EPA Contributions to CDC Environmental Public Health Tracking (EPHT) Network

Activities and Next Steps

May 2007

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Office of Research and Development

Briefing Purpose

Provide background on EPA-CDC collaborative activities on EPHT

Describe air quality data being developed by EPA for use in EPHT

Overview

ORD & OAQPS will be developing air quality measures for CDC/others.

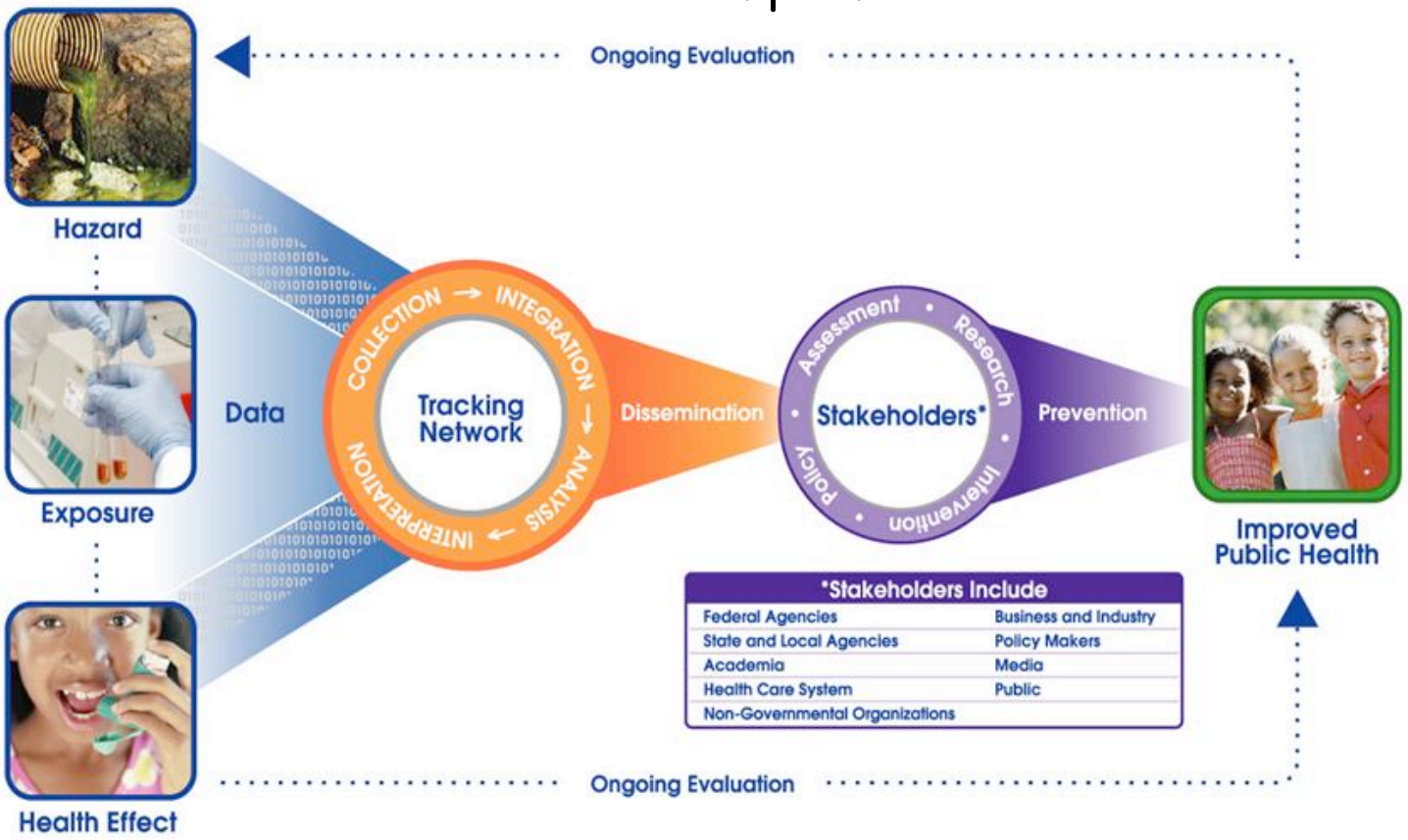
Scientific basis and regulatory decisions for improved air quality

Relating air quality changes to health outcomes: OAQPS Accountability, PM centers, HEI, CDC/EPHT, NERL/NHEERL

Evaluation of scientific basis and regulatory decisions

Environmental Public Health Tracking

National Network Implementation Plan



DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER • HEALTHIER • PEOPLE

Synopsis of Main EPA-CDC Activities

- EPA-CDC partnerships –
  - Existing MOU between EPA and CDC
  - Connections between EPA Report on the Environment & CDC Indicators
  - PHASE (Public Health Air Surveillance Evaluation) Project
- In PHASE, EPA engaged pilot projects with CDC and State public health agencies to link air quality data with health outcome data.
- PHASE implementation being developed through the EPA's Advanced Monitoring Initiative project
- CDC and EPA have discussed an IAG to operationalize developing, delivering and studying air-related exposure measures.
  - Resources from CDC to EPA for air quality data.
  - Specific working relationships established through IAG to define routine operations and additional research collaborations.

Public Health Air Surveillance Evaluation

PHASE Partners and Initial Outcomes

- Partner states - Maine, New York , Wisconsin
- PHASE products/outcomes:
  - EPA (& state) investigation of novel air quality estimating technique - EPA delivered monitor, CMAQ and fused AQ data
  - Study of "case-crossover" method with "how to" guide
  - Multi-state comparisons of AQ-health associations
  - Interactions with state public health agencies - Example of effective interagency collaboration
- Associations (preliminary) between AQ (8-hour O_3 and $PM_{2.5}$) and asthma, and AQ ($PM_{2.5}$) and myocardial infarction through case-crossover analyses

What did EPA provide?

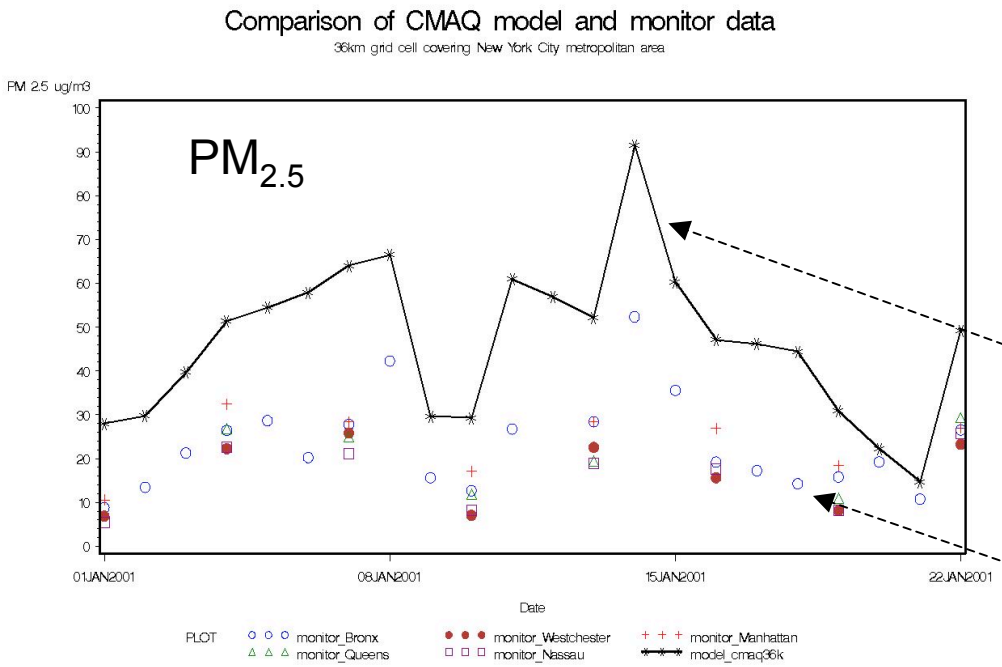
- Air quality data for Maine, New York and Wisconsin (2001):
  - Ozone and $PM_{2.5}$ ambient data (with training)
  - CMAQ prediction at 36km
  - Eastern U.S. 36 km gridded AQ surfaces – interpolated and "statistically combined" estimates
  - Eastern U.S. 12 km gridded AQ surfaces – interpolated and "statistically combined" estimates
- Support on development of health analyses and interpretation of associations between AQ and health data

Improved Spatial Prediction with Combined Sources of Data

- Observational data (AQ and MODIS) and model results (CMAQ) can be used simultaneously to predict the pollutant surface (i.e., continuous gridded concentration field)

- Draw on strengths of each data source:
  - Give more weight to accurate monitoring data in monitored areas
  - Rely on model output in non-monitored areas
  - Statistically model underlying spatial and temporal dependence, and measurement errors of each data source

- Leads to more accurate daily predictions and provides prediction errors



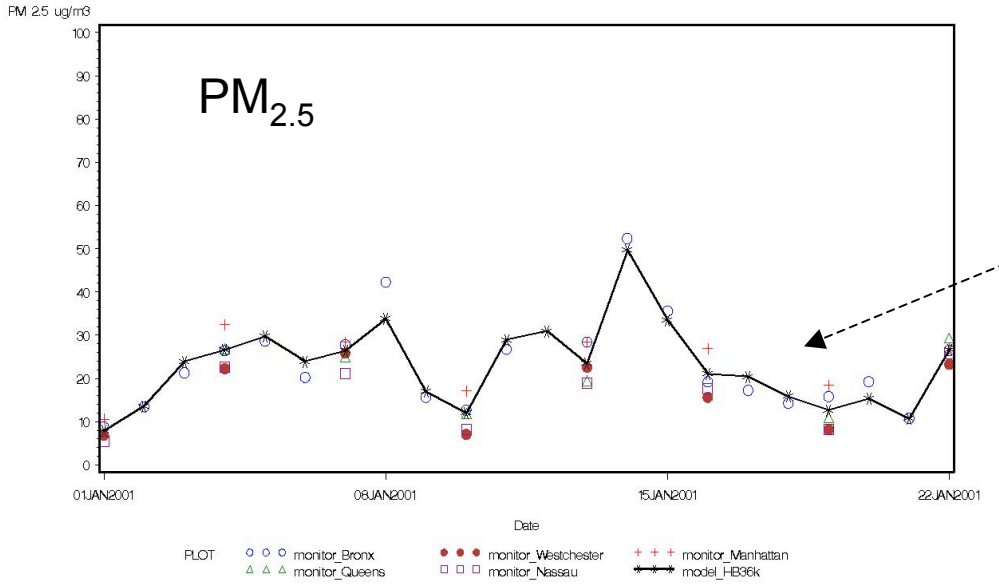
Improving the quality of observations or modeled results in isolation through "fusion" techniques.

