



Air Quality Forecast Capability

End-to-End Operational Capability

Model Components: Linked numerical prediction system

Operationally integrated on NCEP's supercomputer

- NCEP mesoscale NWP: WRF-NMM
- NOAA/EPA community model for AQ: CMAQ

Observational Input:

- NWS weather observations; NESDIS fire locations
- EPA emissions inventory

Gridded forecast guidance products

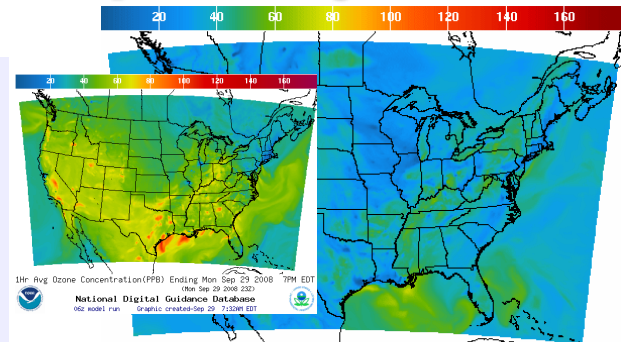
- On NWS servers: www.weather.gov/aq and ftp-servers
- On EPA servers
- Updated 2x daily

Verification basis, near-real time:

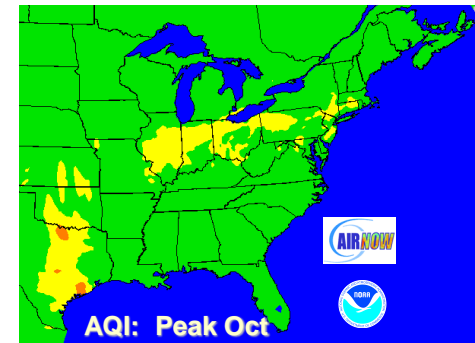
- Ground-level AIRNow observations
- Satellite smoke observations

Customer outreach/feedback

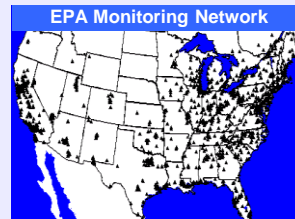
- State & Local AQ forecasters coordinated with EPA
- Public and Private Sector AQ constituents
- Website monitoring

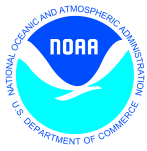


1Hr Avg Ozone Concentration(PPB) Ending Thu Sep 20 2007 10AM EDT (Thu Sep 20 2007 14Z) National Digital Guidance Database 06z model run Graphic created-Sep 20 7:23AM EDT



1Hr Surface Smoke (micrograms/m³) Thu Sep 20 2007 9AM EDT (Thu Sep 20 2007 13Z) National Digital Guidance Database 6z model run Graphic created-Sep 20 8:24AM EDT





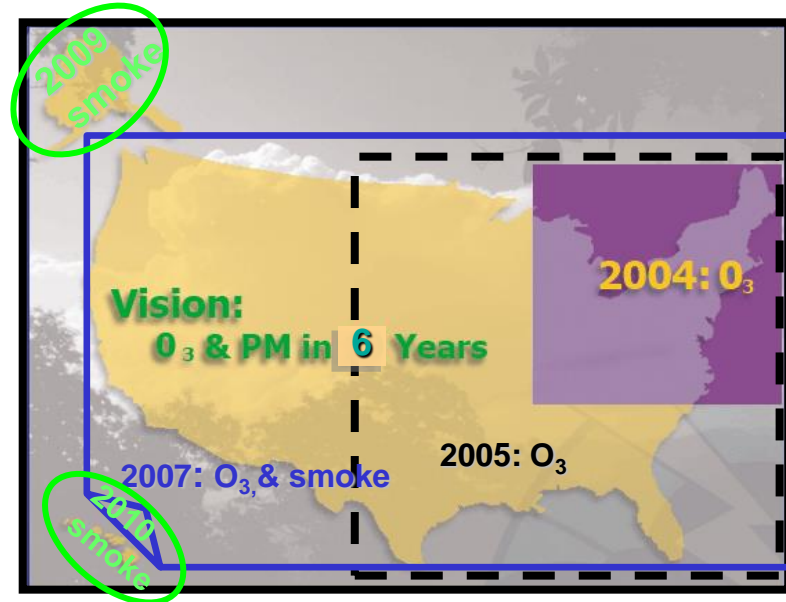
National Air Quality Forecast Capability

Current and Planned Capabilities, 3/09

- Improving the basis for AQ alerts
- Providing AQ information for people at risk

FY09 Prediction Capabilities and Targets

- Operations:
 - Ozone, expanded from EUS to CONUS, 9/07*
 - Smoke implemented over CONUS, 3/07*
 - Smoke implemented over AK 9/09*
- Experimental testing:
 - Ozone upgrades*
 - Smoke predictions over AK*
 - Smoke predictions over HI 6/09*
- Developmental testing:
 - components for particulate matter (PM) forecasts*
 - ozone prototypes for AK, HI 9/09*

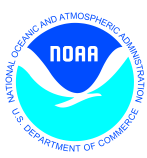


Near-term Operational Targets:

- Ozone, smoke coverage extended Nationwide

Longer range:

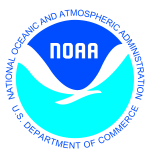
- Quantitative PM_{2.5} prediction 2015
- Extend air quality forecast range to 3-5 days...
- Include broader range of significant pollutants...



