AIRNow and AIRNow-Tech

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Outline

- Overview of AIRNow
- AIRNow-Tech
 - About
 - Features
 - Case study analysis: Use of AIRNow-Tech during 2008 California wildfires
- Related topics
 - Air Quality Index (AQI)
 - Getting data into AIRNow
 - AIRNow mapping
- AIRNow-Tech Demonstration

Overview of AIRNow

AIRNow provides a common framework for acquiring and distributing air quality information that

- Fosters community effort among tribal, federal, state, and local air quality agencies (130+)
- Collects, quality assures, and transfers real-time and forecasted air quality information to the public
- Communicates air quality via the AQI
- Issues weather/air quality news stories
- Enables partnerships with national media
- Provides air quality education and outreach





Overview of AIRNow

- Program
 - Coordination: 44 tribes, 130+ agencies, and 1,500+ stakeholders
 - Monitoring: 2,000+ sites, 400 forecasts
 - Assistance: 130+ agencies, 30+ media users, 20+ data users
 - Education: Stakeholders
 - Media outreach: print, TV, web outlets, social media
- Systems
 - Centralization: one-stop data source for real-time/forecast data

data for public, media, researchers, systems

- Quality control : automated and manual quality checks
- AQI conversion: consistency across the nation
- Mapping: quick and automated mapping methods
- Distribution:

Overview of AIRNow – AIRNow vs. AQS

	AQS	AIRNow
Data use	Regulatory decisions	Health-based decisions, mapping, education
Timeliness of data	6-12 month delay	Real-time
Historical record	6-12 months prior to 1998	Last hour to 2002*
Data quality	Official data	Preliminary data
Routine mapping	Not available	Hourly on AIRNow.gov
Data access	Data Mart	AIRNow-Tech and AIRNow Gateway
Media distribution	Not available	Hourly (AQI observations and forecasts)

* Data available on AIRNow-Tech back to February 2009



Overview of AIRNow – Purpose

- Data $\rightarrow \rightarrow \rightarrow$ Decision
- Inform the public, media, and decision makers
- Educate and support the voluntary AIRNow community of agencies
- Provide data to other systems









Overview of AIRNow – Community







Overview of AIRNow – Data Flow





Example Monitoring Data Flow



About AIRNow – A Brief History

1997: Beginning (northeast U.S.)

1999–2002: Expanding coverage

Early 2000s: First tribal partner

2003–2009: New services

- » AIRNow-Tech (technical web site)
- » AIRNow Gateway (distribution service)
- » Coordination with media
- » More pollutants

2009+:

AIRNow-International

- » New software system
- » Coordination with other countries



























Participation by Tribal Groups



About AIRNow-Tech

AIRNowTech.org

- Decision Support System management and analysis tool for the AIRNow Program
- GIS functions HYSPLIT trajectory tool, satellite, and smoke products
- Data queries, personalized tools, preferences, and services
- Ability to view meteorological and air quality data
- Password-protected user accounts





AIRNow-Tech Features (1 of 2)



- Home Relevant news, events, and snapshot of agency status
- Agencies Status of monitor data delivery by agency and parameter
- Sites Monitor information, configuration, and status by site
- **Navigator (GIS)** Monitor maps, current and historical air quality and meteorological data display, HYSPLIT trajectories, numerous supporting GIS layers (including tribal boundaries)
- Data Hourly, daily, and historical monitoring data queries
- Forecasts Forecast submittal, analysis tools, and configuration
- **Polling** Summaries on data delivery times and completeness
- Notifier AIRNow program email listserv
- EnviroFlash Air quality forecast distribution system
- Resources General information for AIRNow Program and the Data Management Center (DMC)
- **My Account** Account management, customizable preferences, and tools



AIRNow-Tech Features (2 of 2)

AIRNow-Tech tools for current or past event analysis

- Query and export spreadsheets
 - Real-time and past hourly air quality data ($PM_{2.5}$, PM_{10} , O_3 , and other pollutants)
 - Data summaries (e.g., days with AQI over 100)
- Create time-series plots of current and past hourly or daily air quality data
- Access real-time and past meteorological observations
- Create and save GIS maps of
 - Current or past observed AQ and meteorological conditions
 - HYSPLIT backward and forward trajectories at different heights
 - Hazard Mapping System smoke and fire locations and other layers



