Characterizing Air Quality for Environmental Public Health Tracking

"Many Voices - One Vision"

Environmental Public Health Tracking Conference

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Presentation Overview

- EPA Perspective

- What air quality data is available?
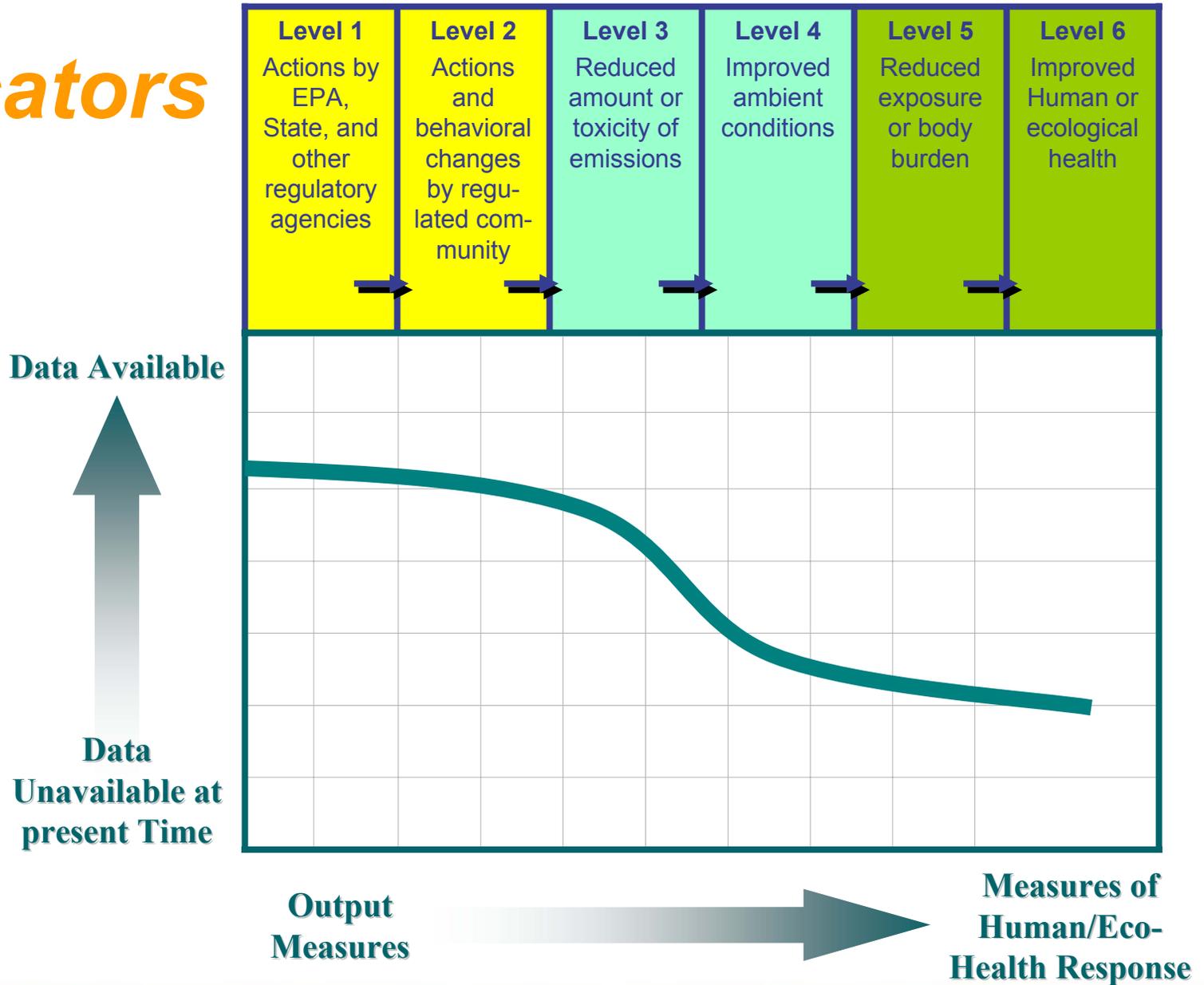
- CDC-EPA Pilot Project

EPA's Mission

- "To protect human health and to safeguard the natural environment — air, water, and land — upon which life depends."