CMAQ Prediction

(line)

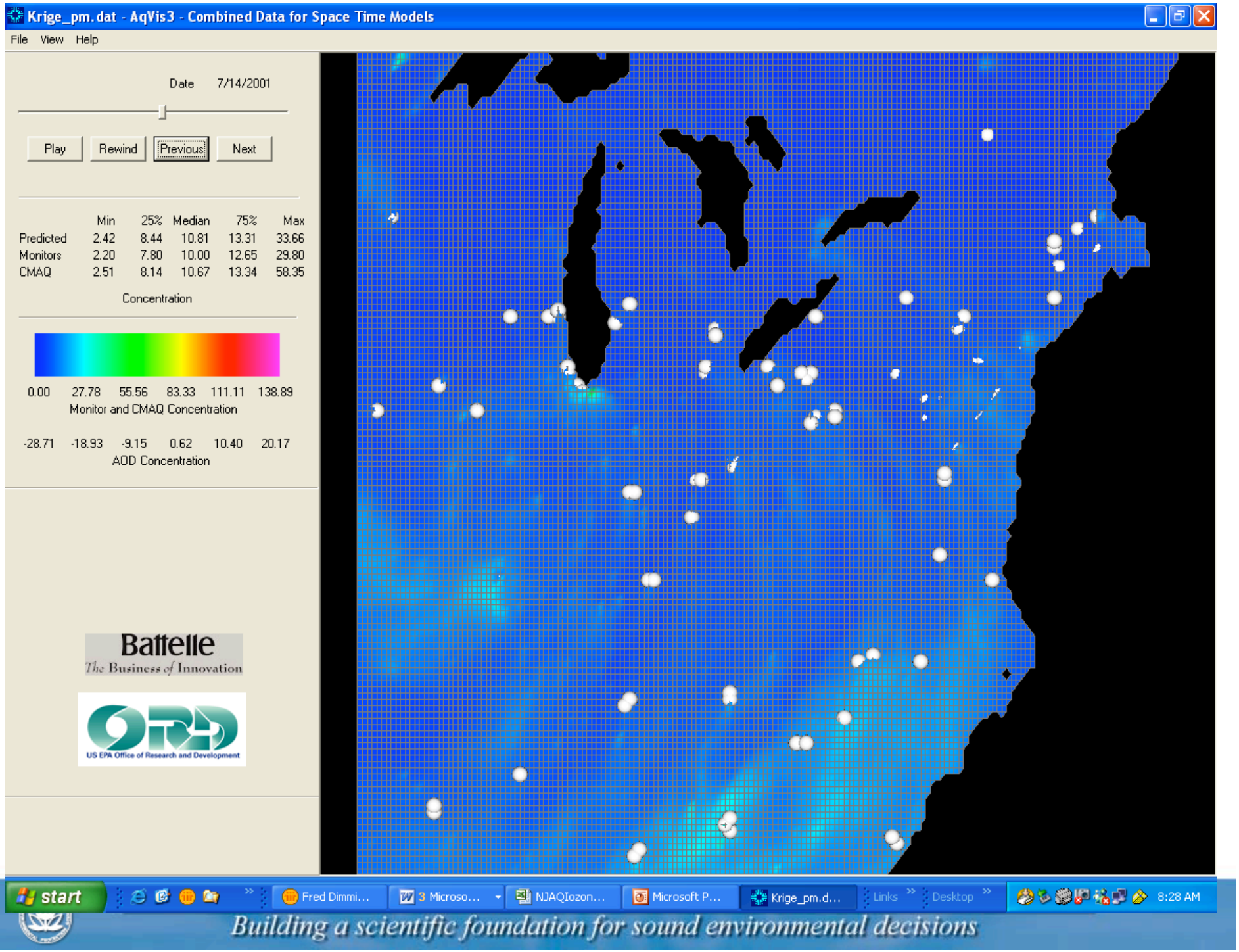
AQ Monitoring Data

(various points)