Case Study Analysis with AIRNow-Tech

- AIRNow-Tech was a key tool during the summer wildfires of 2008 in California
- Data flowed into AIRNow from mobile monitors that were deployed near fire locations
- Emergency response personnel used AIRNow-Tech to track air quality
 - Data queries
 - Navigator GIS
 - HYSPLIT
 - Satellite-detected fire locations



AIRNow-Tech Navigator (1 of 3)





AIRNow-Tech Navigator (2 of 3)





Backward trajectory showing where Sacramento's air came from during the last 24 hours.

AIRNow-Tech Navigator (3 of 3)



Forward trajectory showing where the smoke from the wildfires was going during the next 24 hours.

What is the Air Quality Index? (1 of 3)

Air Quality Index (AQI)

• Provides indicator of the quality of the air and its health effects



- Color is key for communication
- Ranges from 0 to 500
- 101 corresponds to the level that violates the federal health standard (except for PM_{2.5})

AQI Values	AQI Category (Descriptor)	AQI Color
0 - 50	Good	Green
51 - 100	Moderate	Yellow
101 - 150	Unhealthy for Sensitive Groups	Orange
151 - 200	Unhealthy	Red
201 - 300	Very Unhealthy	Purple
301 - 500	Hazardous	Maroon



What is the Air Quality Index? (2 of 3)

Descriptors	Cautionary Statements	
Good 0 – 50	No message	
Moderate 51 – 100	Moderate health concerns for unusually sensitive individuals	NAAQS*
Unhealthy for Sensitive Groups 101 – 150	Identifiable groups at risk – different groups for different pollutants	
Unhealthy 151 – 200	General public at risk; sensitive groups at greater risk	
Very Unhealthy 201 – 300	General public at greater risk; sensitive groups at greatest risk	
Hazardous 301 – 500	Health warnings of emergency conditions	



*National Ambient Air Quality Standard

What is the Air Quality Index? AQI Breakpoints (3 of 3)

AQI Values	8-hr Avg O ₃ (ppm)	24-hr Avg PM ₁₀ (μg/m³)	24-hr Avg PM _{2.5} (µg/m³)
0 - 50	0-0.059	0-54	0 – 15.4
51 - 100	0.06 – 0.075	<u> 55 – 154</u>	15.5 – 35.4
101 - 150	0.076 – 0.095	155 – 254	35.5 - 65.4
151 - 200	0.096 – 0.115	255 – 354	65.5 – 150.4
201 - 300	0.116 – 0.374	355 – 424	150.5 – 250.4
301 - 500	Not defined	425 – 604	250.5 – 500.4

Pollutant Reporting – Air Quality Index

Uniform for all pollutants



Getting Data into AIRNow

- Three ways to submit data to AIRNow
 - OBS file (phasing out)
 - XML file via Data Exchange Node

– AQCSV file

- Details on each file format are available on the AIRNow-Tech Resources page
- Many data logger manufacturers have modules available to automatically create one or more of these formats



OBS Format

- Legacy format for data ingest into AIRNow
- Why are we phasing it out?
 - Difficult to program
 - No native support for
 - Mobile monitors
 - Three-dimensional data
 - Limited list of accepted parameters
 - No sub-hourly data
 - Applied only to North America
 - Difficult to use in mobile applications



AQCSV Format (1 of 2)

- Supports
 - AQS standards (parameter codes, POC)
 - Any AQS parameters
 - Speciated/lab data
 - Mobile monitors data (changing location)
- Allows for
 - Ingest of AQS data into AIRNow
 - Backfill of AQS certified data into AIRNow when available
 - Bulk data updates
 - Support of international data exchange
 - Easy encoding and parsing of data (Excel)





AQCSV Format (2 of 2)

ISO Standards

- Country codes (840 = USA)
- Date and time
- AQS-Based
 - Parameter codes
 - Units codes
- Support for
 - AQS qualifier codes
 - Location information
 - Latitude and longitude
 - Elevation and GIS datum
 - Method codes
 - Measurement performance characteristics (value and uncertainty)