- How do we measure our effectiveness?

Indicators

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Actions by EPA, State, and other regulatory agencies	Actions and behavioral changes by regulated community	Reduced amount or toxicity of emissions	Improved ambient conditions	Reduced exposure or body burden	Improved Human or ecological health

Data Available

Data Unavailable at present Time

Output Measures → **Measures of Human/Eco-Health Response**

EPA's Draft Report on the Environment 2003

- How can we measure the success of policies and programs to protect health and the environment?

- Describes what EPA knows - and doesn't know

  - Identifies measures/indicators to report on the status and trends and, where possible, their impacts on human health and the environment; and,

  - Discusses the challenges that the nation faces in improving these measures.

What does the Report on the Environment say about Air?

- "In general, there are some very good measures of outdoor air quality."

- However . . . "There is a need for measures to compare actual and predicted human health and ecological effects related to exposure to air pollutants."
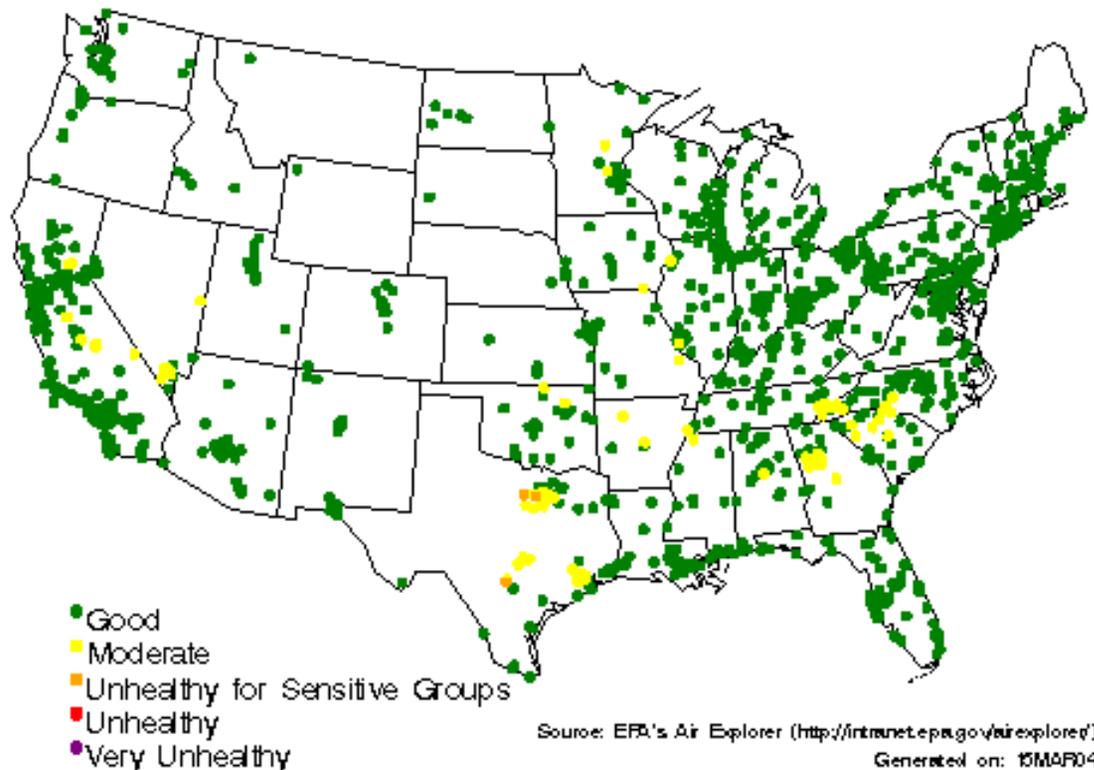
Sources of Air Quality Characterization Data