After application of statistical combination technique

Displays of Air Quality Estimates Based on Statistical Combination Technique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Monitors 2.20 7.80 10.00 12.65 29.80
CMAQ 2.51 8.14 10.67 13.34 58.35
Concentration
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The Business of Innovation
US EPA Office of Research and Development
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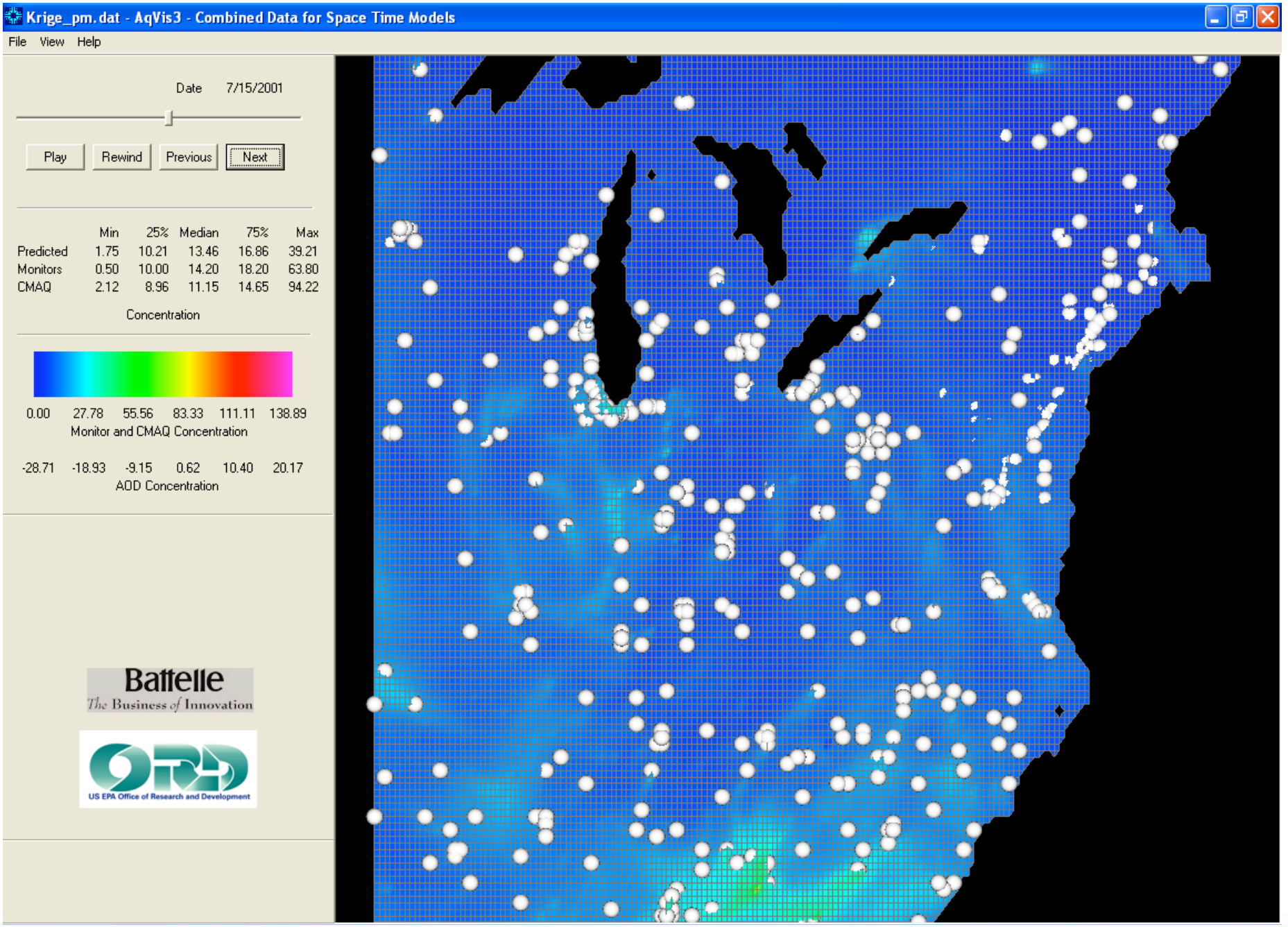