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AIRNow Maps

- Map types include
 - Forecast or observed AQI
 - Pollutant-specific or overall AQI
 - Local, regional, or national scale
 - Current hour, current animation, or daily peak
- Map are archived on AIRNow.gov
- Maps are created automatically whenever new data are received

Forecasts



Observations



32



AIRNow.gov – Current Air Quality Maps



AIRNow.gov – Archived Maps

Search archives by

- Map type
- Region
- Month/year

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Making AIRNow Maps: Masking

AQI is first interpolated based on observations at stations. But how do we deal with monitor-sparse regions?





AIRNow Maps: Masking

A mask is created to block out areas without sufficient monitoring.



Blue shading indicates masked areas



AIRNow Maps: Masking

The resulting map shows interpolated AQI which is accurate near station observations but is not displayed in regions far from monitors.





AIRNow-Tech Demonstration

- Site and monitor management
- Performing data queries
- Navigator GIS
- Customizable preferences and tools in My Account

AIRNow-Tech Home Page

AIRNowTech.org

- Default home page includes a News and Events section and a Polling Summary of all participating agencies
- Home page can be personalized to include other agency-specific information

Seven and Events AIRNow Database Migration Costponed Due to technical difficulties, the AIRNow database migration scheduled for September 2 will be postponed until next Weinesday, September 2. Dark you for your attention. -ARNow DMC Posted September 2, 2009, 14:42 (PT) Date Monday is a holiday, we would like to remind you to enter your forecasts for holiday, we would like to remind you to enter your forecasts for holiday, we would like to remind you to enter your forecasts will be disseminated to various Weather Service Providers, which in turn will distribute them to local and antional media outlets. You can take advantage of the long-range forecast input capability of the submittal system to enter your forecasts up to a data simply update them if necessary. The forecasting schedule poses a problem for your agency to to staff imitations over the weekend, please e-mail us at the ARNow Diata Management Center (ARNowOMC@genomatech.com) with your forecast AQI numers and we can enter the forecasts drive dissed in throug have staff on duty at the DCO over the weekend throug have staff on duty at the DCO over the weekend infraces to an any way. Thank you very much for your attention. Paid ARNow Diate Management Center (ARNowDiate Management Center) Thank you very much for your attention. Paid ARNow Diate Management Center (ARNowDiate Management Center) The and ARNow Diate Management Center (ARNowDiate Management Center) Paid an ARNow Diate Management Center (ARNowDiate Stone another the forecasts stripeton perminerestri	Home Agenciés Sites Navigato	r Data Forecas	ts Polling Noti	fier EnviroFlash	Resources
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Site and Monitor Management (1 of 4)

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Site and Monitor Management (2 of 4)

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Site and Monitor Management (3 of 4)

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Site ID*:	n/a		Geo Type:	n/a	PM7.5
Site Name*:	MARION		Elevation:	0 ft. or 0 m.	Site status can be set to
Agency ID:	AR1			DDDMM SS Dec Deg	either Active or Inactive
State:	AR	Edit site	Latitude*:	35 11 48 or 35.1967	Inacti Edit parameter
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Site and Monitor Management (4 of 4)

103 🔽	03 (PPB)						
Are data approved for public reporting?	· · · · · · · · · · · · · · · · · · ·	Approve	data	for	public	repor	tind
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Measurement Scale :	Select	~					
Collection Description :	n/a						
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Performing Data Queries (1 of 7)

5	Pre-defin	ed Querie	s		Welcome	AIRNow Tech	User! M	Account	Sign Out
IRNOW	Home	Agencies	Sites	Navigator	Data	Forecasts	Polling	Notifier	Resources
TECH	Pre-d	efined Queries	Hou	rly Data	Data Sun	nmaries A	QI History		
Select Mor	itoring Sit	es							
Agency: Select Parameter: Select EPA Region: Select	Agency 💌 Parameter 💌 Region 💌	Map Domain: 🔲 S County: 🛄 S MSA: 🔲 S	elect Map elect County elect MSA	,		16	ctor		
Status: Active				←					1-140
Retriev	e Sites	Reset F	ilters f	Reset Sites					
Filter	ed Sites		Select	ed Sites					
		>> < <<							
				ок с	ancel				
	Site Li	ist Name:			Save				

