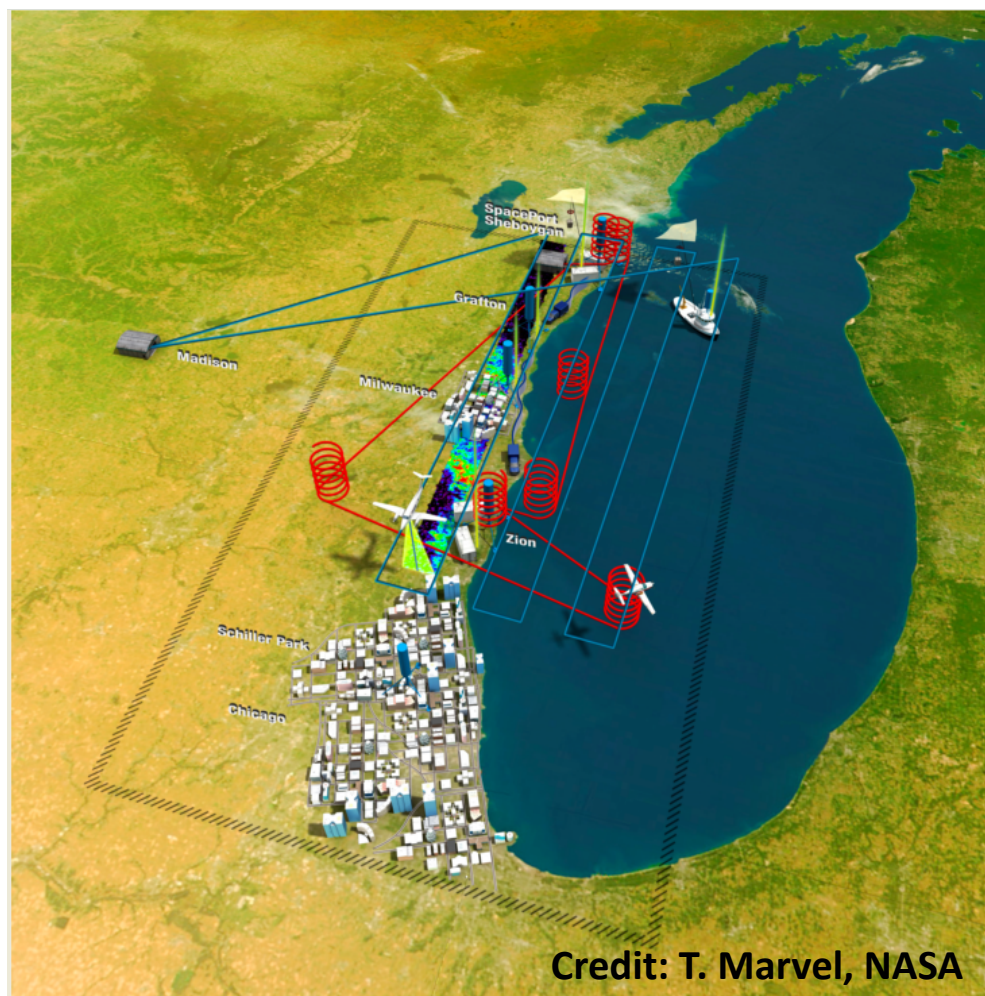


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LMOS Study Design

- Observations
 - Aircraft
 - Ship
 - Mobile on-shore
 - Zion, IL Supersite
 - Sheboygan, WI Ground Site
- Forecasts
 - WI DNR
 - NOAA NESDIS
 - U. Iowa
 - NWS