Building a scientific foundation for sound environmental decisions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Monitors 0.50 10.00 14.20 18.20 63.80
CMAQ 2.12 8.96 11.15 14.65 94.22
Concentration
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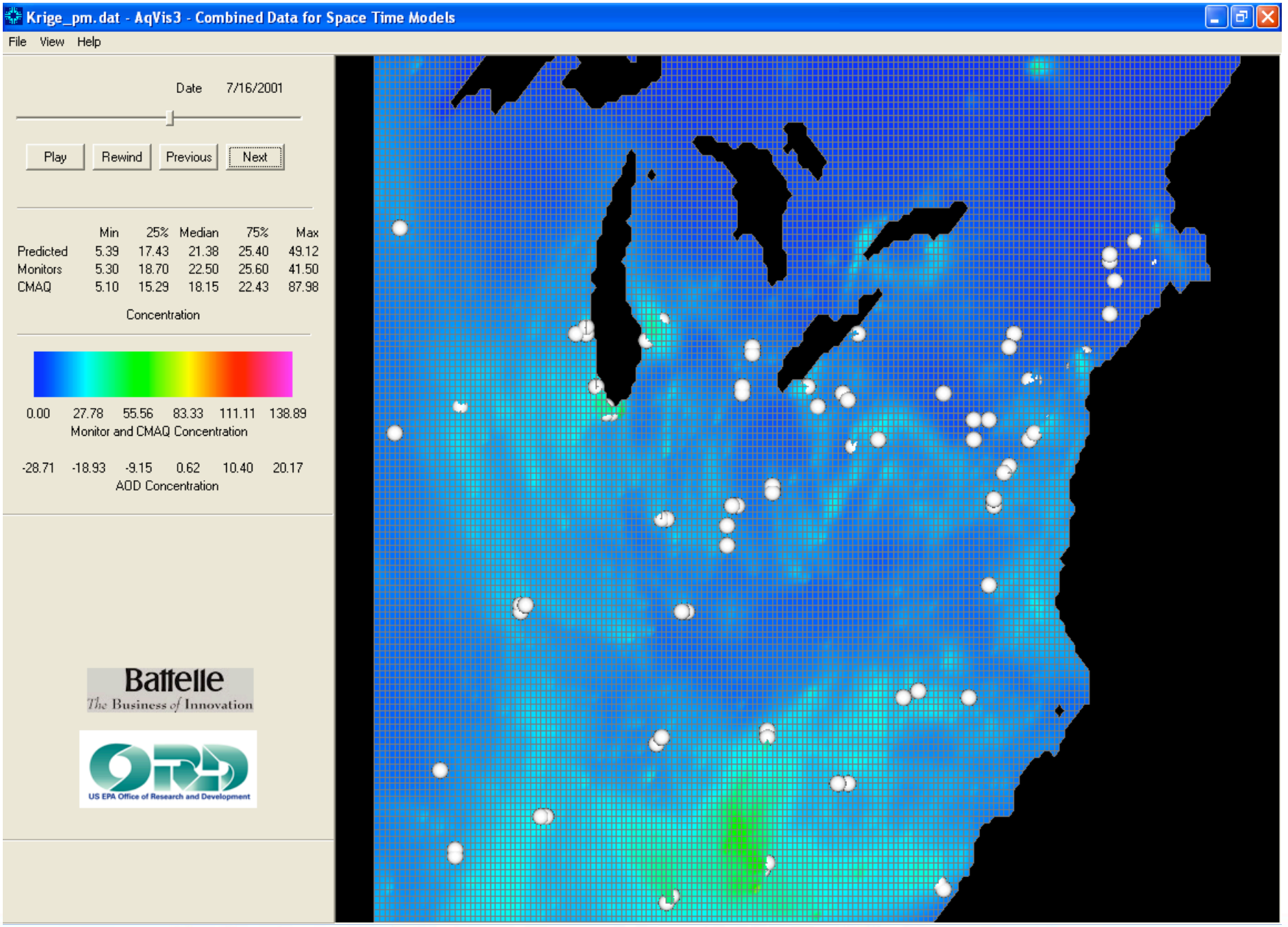
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Monitors 5.30 18.70 22.50 25.60 41.50
CMAQ 5.10 15.29 18.15 22.43 87.98
Concentration
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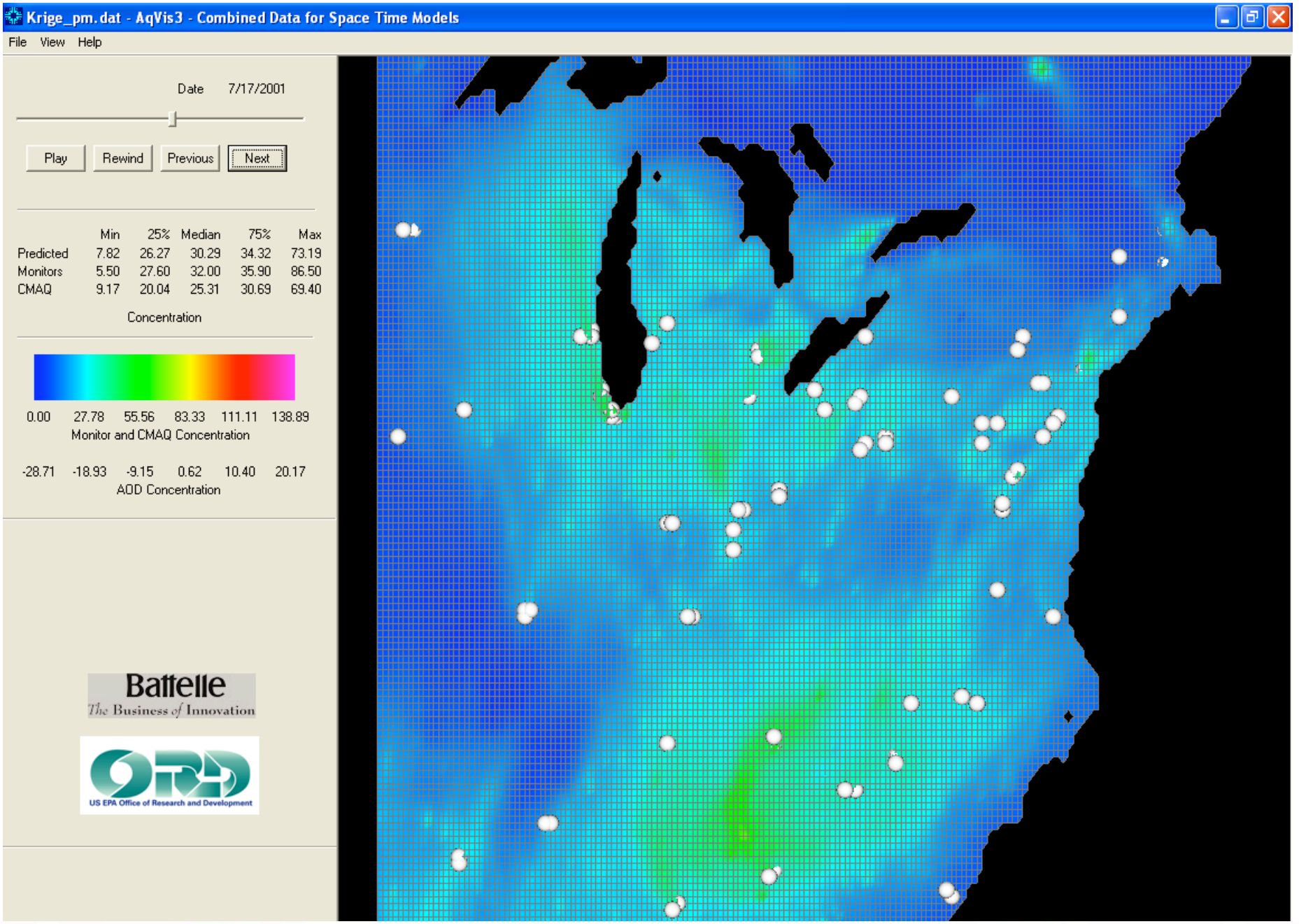