Performing Data Queries (2 of 7)

AIR NOW Home	Agencies Sites Navigator Data	Forecasts Polling Notifier Resources
P	e-defined Queries Hourly Data Dat	ata Summaries
Site(s):	TRX sites	Site Selector
Date Range:	Current Selection (0 sites)	
Query:	Chicago	
Show Graph Optio	Columbus PM2.5 Youngstown PM2.5 San Diego PM2.5 sites Youngstown Ozone New York City	
	Data TRX sites	and the second se
	Ohio Minn./S.P. Verification Columbus Ozone SD Fire sites OAP	
	Imperial Valley Cleveland - all Hawaii New Orleans Ozone	
	LA-MS PM2.5	



Performing Data Queries (3 of 7)

Home	Agencies Sites Navigator Data Foreca	sts Polling Notifier Resources
TECH		
	Pre-defined Queries Hourly Data Data Summ	naries
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	Choose a query	
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	Daily Max 24-hour PM2.5 (ug/m3) Daily Max 24-hour PM2.5 (AOI)	
	Daily Max 24-hour PM10 (ug/m3)	
	Daily Max 24-hour PM10 (AQI)	Contraction
	Ozone: Days Above 100 AQI	



Performing Data Queries (4 of 7)

	ionne Ag	jencies sites	Navigator		Casts Politing	Notifier R	source
	Pre	-defined Queries	B Hourly Da	ta <u>Data Su</u>	<u>mmaries</u>		
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Performing Data Queries (5 of 7)

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Performing Data Queries (6 of 7)

6	Data Querie	S Welco	me, Forecasters at So	onoma Technology	My Account	Sign Out
	Home A	lgencies Sites Na	rvigator Data	Forecasts P	olling Notifier	Resources
	Pr	re-defined Queries	lourly Data Dat	ta Summaries		1
Access to all	Site(s):	Current Select	tion (7 sites)		Site Select	tor
parameters	Parameter(s):	PM2.5 (UG/M3 Create List Edit Li	3)			
Useful for	Date Range:	9/8/2008	to 9/9/2008			
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and daily	Column Summaries:					A State
averages	Hide Graph Options	s				-
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summaries 💦 👘		Data Graph	Data & Graph	Ехроп		
available						100

Performing Data Queries (7 of 7)

6	Data Summ	ary v	/elcome, Forecasters a	t Sonoma Technolo	gy! My Account	Sign Out
	Home A	gencies Sites	Navigator Data	Forecasts	Polling Notifier	Resources
	Pr	e-defined Queries	Hourly Data	Data Summaries		1000
Access to all parameters	Site(s): Parameter(s):	Current Se	election (7 sites)	_	Site Sele	ctor
Useful for daily maximum values or AQI	Date Range: Metric:	Create List E 9/8/2008 Daily Max	idit List Remove List	n 💌	Data prese only	from 1993 to ent (ozone until 2009)
a few weeks or months	Group By: Aggregate By: Pivot Data:	None All Sites □ (Current	y only works with one	parameter)	Enha grou grap	inced data ping and hing
Sorting and row/column summaries available	Show Graph Option	Data Graph	Data & Graph	Export	Usefi year	ul for multi- analysis
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Navigator GIS (1 of 11)



Navigator GIS (2 of 11)



Navigator GIS (3 of 11)



Navigator GIS (4 of 11)



Navigator GIS (5 of 11)



Navigator GIS (6 of 11)



Navigator GIS (7 of 11)



Navigator GIS (8 of 11)



Navigator GIS (9 of 11)



Navigator GIS (10 of 11)





Navigator GIS (10 of 11)



My Account (1 of 4)



My Account (2 of 4)

