

Intermountain West Data Warehouse Overview and Data Products

Western U.S. TEMPO Early Adopters Workshop April 10-11, 2018 Fort Collins, CO















WAQS (Western Air Quality Study)

• State-of-the-art air quality modeling products to support studies assessing air quality in the intermountain west region

IWDW (Intermountain West Data Warehouse)

- Access to air quality monitoring data & air quality modeling platforms
- Project oversight and data request UI and tracking
- Online data visualization and evaluation tools

Monitoring Data

- Standard EPA networks (IMPROVE, NPS, AQS, CASTNet, NADP), Special Studies, RPOs & Local Agencies)
- Visibility, ozone and deposition summaries

Modeling Platforms

- WAQS sponsored PGM modeling
- WAQS derivative modeling studies
- Externally produced modeling platforms

Applications

- NEPA modeling studies (targeted for O&G development projects)
- SIP modeling for O3, PM and haze planning
- Research

Internal Analysis

- Monitoring Network Assessment
- Boundary conditions, winter meteorology and winter O3, source apportionment

Data, Tools and Resources



Bulk Data



Request Modeling Platform Data

Submit a request for IWDW modeling data by selecting modeling platform components and describing your intended use of the data.

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Get Monitoring Data

Use the Database Query Wizard to selectively download data and metadata from the integrated monitoring database by specifying datasets, sites, parameters, date ranges, and other criteria.

Monitoring Data Tools



Visibility Summary

View line and bar charts of deciview trends and aerosol haze budgets on the clearest and haziest days based on data from the IMPROVE Aerosol monitoring network.



Ozone Summary

View line and bar charts of the 4th Highest 8-Hour Daily Ozone Average, the W126 Exposure Index, and the SUM06 Exposure Index based on data from the EPA's Air Quality System (AOS).



Wet Deposition Summary

View line and bar charts of wet nitrate, wet ammonium, and wet sulfate trends and composition based on data from the National Atmospheric Deposition Program (NADP).



Dry Deposition Summary

View line and bar charts of dry nitric acid, ammonium, nitrate, and sulfate trends and composition based on data from the EPA's Clean Air Status and Trends Network (CASTNet).

Modeling Data



Modelina Studies

View a high level listing of modeling studies housed in the Data Warehouse.



Modeling Platforms

View 3SAQS/WAQS modeling platform. File browser allows file level examination of platforms components. Listing include platform components for the 2008b, 2011a, and 2011b modeling platforms.

Reference Documentation



Data Documents

Literature

View a list of key documents that describe the modeling platforms and monitoring data supported by the warehouse.



Project Documents

Links to documents that describe the IWDW-WAQS Project, including objectives and policies. Access is restricted to IWDW-WAQS Project Cooperators.

Publications relevant to emissions inventories and air quality studies in the Intermountain West.

Modeling Data Tools



Model Performance Evaluation Plots View a wide variety of scatter plots, soccer plots, bar charts, and maps demonstrating model performance for several modeling scenarios in the Three-State Air Quality Study (3SAQS).



Model-To-Observation Comparison Tool View network-wide and site-specific time series charts of modeled and observed parameters from several different air quality monitoring networks in the Intermountain West region.



Source Apportionment Visualization Tools and Resources Links to Visualization Tools for 2008b, 2011a and 2011b based Source Apportionment tools; Source Apportionment data download and documentation.

Emissions Data Tools



Emissions Review Tool View charts and graphs of annual emissions totals for States, Counties, and Source Classification Codes (SCCs) from several different 3SAQS modeling scenarios.



Emissions Review Map View spatial display of annual emissions totals for States, Counties, and Source Classification Codes

Metadata Tools



Monitoring Site Browser

View the locations of monitoring sites and explore monitoring site metadata for all the available monitoring networks in the IWDW database using an interactive map.

Community and Support



Forums

Review announcements, ask questions, have discussions, and browse topics and threads relevant to data warehouse contents and operations.



Browse a growing repository of supporting documentation and information regarding modeling platforms, modeling protocols, air quality studies, projects, procedures, and processes that are relevant to the warehouse.



View a list of dated updates to modeling data components, warehouse wiki pages, and study documents



Site Index Index of IWDW Website and IWDW-WAQS Wiki



Citation Formats

Examples of how to cite modeling platform and observational data obtained from the IWDW.