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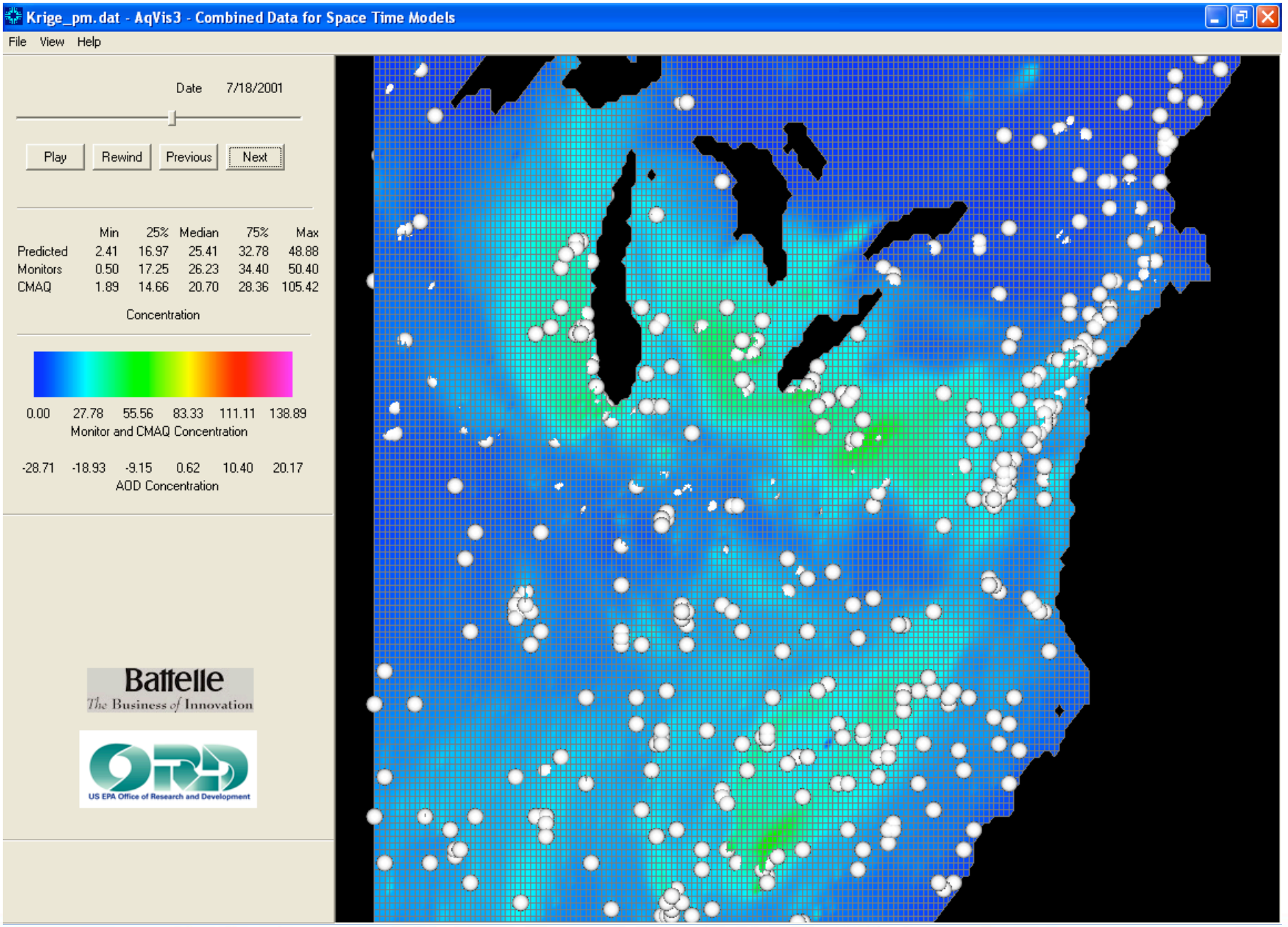
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Monitors 0.50 17.25 26.23 34.40 50.40
CMAQ 1.89 14.66 20.70 28.36 105.42
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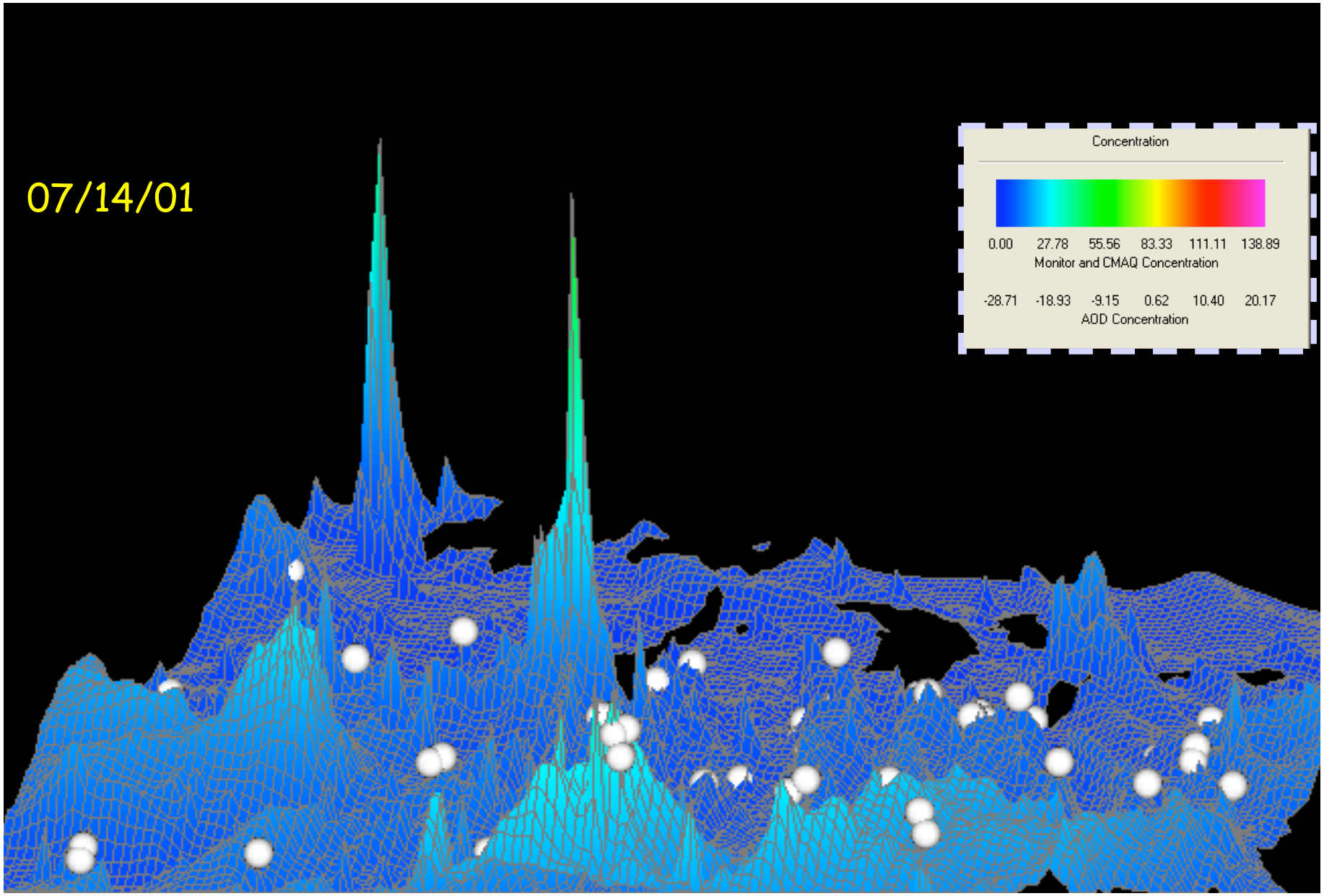
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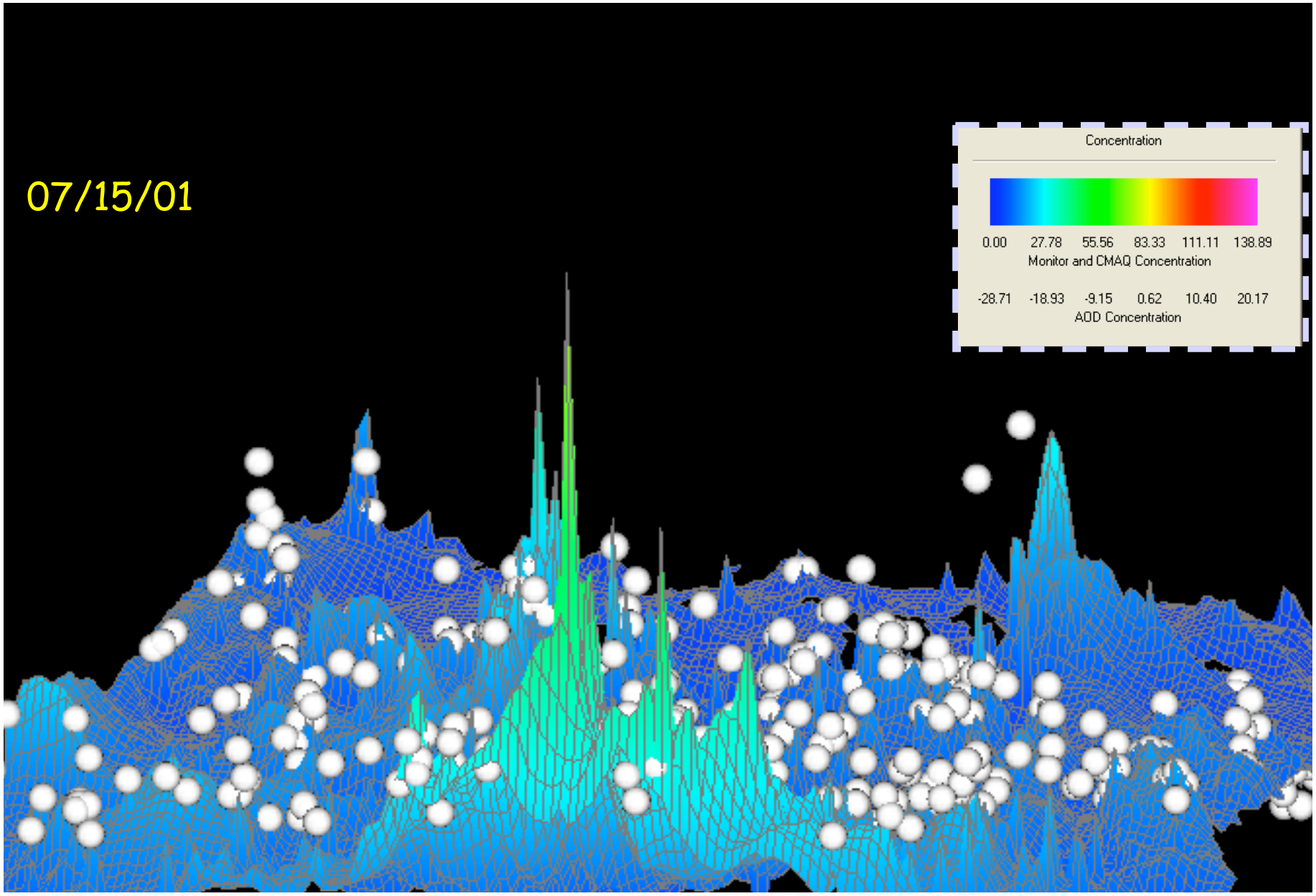
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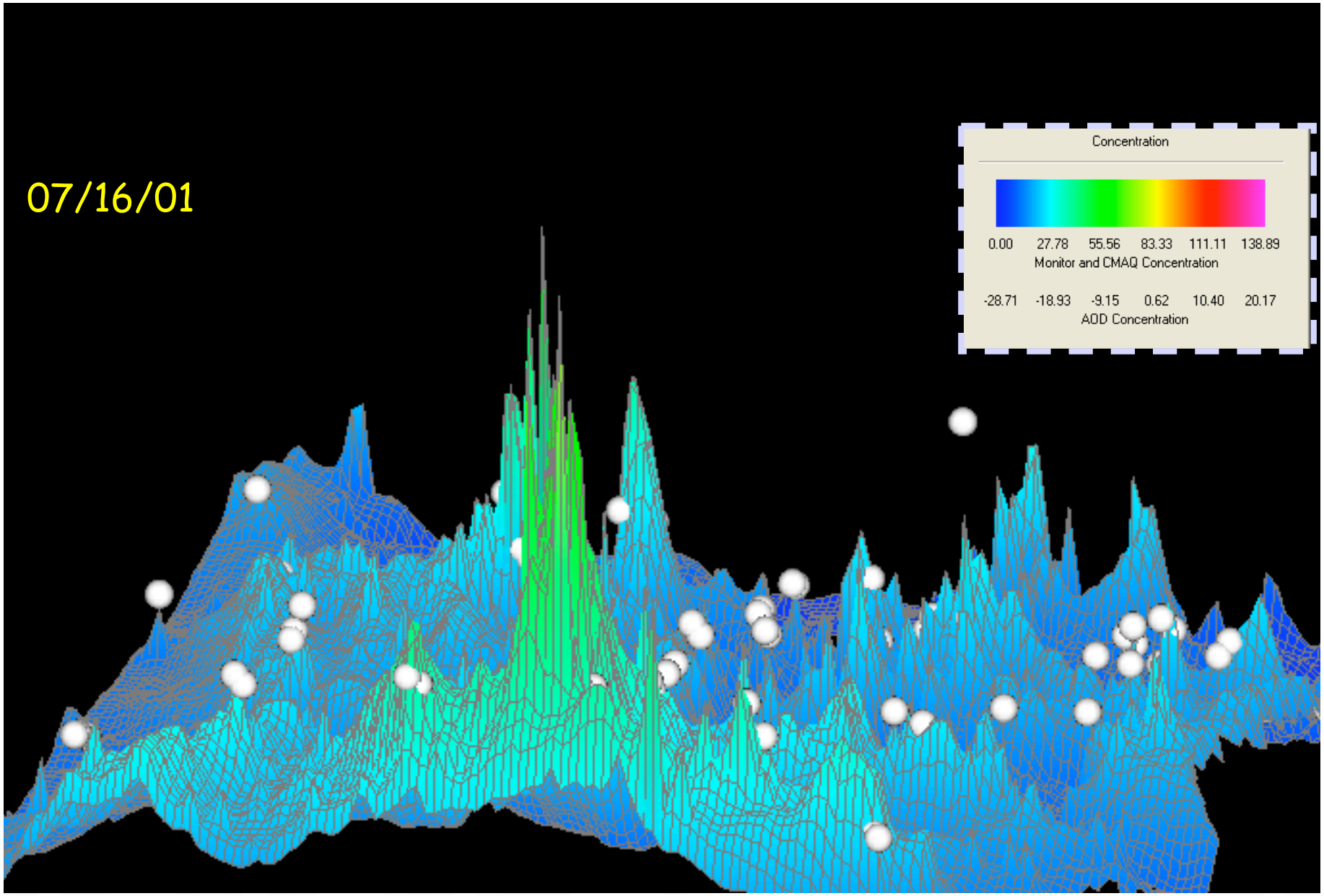
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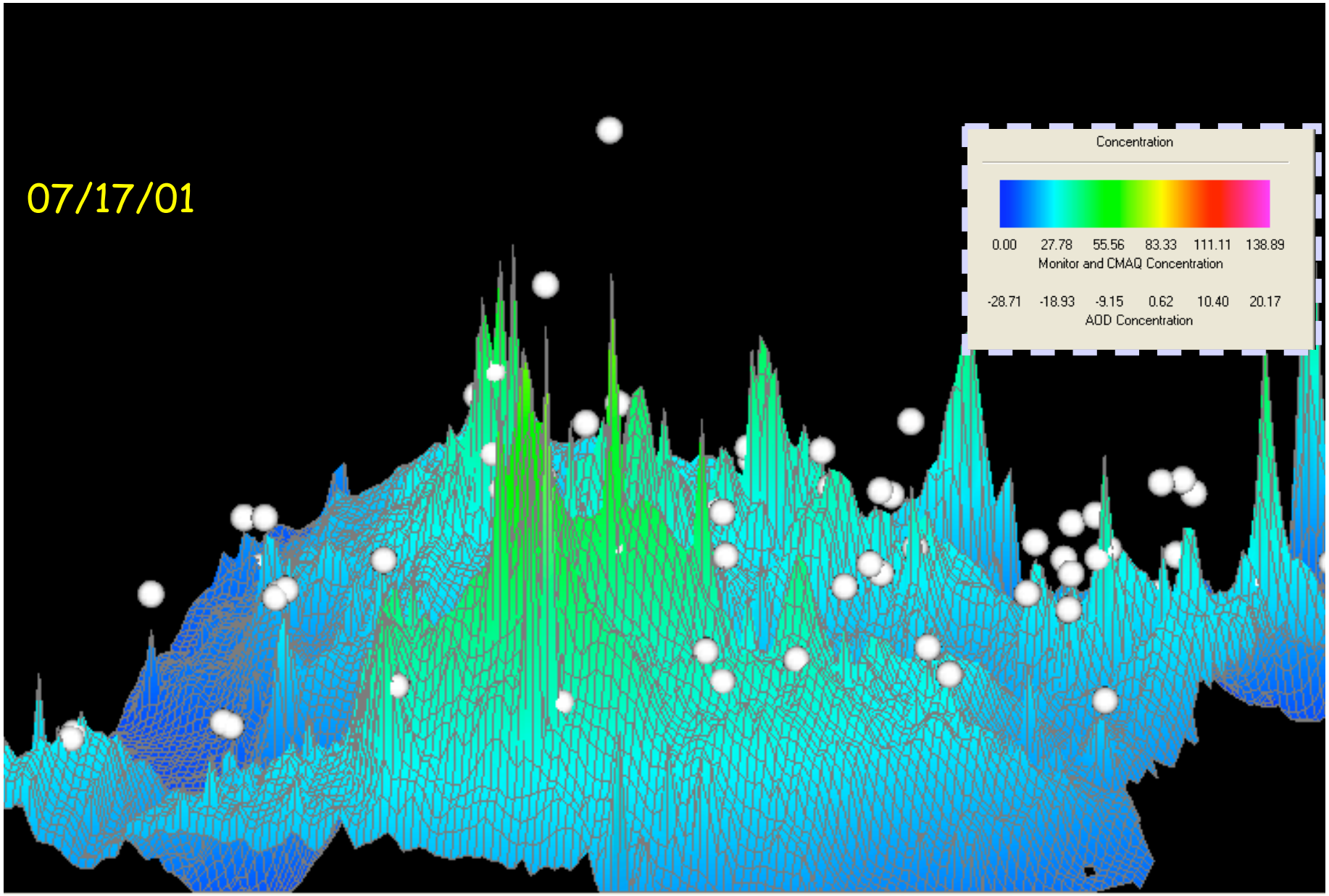
