Zac Adelman
LADCO Executive Director

LADCO Regional Air Quality Meeting
April 15, 2019
LADCO and the MJOs are funded primarily by U.S. EPA grants to the states under **Section 105** of the Clean Air Act.
LADCO Background

• Formed in 1989 to bring Michigan, Indiana, Illinois, and Wisconsin together to address ozone pollution
  • Ohio joined in 2004; Minnesota joined in 2012
• Technical lead in the region for continental to urban-scale atmospheric modeling: meteorology, emissions, and chemistry-transport
  • LADCO produces decision support information via modeling and monitoring data analyses that our states use for air quality management
  • LADCO does not provide policy guidance to our membership, only technical guidance and support
LADCO Executive Office Staff

• Zac Adelman Executive Director, since 2017

• Donna Kenski, PhD Data Scientist, since 2000

• Mark Janssen Emissions Director, since 1992

• Tsengel Nergui, PhD Atmospheric Modeler, since 2018

• Catherine Heath Office Manager, since 2017
What Does LADCO Actually Do?

• Air Quality Modeling
• Air Monitoring
• Data Science
• Air Quality Research
• Training Coordination
• Intra-region Communication Platform
• Contract Management
• Outreach and Advocacy
What Does LADCO Produce?

• Decision Support Systems and Data
• Modeling Protocols
• Technical Support Documents (TSDs)
• Knowledge in our Member States

Modeling Platform
Software and data package of all elements that went into a modeling project
Air Monitoring & Data Science

- LADCO staff are experts with ambient monitoring data, and air quality modeling data
- LADCO supports our states through transferring data, analysis products, and modeling capabilities

GIS & Mapping
Data Visualization
Model Evaluation
Statistical Analysis
Cloud Computing
Big Data Delivery
LADCO technical staff serve as collaborators, technical advisors, and/or air planning agency stakeholders

Remote Sensing Aerosol Optical Depth vs. Surface Visibility Correlation Warm Season (Apr – Sept) Trends

Lake Michigan Air Directors Consortium • 9501 West Devon Avenue, Suite 701 Rosemont, IL 60018
Current Technical Analyses

• Observational Trends
  • Surface network review and enhancement
  • Updating regional & urban O₃ conceptual models

• Regional Photochemical Modeling
  • 2016 WRF/CAMx/CMAQ modeling for O₃ and Regional Haze

• Emissions Modeling
  • Inventory Collaborative
  • Analysis/improvement of mobile sources: onroad, offroad, rail, marine

• Meteorology Modeling
  • WRF optimization for high ozone conditions

• Exceptional Events
  • Studying smoke impacts on air quality in the region
Current Regulatory Focus

• **2015 O₃ NAAQS**
  • EPA designations finalized in August 2018
  • Marginal status for all violating LADCO monitors
  • iSIPs (including ”Good Neighbor” SIPs) due October 2018
  • Attainment demonstration (NAA SIP) not required for marginal
  • Marginal attainment date August 3, 2021 → 2020 O₃ Season

• **2008 O₃ NAAQS**
  • Chicago and Sheboygan reclassification from moderate to serious status due to be finalized June 2019
  • NAA SIPs due from IL, IN, WI in Spring 2020
  • Serious attainment date July 21, 2021 → 2020 O₃ Season

• **Regional Haze**
  • Round 2 SIPs due July 2021
• LADCO reproduced EPA 2011 and 2023 CAMx regional modeling (“EN Platform”) as the basis of a transport modeling Technical Support Document (TSD) for our member states
• LADCO replaced the EPA electricity sector 2023 forecasts with ERTAC-EGU model projections; everything else the same with EPA
• CAMx used to tag sector and state contributions to 2023 ozone

EPA – LADCO: differences in 2023 daily maximum MDA8 O3
2015 O₃ NAAQS Transport Modeling

~20% Reduction in U.S. EPA National Emissions Inventory NOx Emissions from 2011 → 2017
2008 O₃ NAAQS Attainment Modeling

• Chicago and Sheboygan O₃ NAAs reclassified to serious
• Attainment modeling will be done by LADCO to demonstrate how to reach attainment by July 21, 2021 (actually by the 2020 O₃ season)

• Modeling approach
  • WRF 2016 simulation, configuration based on LMOS and NASA research projects
  • 2016 emissions projected to 2020 using EPA MOVES (mobile) and ERTAC EGU (power sector) emissions
  • On-the-books emissions controls and source apportionment modeling to identify inventory sector/source regions that contribute to regional ozone