- Ambient Air Monitoring

- Satellite Data
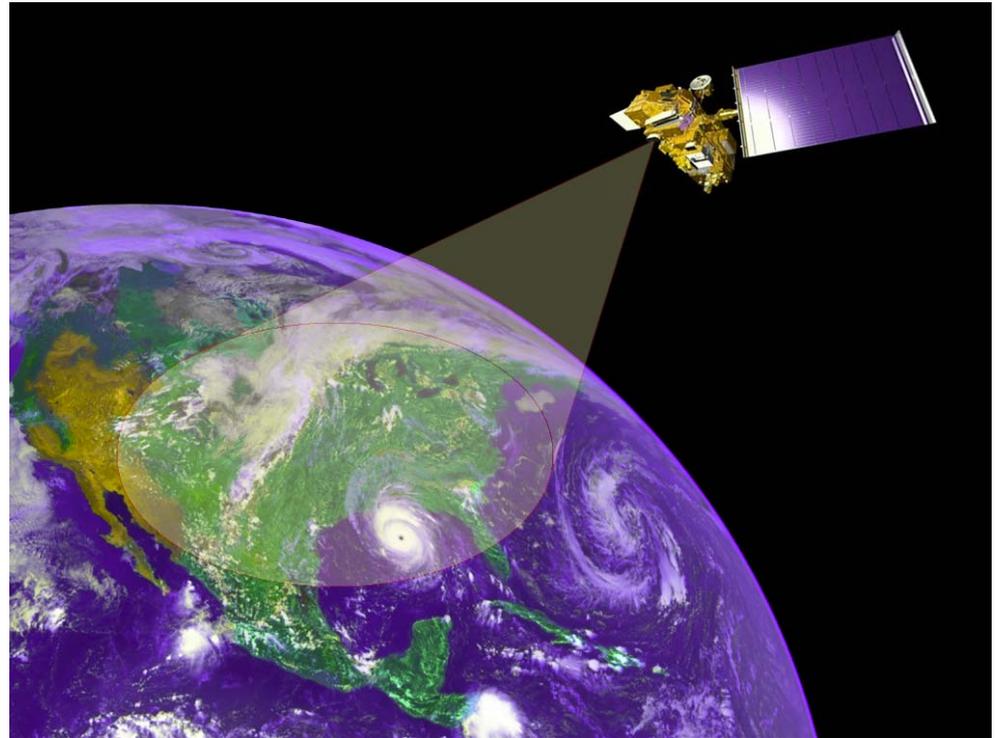
- Air Quality Modeling

Ambient Air Monitoring

- True measure of air quality

- Spatial and Temporal Gaps

- Routinely available information
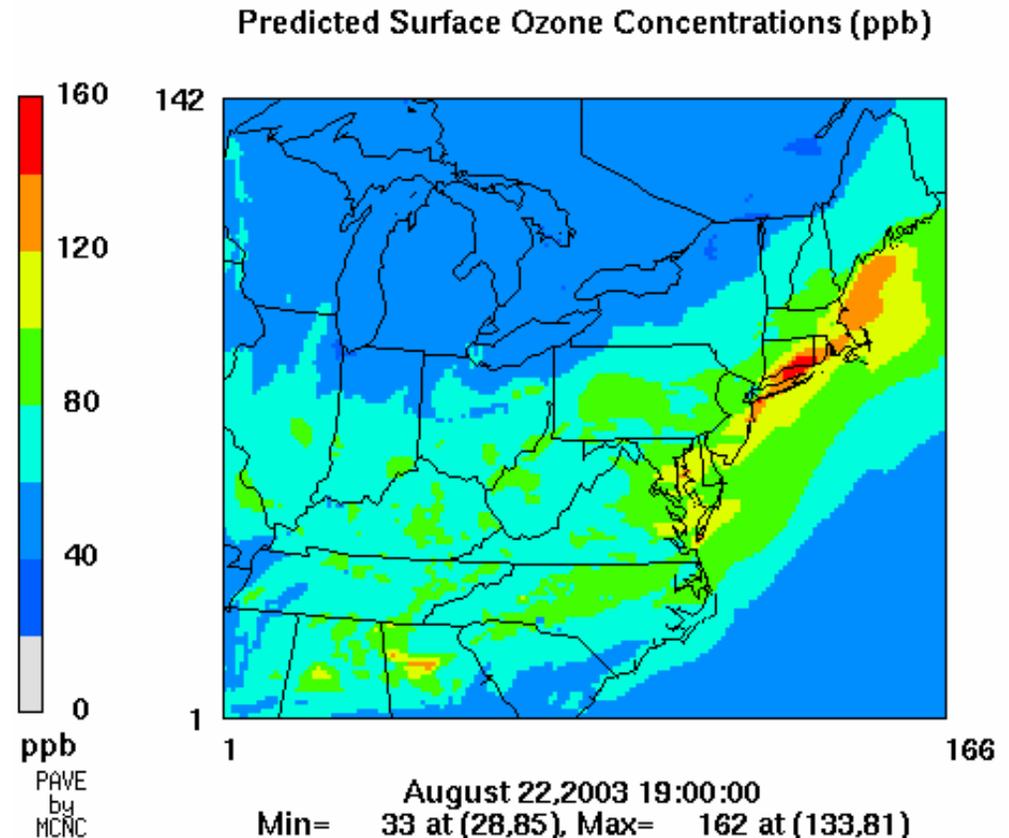

Ozone AQI Values by site on 06/20/2003

- Good
- Moderate
- Unhealthy for Sensitive Groups
- Unhealthy
- Very Unhealthy

Source: EPA's Air Explorer (http://intranet.epa.gov/airexplorer/)
Generated on: 15MAR04

Satellite Data

- Emerging source of data