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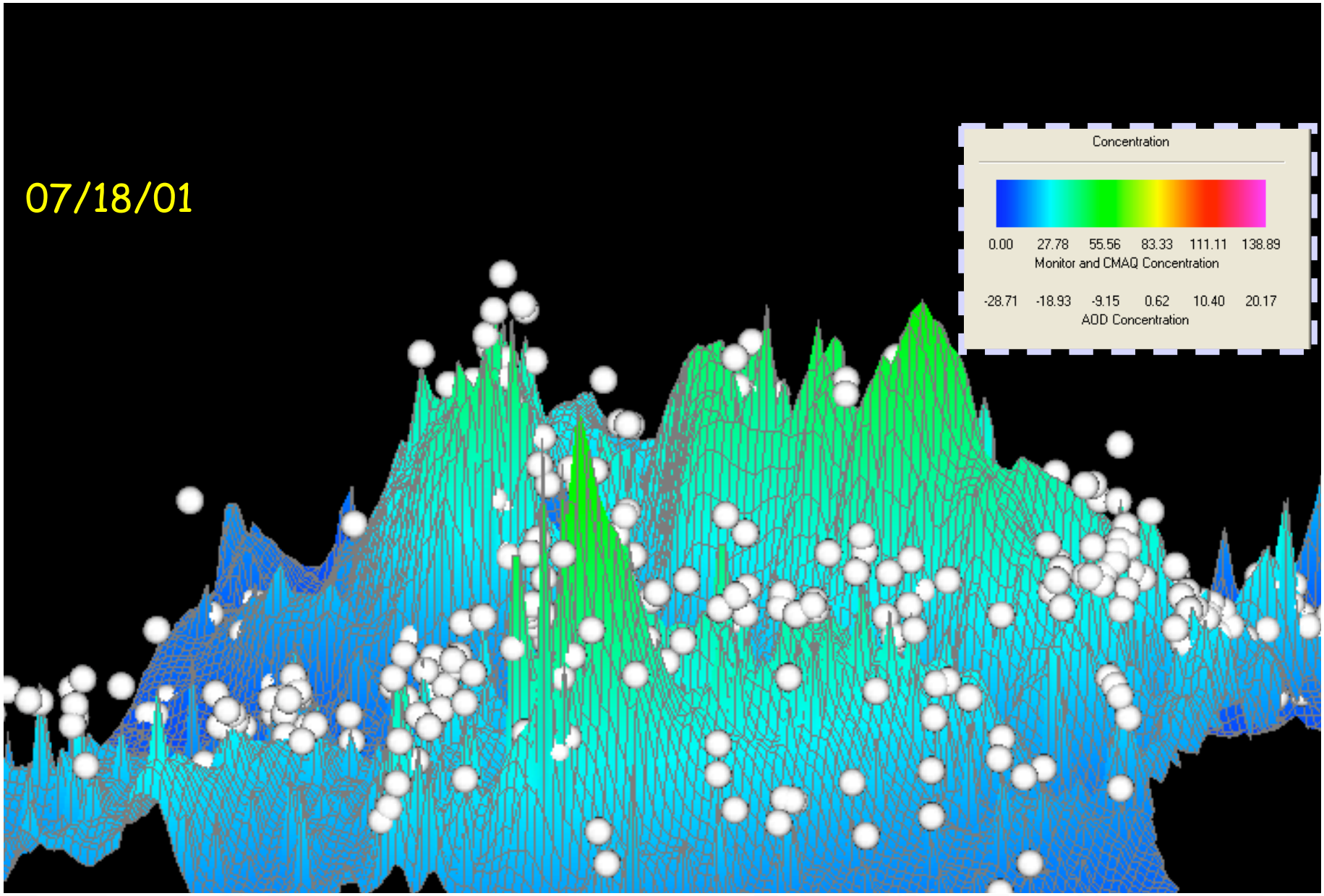
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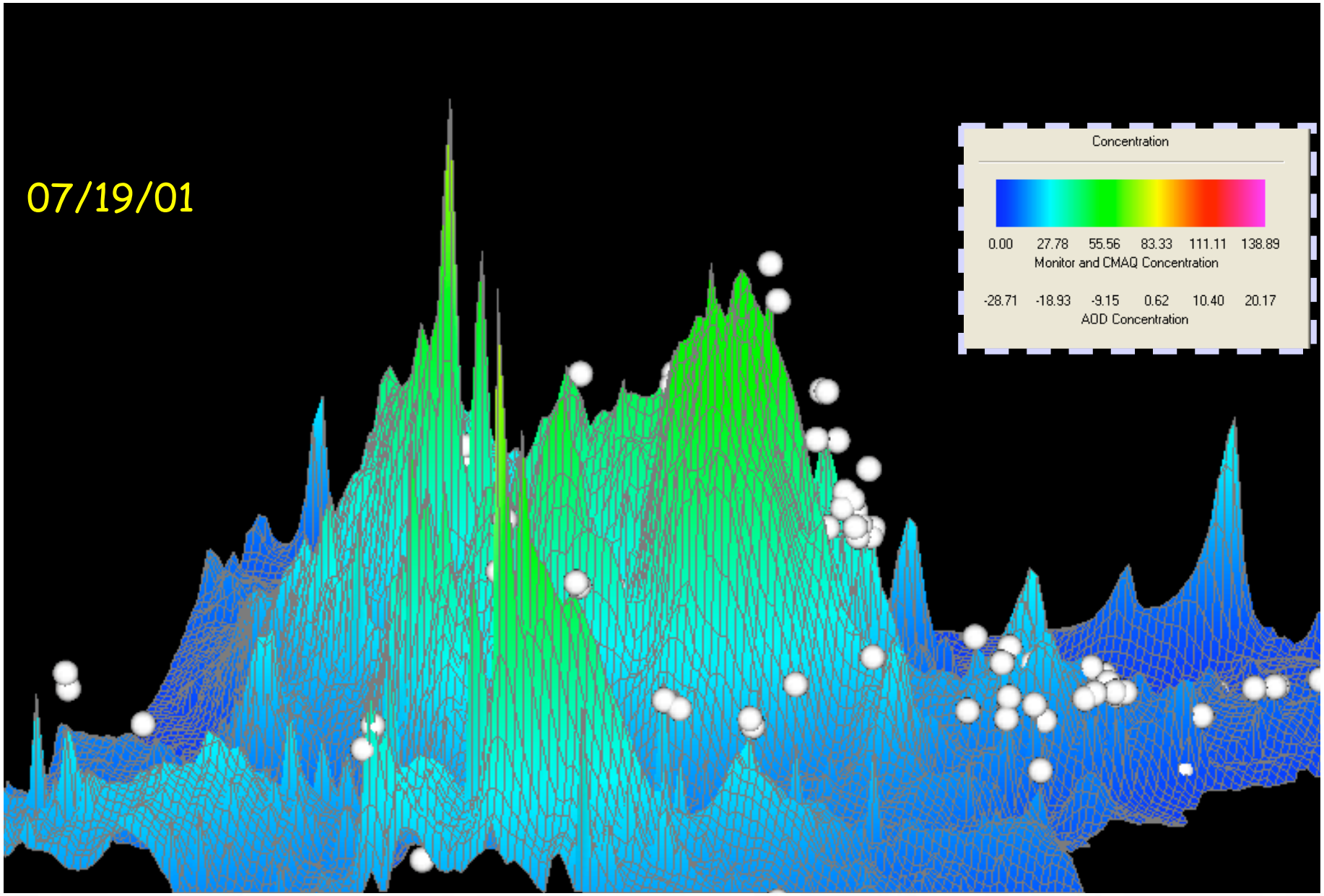
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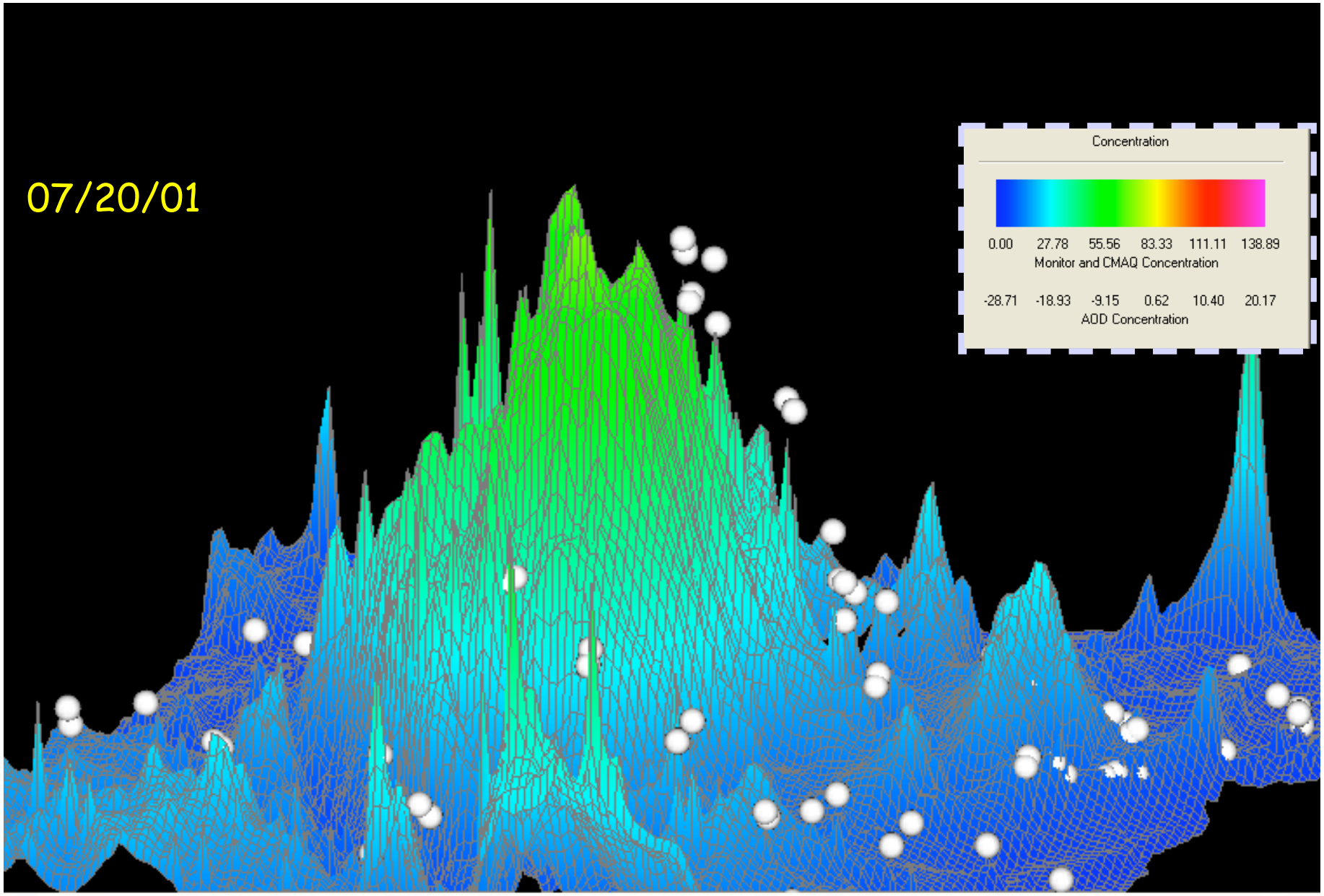
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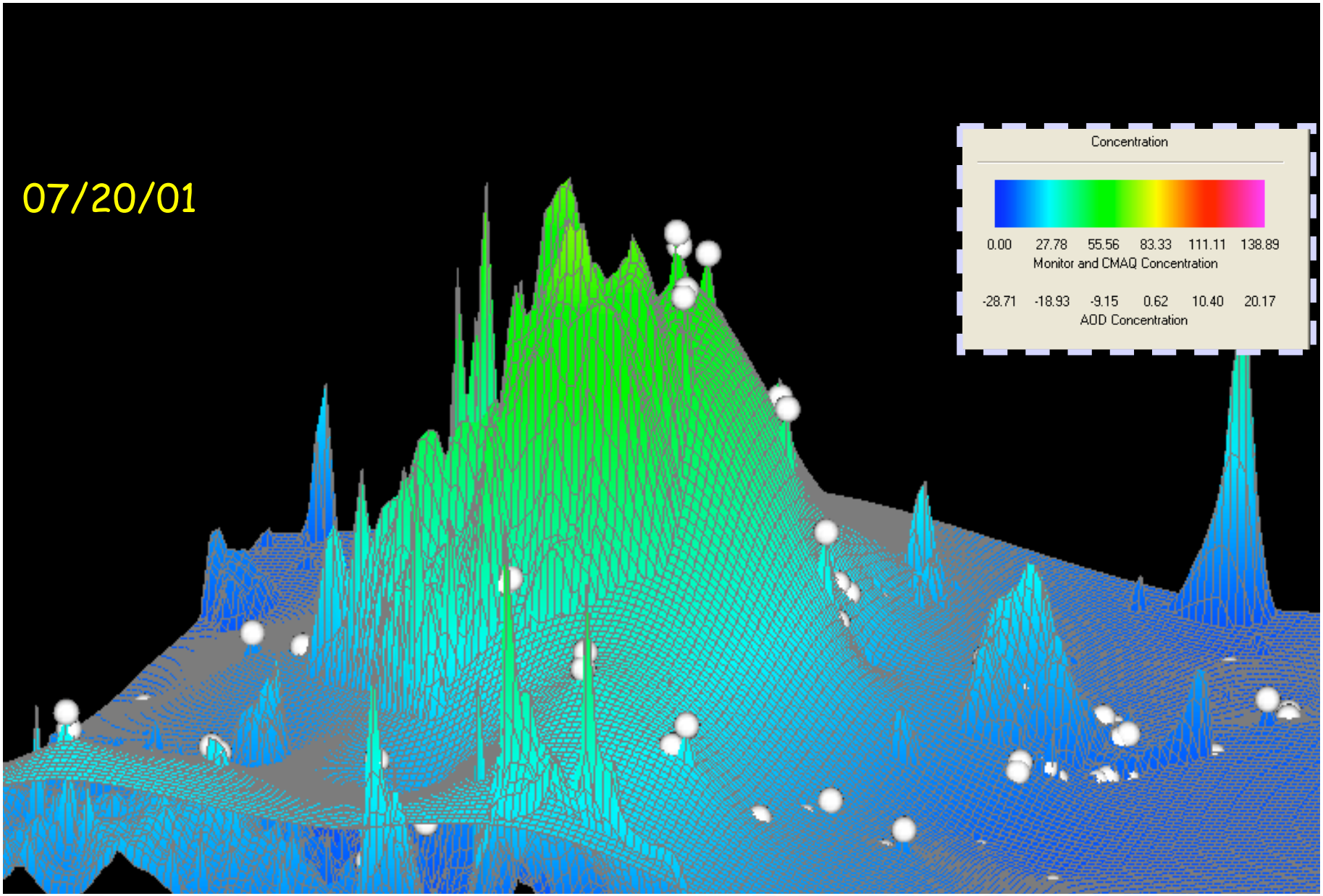
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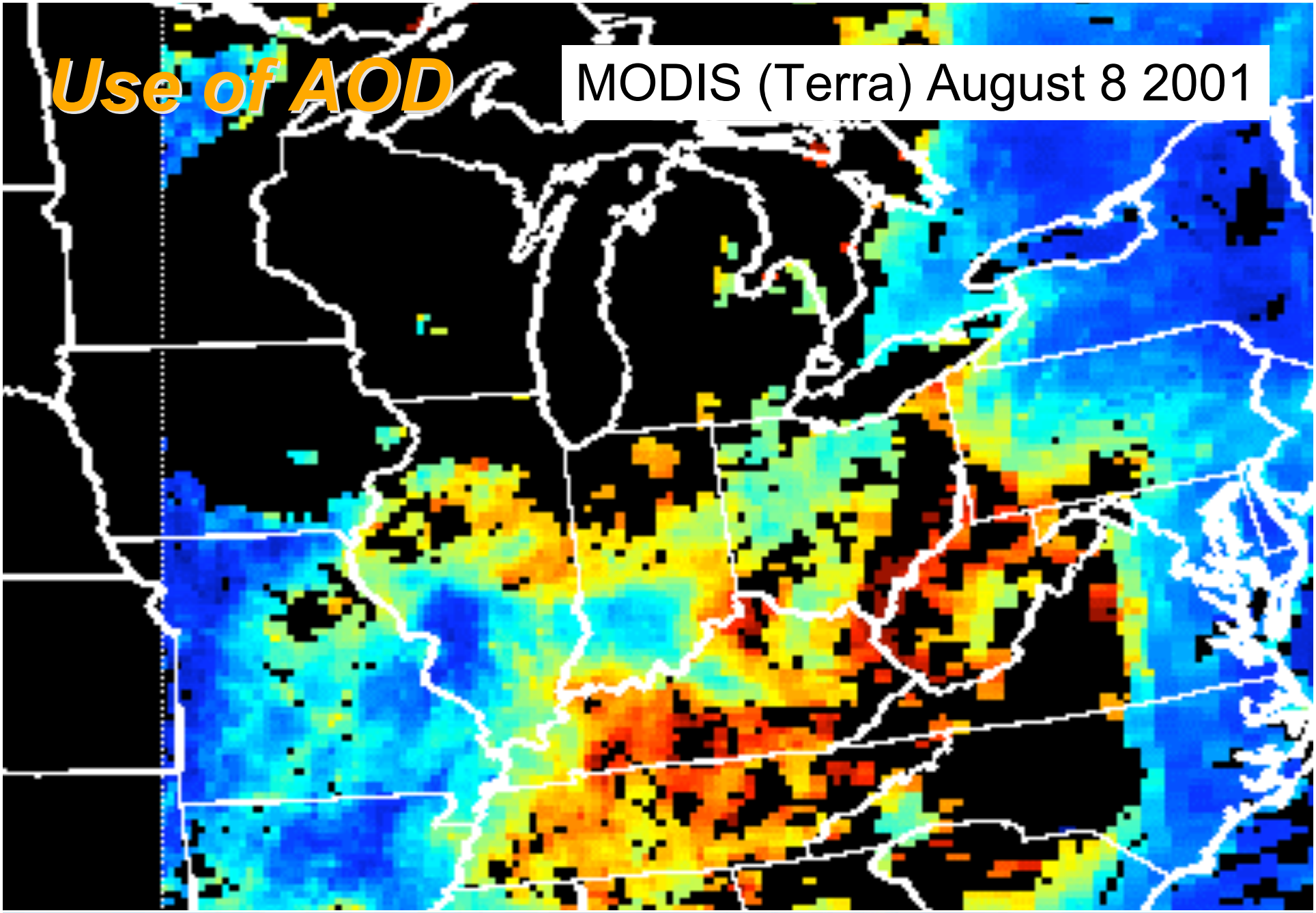
AOD Concentration

