AirNow & AirNow-Tech

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Outline

• History of AirNow
• Journey of Data Through AirNow
  – Data transmission
  – QC checks
  – Viewing and editing data
  – Data display on public websites
• AirNow and AirNow-Tech Help Options
• Future of AirNow-Tech
  – Updated website
History of AirNow

- Started in 1997 with 14 states
- Over 650 cities/regions
- Year-round real-time data for over 2500 monitoring sites around the world
- Information about the Air Quality Index (AQI), health effects, and education for the public and media
What Makes AirNow Different

- Real-time data on a public-facing website using the Air Quality Index (AQI)
  - AirNow App
  - Email notifications through EnviroFlash
- Information sharing among agencies
  - Data
  - Forecasts
- AirNow API
  - Allows for easy access to air quality data by software developers
- Meteorological Data
  - Hourly ingest of NOAA Meteorological Assimilation Data Ingest System (MADIS) data (>3000 sites)
AirNow Community

[Map showing current and planned communities worldwide]
Journey of Data Through AirNow

**Stakeholders**
- Agencies

**Data Management Center**
- AirNow Database
- AQ and Met Data
- Data Access and Control

**End Uses**
- Data
- Data Files
- Maps
- Web Services and Application Programming Interface (API)
- Media Stories
Major Functions

INGEST
- Incoming FTP Server
- AQ Data Exchange Node
- NOAA MADIS

DISTRIBUTION
- FTP Server
- AirNow.gov
- EnviroFlash
- Village Green
- AirNow Satellite Data Processor

DATA MANAGEMENT
- AirNow-Tech
  - Data Queries
  - Site Management
  - Forecast Submittal System
  - Visualization Tools
  - Analysis Tools

Journey of Data Through AirNow
Submitting Data

1. Request an AirNow-Tech account at https://www.airnowtech.org/requestAccnt.cfm
2. Files are sent via FTP server using AQCSV file format
   • Test directory available
   • Hourly files to be sent by 20 minutes past each hour
   • Contact AirNowInfo@sonomatech.com for FTP server information
AQCSV File Format

• The AQCSV file format supports
  - AQS Standards (parameter codes, parameter occurrence codes [POC])
  - Speciated/lab data
  - Mobile monitor data
  - Sub-hourly data

• Allows for
  - Backfill of AQS data into AirNow when available
  - Easy encoding and parsing of data
  - Support of international data exchange

Sample line from an AQCSV file

840060670011,0,0,20161122T1200-0800,42601,60,,1,008,0,1,38,302591,-121.420838,WGS84,6,074,,
What happens when the AirNow DMC receives a data file?

- New sites or parameters are created in the database
- Run automated QC checks (customizable)
- Calculation of aggregates and AQI
  - NowCast concentrations
  - Running 8-hour (ozone) and 24-hour averages (PM$_{2.5}$)
Automated QC Checks (1)

- Three ways QC codes can be changed
  - In the AQCSV data files by the agency
  - During Automated QC Checks
  - Manually in AirNow-Tech
- QC checks are customizable by value and hour
Automated QC Checks (2)

• Range
  – Data values above or below a certain threshold
    • Minimum drift
    • Maximum suspect
    • Maximum severe

• Rate of Change
  – Difference in data values between two consecutive hours
Automated QC Checks (3)

• Sticking
  – Checks for data values “stuck” at the same value for a specified number of hours
  – “Sticking value”: minimum value for which data will be checked

• Buddy Check
  – Uses separate “Target” and “Test” sites
  – If the absolute difference in concentrations differs by a defined threshold, invalidate the “Target” site data
Dashboard (1)

- At-a-glance display shows data delivery status
- Stay up-to-date with the latest hourly readings
- Important for AQI reporting and alerts
Dashboard (2)

- **Event Log**
  - Automatically updates every few minutes
  - Is AirNow receiving files? Are they being imported successfully?
- **Instruments not reporting**
Navigator (1)

- **Data view**
  - View concentrations for each parameter from every agency
  - MADIS data from NOAA (temperature, wind, etc.)
  - HYSPLIT trajectories
  - Wind and pollution roses

August 13, 2016, at 18:00 PDT: 1-hour ozone (ppb) with wind barbs and a pollution rose. Source: AirNow-Tech.
• External Layers
  - Moderate Resolution Imaging Spectroradiometer (MODIS) satellite imagery
  - MODIS Aerosol Optical Depth (AOD)
  - Hazard Mapping System (HMS) smoke and fire detections
  - Geostationary Operational Environmental Satellite (GOES) 1 km visible imagery

July 30, 2016, at 14:00 PDT: 1-hour PM$_{2.5}$ ($\mu$g/m$^3$), HMS smoke and fire detections, and MODIS satellite image. Source: AirNow-Tech.
Data Queries

• Data view
  – View hourly, daily, and 8-hour concentration averages and AQI
  – Create line graphs and scatter plots
  – Edit values and QC codes with data editor rights
  – Export to CSV
How are current data displayed?