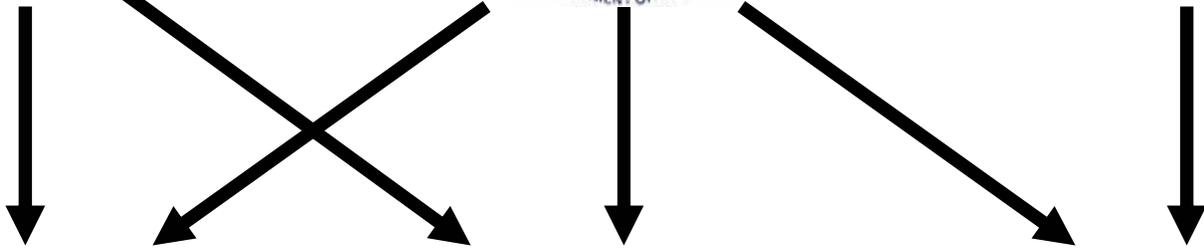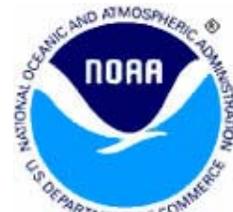- Spatial and Temporal Gaps

- Routinely available data

Air Quality Modeling
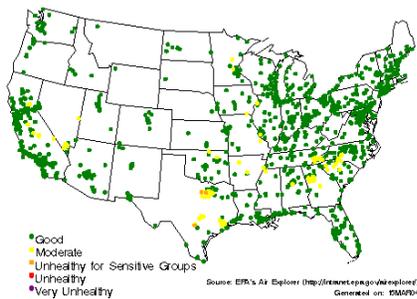
- Estimate of air quality
- Good spatial and temporal coverage
- Air Quality Forecasting
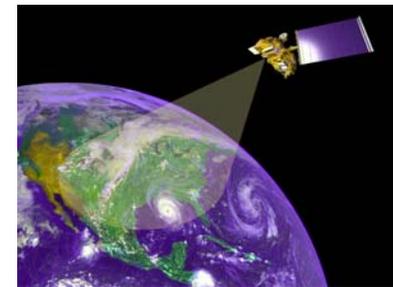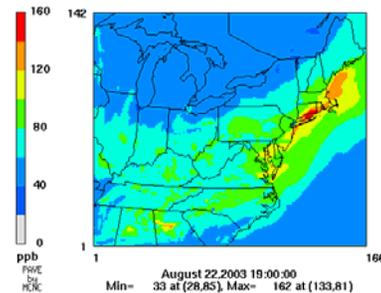 - Emerging source of routine data

Predicted Surface Ozone Concentrations (ppb)

August 22, 2003 19:00:00
Min= 33 at (28,85), Max= 162 at (133,81)