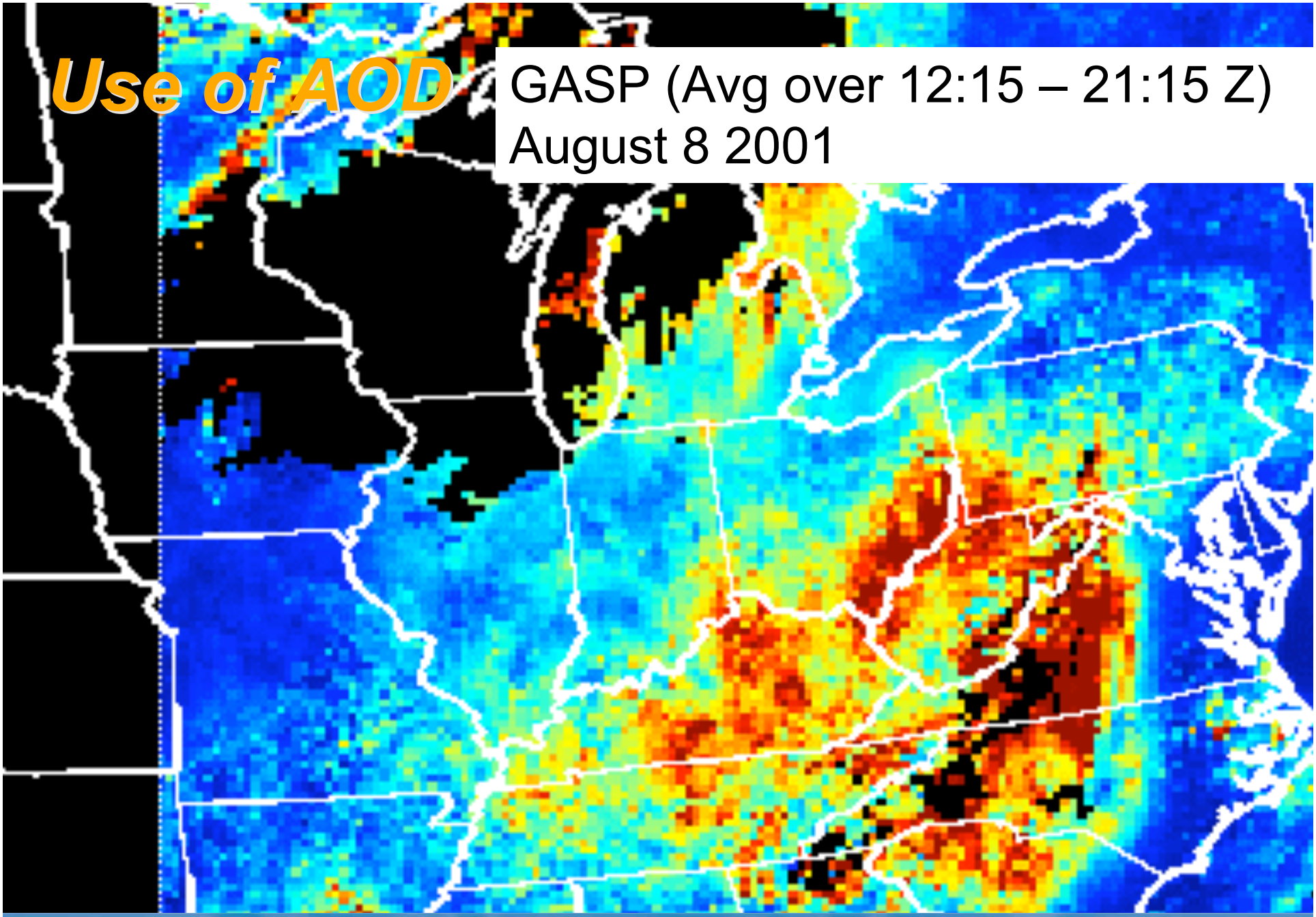
Use of AOD

- Initial attempts use MODIS AOD as independent surface – spatial variable
- “Missing data” limit improvement in predictions
- Considering model changes and GASP AOD