			Arkansas Dept. of Enviro
	First Name: AIRNow Tech	Phone:	000-000-0000 Fax: n/a
	Last Name: User	Address 1:	n/a
	E-mail Address: airnowtech.user@gmail.com	n Address 2:	n/a
	Login: Your Username	City:	n/a
_			IISA
	iurn Divic emails (on/off	
Notifications:	Agency Daily: 🗹 Fored Agency Hourly: 🗹	cast Daily: 🗹	Management Select Report Select a Sitelist
			Change o guent
	050350006 - Clarkdale		Choose a query

My Account (3 of 4)

		Arkansas Dent. of Environmental Quality
first Name:	AIRNow	Fech Phone: 0000-0000 Fex In/a
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My Account (4 of 4)

Last Name:	AIRNow Tech User	Phone: Address 1:	000-000-0000 Fax: n/a
E-mail Address	airnowtech.user@gmail.com	Address 2:	n/a
Login: Password	vour Username	City: State:	n/a n/a zin n/a
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Resources

sample file

Data Management

Description of PM2.5 Site Information Table

The AIRNow-Tech **Resources** page has

- Tutorial videos
- Manuals and Instructions
- Data formats and processing details
- Links and other useful information

Resources	Welcome, AIRNow Tech User! <u>My Account</u> Sign Out
Home Agencies Site	s Navigator Data Forecasts Polling Notifier Resource
Contacts	New Forecast Submittal System
AIRNow and DMC contact information	Overview - Fact Sheet Video
	Submit Forecast and Discussion - Fact sheet Video
AIRNow-Tech Tutorial Videos	Settings - Fact sheet Video
	Query Forecast - Fact sheet Video
Logging In	verification - Fact sheet Video
Creating Site Lists	En la Rad
Email Report Management on "My Account"	Environash
Navigator	Neurol Insure Oberta Uni Origina
Site and Monitor Management	New Users Start-Up Guide
Querying EBAMS data	Environiash - New Customization Features - February 2010
HYSPLIT Trajectories in Navigator	Data Farmata and Brassaning
Air Quality Encoderting Training Videos	Data Formats and Processing
An Outanty Forecasting framing videos	OPC file documentation and comple file
Course Introduction	Costrol Checks for AIRNow Manning System
Course Introduction	Undeted Orona Slana and Interperts (2004, 2006, AIRNow)
Air Orielity Overview	opuated Ozone Stope and Intercepts (2004 - 2000 Aiktitow)
Althet Controls Air Quality	EP8 1_br to 8_br Ozone Surrogate Report (1994 - 1996
Why Forecast Air Quality	data)
How to Forecast Air Quality	EPA PM2 5 Surrogate Report
Meteorology - Temperature	Polling Performance 2002 (PowerPoint file)
Meteorology - Air Pressure	Polling Performance 2003-2004 (PowerPoint file)
Meteorology – Water Vapor	Polling Performance 2004-2005 (PDF file)
Meteorology – Upper Air Pressure	Polling Performance 2005-2006 (PDF file)
Meteorology - Surface Pressure and Wind	Polling Performance 2006 (PDF file)
Meteorology - Fronts and Air Masses	Polling Performance 2008 (PDF file)
Meteorology - Stability	Polling Performance 2009 (PDF file)
Meteorology - Clouds, Fog, and Precipitation	AIRNow-I AQCSV Format Specifications Document (PDF
Meteorology – Weather Cycles	<u>file)</u>
Manuals/Instructions	Software
New GeoEditor Fact Sheet	MapGen - as of 7/26/02 (about 22 MB)
AIRNow-Tech Release Notes (June 2006)	
Overview of New AlRNow-Tech Features Quick Reference for New AlRNow Parameters	Weather Service Provider (WSP) Information
AIRNow Forecast Submittal System FTP Instructions and	Forecast File Fact Sheet

Forecast File Fact Sheet

Mapping File Fact Sheet

Contacts

Request an Account

AID NOW	Home	Agencies	Sites	Navigator	Request an AIRNow-Tech Account
TECH		Please I Usernam Password Log In	og in to u e: d:	ise AIRNow-Ter	First Name*: Last Name*: Login Name*: E-mail Address*: Phone*: Comment:
		Request	an AIRNov	v-Tech Account	Agency*: (Select Agency) Send Request *Required

www.airnowtech.org



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