Partnerships in Characterizing Air Quality

Monitoring ⟷ Modeling ⟷ Satellite

The Role of Statistics

- Statistical techniques can be used to fill in the spatial and temporal monitoring gaps
- Most statistical spatial analyses have been applied to ambient monitoring data
  - Proximity
  - Interpolation (e.g., kriging, IDW)
- New statistical techniques "combine" ambient monitoring and emerging sources of data (e.g., satellite, modeling)
  - Capitalize on the strengths of each data source while minimizing the weaknesses
  - Improved measures of spatial and temporal uncertainty

Linking Air Quality and Public Health?

- Do different air quality characterization methods improve capabilities for environmental public health tracking?

Considerations

Personal Monitor
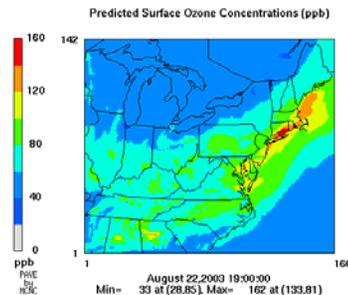
- Ambient vs Personal Exposure
  - Methods estimate ambient concentrations, but . . .
  - People experience health impacts from the air they breathe (i.e., their personal exposure)
  - How do the outputs from the various air quality characterization methods relate to personal exposure?

- Health Outcome
  - Temporal Resolution? => Chronic vs Acute
  - Pollutant Measured? => Effect/Endpoint

Pilot Project for Evaluation of Air Quality Characterization Methods

- Develop and evaluate alternative air quality characterization methods for environmental public health tracking
  - Air Pollutants
    - Ozone and Particulate Matter
  - Health Endpoints
    - TBD Based on State Priorities and Data Availability

- Working with 3 CDC State EPHT Partners
  - Maine
  - New York
  - Wisconsin

Pilot Project Objective

- Provide enhanced air quality information for use in Environmental Public Health Tracking
  - Supplement the ambient air monitoring network data with emerging data sources
    - Satellites
    - Air Quality Modeling (Forecasts)
    - Improved spatial and temporal coverage
  - Use statistical techniques to "combine" data from the various sources
    - Reduce uncertainty in monitoring gaps
  - Produce information that can be ROUTINELY used to track potential relationships between public health and air quality

Pilot Project Conceptual Framework

Phase 1 - Development and Evaluation

Can we produced better air quality maps by combining data sets (Ambient Monitoring, Modeling, Satellite Data)?

If so, do these maps improve currently available EPHT capabilities (proximity, interpolation)?

Phase 1 Successful?

YES

Phase 2 - Operability

How do State partners acquire the improved air quality information?
- Generate the maps themselves
- Maps supplied to them

NO

State partners to use currently available approaches

Pilot Project Process

- Provide State partners with alternative measures to characterize air quality
  - Ambient monitoring
  - Air quality modeling
  - Satellite data
  - Combinations of the above

- State partners "link" the alternative measures to available health surveillance data

- Evaluate and compare the use various air quality characterization methods

Envisioned Output of the Pilot Project

TABLE 1: Particulate Matter (PM 2.5 and Birth Defects)						
Air Quality Characterization Method	**Costs** Hardware & Software, Operating., FTE - time, training	**Ease of Use** Data Access , Exposure Assignment, and Analyses	**Validity, Uncertainty Measures**	**Temporal, Geographic Coverage & Resolution of Data**	**Correlation of Exposure Estimates/ Measure of Misclassification**	**Impact on PH Analyses & Associated PH Action**
Monitoring alone (Proximity)						
Monitoring w/Interpolation (IDW/Kriging)						
Air Quality Modeling						
Satellite Data						
Combining Data (Monitoring with AQ Model and/or Satellite Data)						

Summary

- EPA is seeking better ways to measure the success of its programs.

- Environmental Public Health Tracking is seeking compatible air quality data to inform public health actions.

- There are new possibilities for improving the way we characterize air quality.

- These new approaches may improve our ability to understand relationships between air quality and public health.

- The Air Quality Characterization Pilot Project will be evaluating these new approaches.