• LADCO TSD to states by Fall 2019
Round II Regional Haze Modeling

• Regional Haze committee was reconvened in January 2018
• Members from LADCO states, FLMs, R5, EPA-HQ, tribes
• Meet monthly via teleconference
• **Goal**: develop documentation, analyses, modeling, and inventories to assist states in meeting the July 2021 RH SIP submittal target
• Tasks described on timeline (next slide); 3 years remaining to SIP submittal
LADCO Round 2 Regional Haze Planning Timeline

- **LADCO and MN**: Improving data analysis using new methodology, updating trends, URP determination, back trajectory analysis.
- **LADCO and MN**: Projecting 2011 base year inventory to 2028 by merging EPA's EN and EL
- **LADCO and states**: Screening sources for 4-factor analysis
- **LADCO and states**: Developing 2016 base year inventory
- **WI DNR and LADCO**: Developing 2016 meteorology
- **LADCO and individual states**: Developing Long-term Strategy using 4-factor analysis
- **LADCO and states**: Source apportionment modeling
- **LADCO and states**: Regional modeling incorporating LTS to determine 2028 RPG
- **individual states**: Draft SIP completed
- **collective states/LADCO/FLMs**: State agency approval of draft SIP, FLM consultation begins
- **individual states**: FLM consultation complete, public comments and hearings begin
- **individual states**: Public comments end
- **individual states**: Respond to comments, revise drafts, final state approval, submittal to EPA showing 2028 progress
Exceptional Events

- States can get regulatory relief from air pollution caused by unusual or naturally occurring air pollution events.
- LADCO works with our states to survey ozone season observations for possible exceptional events (EE).
- LADCO EE Workgroup: monthly triage analysis reviews daily surface observations and smoke columns from previous month.

Credit: Airow Tech
Lake Michigan Ozone Study

May – June 2017
Western Shore of Lake Michigan
Motivations for LMOS

• Persistent high O$_3$ at some coastal sites
• Planning needs of the LADCO states require further clarity on regional O$_3$ production
• Last field campaign: summer 1991
• Need for a new study: New instruments/satellites and scarce aloft and over-lake observations

Nowlan et al., 2016

Geostationary Trace gas and Aerosol Sensor Optimization

Zion, IL
LMOS Study Design

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

Credit: T. Marvel, NASA
Weekday/weekend NO$_2$ column differences in Chicago as seen by GeoTASO

Credit: L. Judd, NASA/LaRC
Data Assimilation to Improve Air Quality Model Results

**TROPMOMI**
- TROPOspheric Monitoring Instrument
- Launch: October 2017
- Operator: ESA
- Orbit: Sun synchronous
- Horizontal Resolution: 7km x 7km
- Atmospheric Composition: O3, CH4, HCHO, CO, NO2, SO2, aerosol

**Aura OMI**
- Ozone Monitoring Instrument
- Launch: July 2004
- Operator: NASA
- Orbit: Sun synchronous
- Horizontal Resolution: 13km x 13km
- Atmospheric Composition: O3, NO2, SO2, BrO, OCIO, aerosol

Credit: Tommy Jasmin (UW-Madison/SSEC)
Satellite NO\(_2\) Column Data Assimilation
Constrain Air Quality Model Emissions Data w/ Remote Sensing

LMOS 2017 Study Period (May-June) OMI NO\(_2\) Column Assimilation

ListOS 2018 Study Period (June-Sept) TropOMI NO\(_2\) Column Assimilation

CMAQ Surface NO\(_x\) Emissions Adjustment

OMI NO\(_2\) results in ~4% reductions in CMAQ NO\(_x\) emissions in June 2017

TropOMI NO\(_2\) results in ~20% reductions in CMAQ NO\(_x\) emissions in July-Aug 2018
LADCO’s 1-2 Year Plan

• Continue to service our member state air quality planning needs
  • Build collaborations around the region to enhance our capabilities and services

• Modernize our decision support and data systems
  • Cloud-based computing
  • Interactive web-based analysis resources @ www.ladco.org
  • Driving applied research with remote sensing data and cutting-edge modeling technologies

• Enhance the National Air Pollution Training Program

• Continued advocacy for LADCO region on national initiatives
Summary

• LADCO is a hub for our member agencies to receive training and technical data/guidance to support their air quality planning goals
• LADCO does not provide policy guidance to our membership, only technical guidance and support
• Currently working on O₃ NAAQS and Regional Haze SIP support
• Ongoing efforts to modernize and improve our modeling systems and technology/knowledge transfer approaches to our members
• Continued engagement and advocacy on research and training projects
Questions and Contact

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Sleeping Bear Dunes, MI

Garden of the Gods, IL

Credit: NPS
Credit: Daniel Schwen