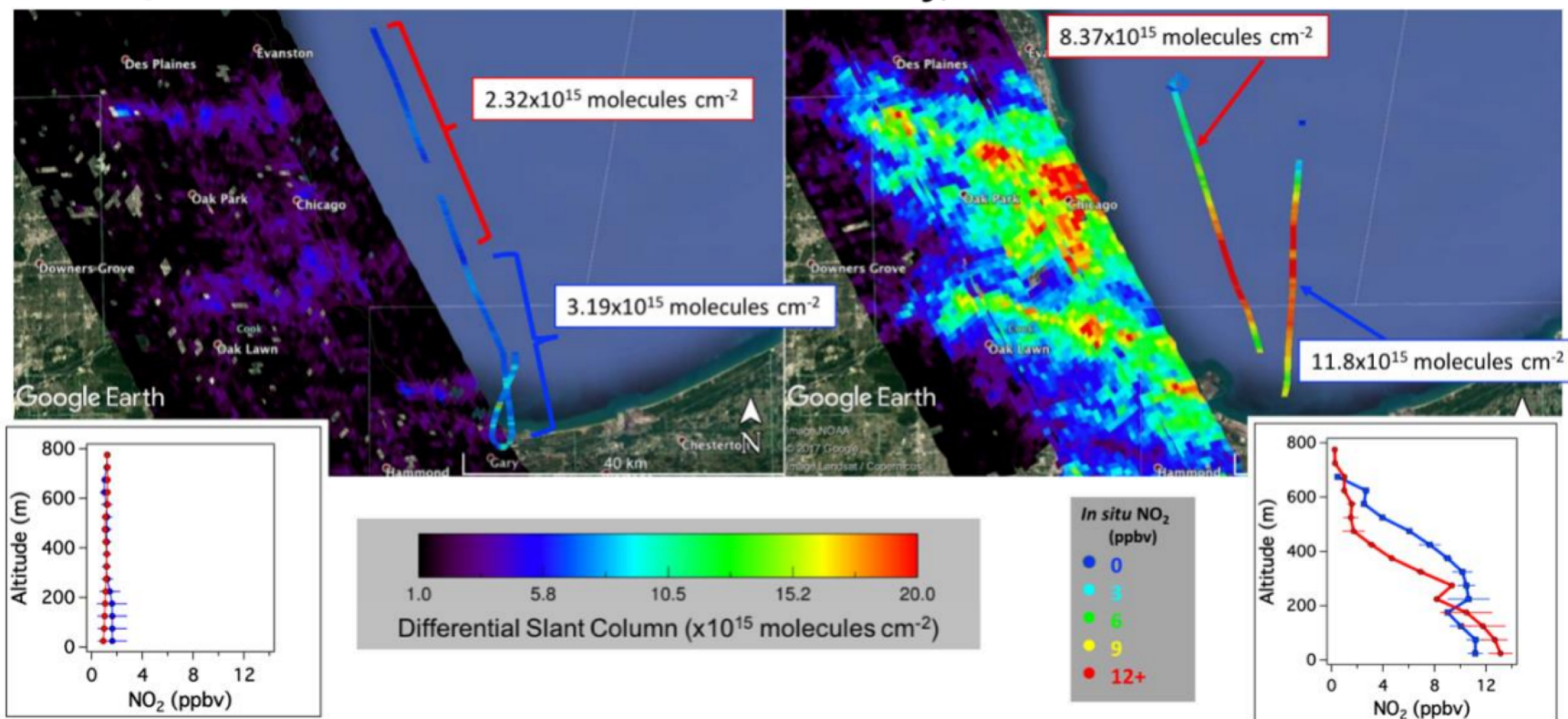
NASA GeoTASO LMOS NO₂ Retrievals



LADCO

Sunday, June 18th 8-10 LDT

Monday, June 19th 8-10 LDT



Weekday/weekend NO₂ column differences in Chicago as seen by GeoTASO

Credit: L. Judd, NASA/LaRC

Preliminary LMOS Results



- Modeling and observations during LMOS showed that the polluted layer over the lake is an important factor in coastal O₃ exceedance events
- Meteorological and photochemical model skill in forecasting these events needs improvement.
 - Models of the LMOS period underestimated peak O₃ concentrations and overestimated NO₂ concentrations
 - Model sensitivity studies show that reductions in anthropogenic NO_x emissions and increases in biogenic volatile organic compounds (VOCs) emissions are necessary to reproduce the observed surface O₃

LMOS Next Steps



- Meteorology and air quality model optimization for the Lake Michigan area
 - Integration of remote sensing and in-situ observations into simulations
- Mining the observational data for emissions signals
 - What can we learn about simulated emissions from the LMOS observations?
- Synthesis report for the field campaign available @ **ladco.org**
- LMOS data are now publicly available

<https://www-air.larc.nasa.gov/missions/lmos>

LADCO Collaboration



- Routine data sharing with EPA and other MJOs
- Close collaboration with states/regions outside of LADCO through national workgroups, conferences, planning organizations
 - Opportunities to share best practices and emissions data between regions
- Not much work being done outside of the NAAQS space, e.g., multi-media, health, climate, air toxics
- Given the proximity of LADCO to Canada, it would be appropriate and worthwhile to foster technical exchanges
 - Regional modeling workshops and meetings
 - Conference calls
 - Webinars

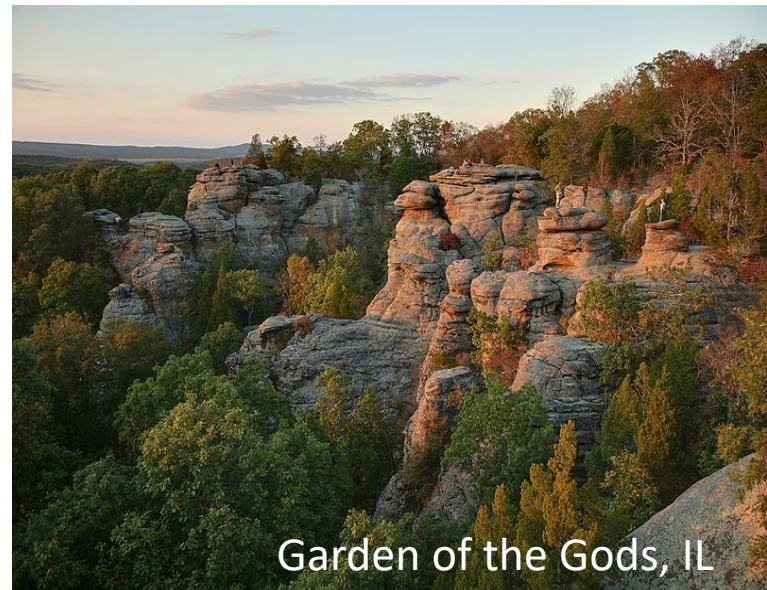
Questions and Contact



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