Database and Analytical Tool Development for the Management of Data Derived from US DOE (NETL) Funded Fine Particulate (PM$_{2.5}$) Research
Project Objectives

Primary objective is to develop a comprehensive, web-based application for:

• Integrating the ambient air quality data being collected under multiple on-going DOE-sponsored monitoring programs in the Upper Ohio River Valley (UORV) region

• Creating a publicly-available tool for accessing, displaying, analyzing and interpreting these air quality data
Project Team Leaders

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Application Platform

- **Development** - Microsoft Visual Studio .NET
- **Database** - Microsoft SQL Server 2000 Enterprise Edition
- **Web/Application Server** - Microsoft Internet Information Services
Database Features

- Server Hardware and Software With Terabyte-Scale Data Capacity
- Servers Located in Pittsburgh, PA; Athens, OH and Kingsville, TX For Redundancy and Availability.
EPA and NCDC Sites
NESCAUM and MARAMA Sites
Measured Parameters

- **Gases**: CO, SO₂, Nitrogen Oxides, Ammonia, Ozone, VOC’s and Hydrogen Peroxide.
- **PM Sampling**: PM₁₀, PM₂.₅, PM₂.₅-₁₀ and TSP
- **PM Chemistry**: Mass, Ions, Metals, Elements, Nitrate, Sulfate, Organic Carbon/Elemental Carbon (OC/EC), Semi-volatile organics and Organic speciation
- **Meteorological Parameters**: Relative Humidity, Wind Speed, Wind Direction, Temperature, Precipitation and Pressure
Web-Based Retrieval System

- XML Web Services
- Tabular Datasets
XML Web Services

• Create custom interfaces using MS Visual Studio .NET

• **Methods** - pre-programmed procedures to retrieve data and perform analysis calculations.

• **Properties** - assignable property values. Used for data retrieval and analysis calculations.
Web Service Interface

ObservationalDataService

The following operations are supported. For a formal definition, please review the Service Description.

- UpdateMetaflags
- UpdateParameters
- GetMetaflags
- GetMethods
- UpdateSampleFrequencies
- GetSites
- UpdateSites
- GetSampleDurations
- GetObservations
- GetNWSTOMetaflags
- UpdateNWSTOMetaflags
- UpdateMethods
- GetParameterProperties
Offline Datasets

• Datasets Can Be Downloaded For Further Use Locally
• Datasets Are Cached At The Server To Reduce Database Resource Demands
• Offline Datasets Are Available In NARSTO, CSV And XML Formats
Standard ad hoc Query Builder

1) Select Input Criteria

2) Select Output Criteria

3) Execute Query
Standard ad hoc Query Builder

1106 records found

<table>
<thead>
<tr>
<th>Observation ID</th>
<th>Site ID</th>
<th>Observation Date</th>
<th>Method</th>
<th>Flag Code</th>
<th>Parameter</th>
<th>Observation Value</th>
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4) View Table of Results
Standard ad hoc Query Builder

Screenshot - Tabular Results with Download Option

5) Save Results Locally
1) Choose Parameters

2) Choose Date Range

3) View Results Or Download Data File
1) Click data cart tool.

2) Single click or draw box around features of active layer/s to select. Selected features appear with red outline.

3) When features are selected, results appear below. Deselect features if desired.

4) Press continue.
GIS Visualization Tools

1. Zoom in on the area of interest
2. Turn layers on or off for visual clarification
3. Make layers active
1) Click buffer tool.

2) Select any feature of any active layer.
All EPA sites within 20 miles of Pittsburgh have been selected.
Plume Dispersion

Weather Monitors

<table>
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<th>Add/Remove</th>
<th>Y</th>
<th>X</th>
<th>COOPID</th>
<th>STATION NA</th>
<th>COUNTRY</th>
<th>STATE</th>
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Analysis Tools

- Wind Characteristics
- Comparison by Sites
- Pollution Rose
- Trajectory Analysis
- Meteorological Influence
- Time Series Plot
- Plume Dispersion
- Cluster Analysis
- View Flash Demo
- (Trajectory Animation)
GIS Visualization: Spatial Averaging
Kriging techniques used to spatially average ground level data over a region.
Stakeholder Website

• Go-Live date for performance trials:  
  June 15, 2004

• Password protected
• Upload datasets
• Edit datasets
• Download datasets
• Poll data with XML Web Services
• Forum capabilities with ASP.NET Web Forums
• Associate notes with specific data values
Discussion