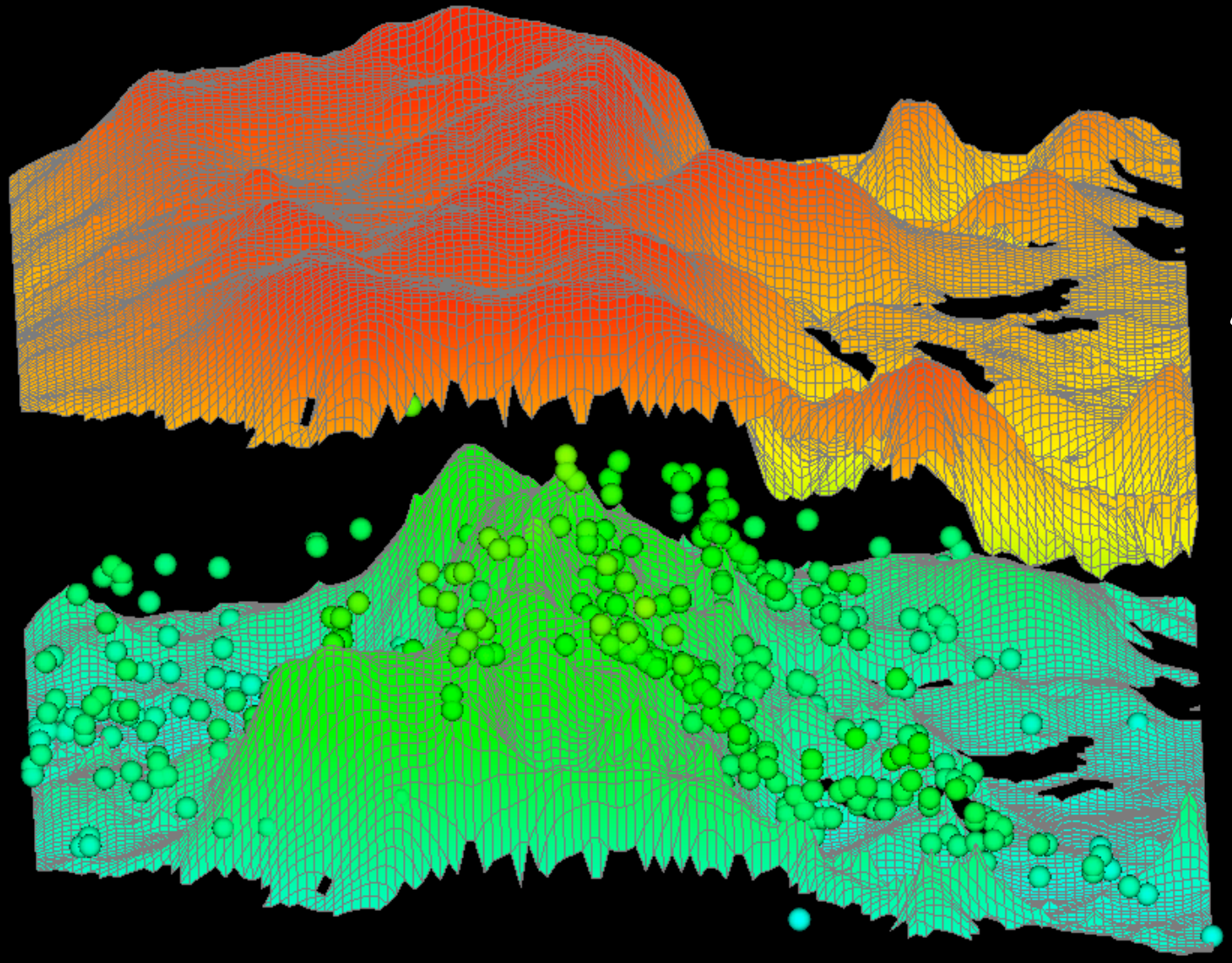
Use of AOD



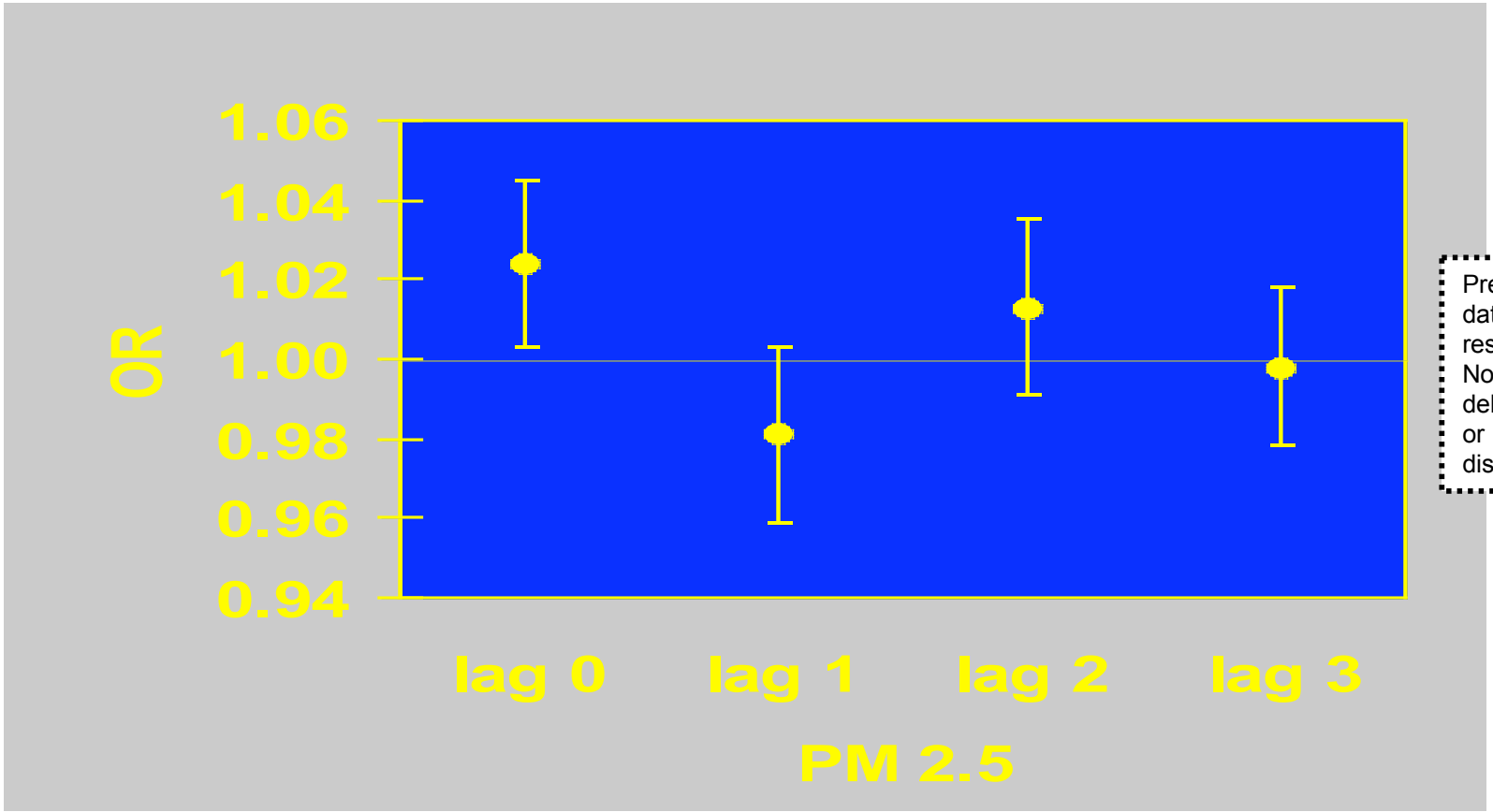
Use of AOD



AOD & Predicted Surfaces



EXAMPLE -- Association Between Myocardial Infarction Hospitalizations in 2001 and $PM_{2.5}$ Bayesian Estimates

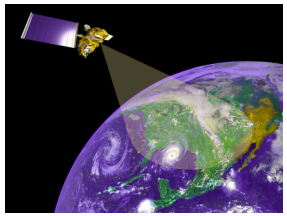


Preliminary data and results. Not for deliberation or distribution.

Four day distributed $PM_{2.5}$ model, controlling for temperature, humidity, and barometric pressure
Odds ratios per 10 ug/m3 PM2.5 (95% CI)

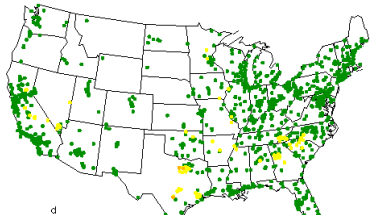
Current Effort: Advanced Monitoring Initiative

PHASE Toolkit Being Built to Develop Fused AQ Estimates Routinely



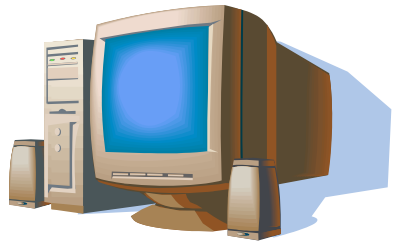
OEI – NASA & NOAA

Satellite



AQ Monitors

OAQPS - states



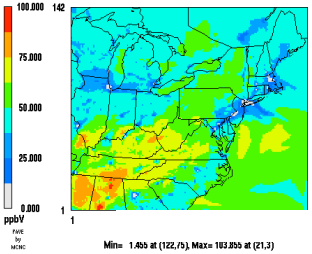
Statistical Tool (HB)

David Holland – science

(?) – manage process

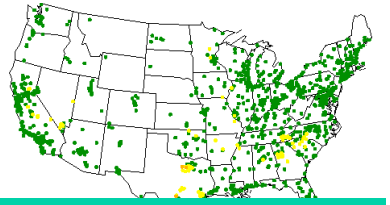
$PM_{2.5}$
Ozone
Fused
Data
Via
OEI
CDX

OEI



CMAQ

AMD & OAQPS



AIRNow Monitors

OAQPS - states

Exposure Measures

Janet Burke

- Housing stock
- Seasonal Activities

Metadata

- Basic tool description
- Special data flags, cautions

EPHT - CDC

States – Academia – EPA studies

Time Line for Potential Involvement

- Develop IAG
  - EPA & CDC discussing
  - Would provide data not now available
- Final data for 2001 being produced
- Next air quality data (rough estimate):
  - 2001- 2002 : preliminary this summer with peer review by fall 2007
  - 2005 : early 2008
  - 2003 & 2004 : being planned

Long-Term Outcomes from Activity

- Fused data provide spatially and temporally enhanced air quality data – advancing a new data type for use in exposure studies.
  - 365 days/year; consecutive years; across the US
  - Completes year by year CMAQ – has been every third year
- Consistent data base to link source-air-exposure-health effects.
  - Responsive to NRC recommendations for improving US air program.
  - Forms baseline for gene-environment studies with Harvard.
- Potential for:
  - Provide basis for large scale epidemiological assessments.
  - Support for areas with large spatial gaps between monitors: data for PM Centers, Academia, States, Tribes.
  - Expanded connections between air program and public health departments.
- Public Health Departments Communicating on the Relevancy of Air Quality Issues Within Their States

Questions ?