Monitoring Site Browser



Air Quality Monitoring Data

- Monitoring site metadata
- Raw data from AQS and other sources
- Data products

Relevance to TEMPO

- Monitor locations, sampling frequency
- Ground level concentration validation

Ozone Metrics Summary



Ozone Trends 0



- <u>Modeling Platform</u>: All data and software tools associated with a photochemical grid modeling (PGM) project
 - Scripts and software
 - PGM Input Data
 - Meteorology
 - Unprocessed and model-ready emissions
 - Initial/boundary conditions
 - Ancillary data
 - PGM Output Data
 - Concentrations
 - Deposition
 - Visibility metrics
 - Model-obs pairs
 - Special Study Data





Oil & Gas Area Sources

Nonroad Mobile
Prescribed Burning

Oil & Gas Point Sources

Wildfires

Residential Wood Combus





Nonpoint Sources

Agricultural Fires

Highcharts.com

Refueling

Emissions

- Online tools show processed county level emissions by chemical species and source sector
- Includes area and point sources
- Displays for gridded 'model-ready' emissions also available

Relevance to TEMPO

- Address discrepancies between top-down and bottom-up emissions inventories
- Inform development of ancillary data for PGM

- WAQS Modeling Platforms
 - WRF meteorology data
 - SMOKE-processed emissions: NEI + regional oil and gas + regional natural (fires, biogenic, lightning)
 - WAQS Photochemical Grid Modeling
 - 2008: 36/12km CAMx simulation with a 2020 future year
 - 2011: 36/12/4km CMAQ and CAMx simulations with a 2025 future year
 - Sensitivity study data by request
 - 2014: in progress



IWDW-WAQS nested 36/12/4 km WRF/CAMx and CMAQ domains





- External Modeling Platforms
 - WestJumpAQMS (2008, archive)
 - CARMMS (v1.0, 2011 Base Case, 2021 Planning)
 - SNMOS (2011 Base Case, 2025 Planning with SA Tools)
 - Denver/NFR O3 SIP (2011 Base Case, 2017 Planning w/ SA Tools)
 - EPA national air quality transport analysis
 - 2011v3 base case
 - 2023 ozone transport
 - 2028 Regional Haze contribution analysis (pending)
 - EPA national WRF/MMIF for AERMOD (2013, 2014, 2015)
 - 2016 Collaborative (2014, 2015, 2016)
 12km CONUS



SNMOS 12/4-km Modeling Domains



Modeling Data Tools

- Data visualization
- Model performance evaluation (AMET) 'modelto-obs'
- Source apportionment
- Data request UI and file server

Relevance to TEMPO

- Leverage gridded data display tools
- Comparisons to Observations



August 1,2011 0:00:00 Min= 0 at (1,1), Max= 93 at (215,133)

Daily Max O3

04km Western US WAQS CAM× Base11b

281

Modeling Data Tools

- On-line displays of gridded data (example shows WAQS 2011b CAMx 12km, July 1 hr 0, ground level ethane)
- Hot-spots show fires and O&G development basins
- Additional Displays
 - gridded met., emissions
 - raw & processed PGM (e.g. column totals)
 - PGM results matched to AQ observations
 - regulatory AQ metrics (e.g. 4th highest 8-hr O3, 12-hr NO2 preceding 8-hr O3)



Modeling Data Tools

• WAQS 2011b CAMx 12km, Jan. 1, ground level ethane



Modeling Data Tools

 WAQS 2011b CAMx 12km, Jan. 1, ground level formaldehyde



Modeling Data Tools

• WAQS 2011b CAMx 12km, Jan. 1, ground level NO2



Modeling Data Tools

• WAQS 2011b CAMx 12km, Jan. 1, ground level ozone





TEMPO and IWDW-WAQS Synergies

Remote Sensing Data

- Provide easily accessible remotely-sensed land use/cover data
- Access to "actual" remote sensing data at high spatial and temporal resolution

Monitoring data

- Monitor locations/sampling frequencies
- Ground truth remotely sensed data using AQ observations

Emissions Processing

- Address discrepancies top-down vs. bottom-up emissions inventories
- Inform development of spatial and temporal surrogates used to downscale area EIs

AQ Modeling

- Compare model outputs to TEMPO data (e.g. primary and secondary AQ species)
- Visualization tools for raw and processed emission and PGM outputs



IWDW Website: http://views.cira.colostate.edu/tsdw/

IWDW Description and Background: http://views.cira.colostate.edu/tsdw/About

IWDW Data and Tools: http://views.cira.colostate.edu/tsdw/Data

IWDW Resources: http://views.cira.colostate.edu/tsdw/Resources

IWDW Wiki: http://vibe.cira.colostate.edu/wiki

IWDW Forums: http://views.cira.colostate.edu/tsdw/Forum