- Reporting areas (forecast cities)
  - How observations and forecasts are disseminated and displayed on AirNow.gov
  - Individual monitoring sites are assigned to each reporting area
  - Maximum NowCast AQI from sites in a reporting area will show as the “Current AQI”
Configuring Settings in AirNow-Tech

- Verification sites
  - Can be added to or removed from reporting areas via the Verification Sites page
  - Any number of verification sites can be assigned to a reporting area
Configuring Settings in AirNow-Tech

- **Principal Parameter ★**
  - The parameter/POC combination to be used as the data set for AirNow products

- **Public Parameter ★★★**
  - Required before data are included in publicly available products
Configuring Settings in AirNow-Tech

- Editing Principal and Public Parameters
  - Click Enable Editing
  - Select parameter from list
  - Check boxes and save
NowCast

- A way to express real-time air quality in the context of the AQI
- Aligns closely with what people are seeing or experiencing
- Calculation uses longer averages during periods of stable air quality and shorter averages when air quality is changing rapidly
Where is the NowCast used?
AirNow Fire Page

https://airnow.gov/index.cfm?action=topics.smoke_wildfires
AirNow Department of State Page

https://www.airnow.gov/index.cfm?action=airnow.global_summary
Submitting Forecasts in AirNow-Tech

- Forecast for ozone, PM$_{2.5}$, PM$_{10}$, NO$_2$, and SO$_2$, and/or CO
- Forecasts issued in concentrations or AQI units for reporting areas
- Forecasts are for the EPA standard for each pollutant (e.g., 24-hr average for PM$_{2.5}$)
Forecast Dissemination

EnviroFlash Emails

AirNow.gov

API Web Services and File Products

Forecasts

By Zip code
Get current or historical forecasted AQI values and categories for a reporting area by Zip code.

Documentation  Query Tool

By latitude/longitude
Get current or historical forecasted AQI values and categories for a reporting area by latitude and longitude.

Documentation  Query Tool

Air Quality Forecast

Today's High

Air Quality Index (AQI)  38  Good
Particle Pollution (2.5 microns)  Green

Health Message: None

Tomorrow's High

Air Quality Index (AQI)  50  Good
Particle Pollution (2.5 microns)

Health Message: None

AQI - Pollutant Details

Particles (PM2.5)  38  Good

Particles (PM2.5)  50  Good

Forecast Discussion: Tuesday, November 29: An upper-level trough of low pressure will move through northeastern Ohio, enhancing mixing in the atmosphere. In addition, moderate and gusty southerly winds at the surface will disperse pollutants. As a result, AQI levels will be Good. Wednesday, November 30: Light southeasterly winds during the morning hours will gradually bring regional pollutants and moisture into the Mahoning Valley, increasing particle production. However, a cold front will move through Ohio in the afternoon, generating moderate westerly winds. These winds will bring a cleaner air mass into the region and keep AQI levels Good. Thursday through Saturday, light to moderate westerly to southwesterly winds will aid pollutant dispersion and continue to bring clean air into Youngstown-Warren. As a result, AQI levels will be Good on all three days. Sunday, a surface high pressure system will move over the Ohio River Valley, producing light southerly winds in the Youngstown area. These conditions will limit pollutant dispersion. However, low pollutant carryover from previous days will keep AQI levels Good.
AirNow and AirNow-Tech Help

- Email questions to AirNowInfo@sonomatech.com
- Review resources page in AirNow-Tech
- The Feedback Tool on AirNow-Tech will send your comments and questions directly to the AirNow Data Management Center (DMC)
  - Located at the bottom right of each page in AirNow-Tech
AirNow Discussion Forum

- Ask questions, get answers
- Information on a variety of AirNow topics
- Forum.airnowtech.org
New AirNow System

Background – Needs, Growth, and Features

- Big data (e.g., low-cost sensors, sub-hourly data)
- Expansion to additional international users
- Ease of data management
- Improved usability
- New worldwide analysis tool (fire locations and trajectories)
- Completion in early 2017
Homepage and Login Screen
New Look

- Site/parameter management
- QC checks and Approval Mode
Dashboard Widgets

- New widgets
  - Recent Trend concentration map
- Users can add, remove, and rearrange widgets
Data Queries

• Interactive data validation and approval
• Data editing
• QC checks
Navigator Enhancements

- Global point-and-click HYSPLIT trajectories
- Global fire layer
Contact

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