FY09, In Progress

	Operational	Experimental	Developmental
Ozone	CONUS Updates: 2009 emissions, NAM/WRF Dec 2008 upgrade	CONUS Testing advanced gas-phase chemistry CB05 with newer emissions	BC, vertical resolution improvements *4th Q: Full prototype testing for AK, HI (OST)
PM Components			
Smoke	CONUS. NAM/WRF Updates: 4th Q: AK (NWS)	AK Daily experimental prediction from 6/1/08 3rd Q: Begin HI (NWS)	HI
Dust			Adapting LRT modules for CONUS prediction. Long-range transport transport evaluation.
Aerosols from NEI pollutants			Testing: CB05, newer aerosol modules.
Data assimilation			Focussed research: satellite AOD, PM obs
Integrated Quantitative PM			Testing combined NEI-basis with smoke, dust

*** FY09 AOP milestones IN RED**

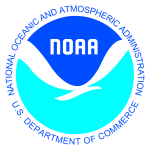


Quantitative PM Prediction Capability

R&D Research & Development
DT&E Developmental Testing/Evaluation
ET&E Experimental (Pre-Operational) Testing/Evaluation
O & M Operations & Maintenance

Program Requirements	FY09	Note	FY 10	FY 11	FY12	FY13	FY14	FY15	FY16
PM: Components									
Smoke	CONUS O&M, Begin ET&E HI 3Q	HI Q3 AK Q4	Nation: 48 hr						
Dust	Begin ET&E CONUS		CONUS: 48 hr						
Chemical Boundary Conditions							ET&E CONUS 3Q		
Data Assimilation									
Advanced chemical mechanism						Begin ET&E NEUS			
Emissions inventory inputs						Begin ET&E NEUS			
PM: Integrated Capability									
Quantitative PM IOC (NEUS)					Initiate PM DT&E	Initiate PM ET&E	NE: 24 hr	NE: O&M, CONUS ET&E	CONUS
Quantitative PM: Nationwide							AK, HI	Nation ET&E	Nation: 24 hr

Milestones per FY09 PB request



Budget/Funding (\$M), FY09 Pres. Budget

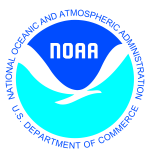
	PY	FY09	FY10	FY11	FY12	FY13	Through FY13
Model Development	8.42	0.8	0.91	0.91	0.61	0.96	12.61
Test/Verification	3.75	0.25	0.25	0.19	0.19	0.31	4.94
Communication/Outreach and O&M	5.75	1.56	2.15	2.21	2.51	2.51	16.69
NCEP - Supercomputing	10.15	2.85	6	6	6	6.75	37.75
Research (OAR)	4.92	1	2	2	2	2.00	13.92
Shenandoah AQ Earmark	0.75	0	0	0	0	0.00	0.75
Total Required	33.74	6.46	11.31	11.31	11.31	12.53	86.66
Funding	25.98	6.46	11.31	11.31	11.31	12.53	78.90
Delta	-7.76	0	0	0	0	0	-7.76

★

- Rebaselined for FY09 to cover shortfall
- FY10: planned increases at risk. Impact: delayed implementation of quantitative PM 2.5 predictions
- FY11: Increase critical for deployment of quantitative PM 2.5 predictions in FY15 IOC + FY16 FOC

Project is Executable (FY09 PB)

Backup Material



NAQFC Coordination: *Implementation Team Members*

OCWWS

Jannie Ferrell

OCIO

Cindy Cromwell, Dan Starosta, Bob Bunge

OST/MDL

Jerry Gorline

OST/MDL

Marc Saccucci, Tim Boyer, Dave Ruth

OST

Ken Carey, Ivanka Stajner

NESDIS/NCDC

Alan Hall

NOAA/OAR

Jim Meagher

NCEP

*Jeff McQueen, Marina Tsidulko, Youhua Tang,
Ho-Chun Huang, Dongchul Kim*

**Sarah Lu*

**Brad Ferrier, *Dan Johnson, *Eric Rogers, *Hui-Ya Chuang*

Geoff Manikin

John Ward, Brent Gordon, Chris Magee

Robert Kelly, Bob Bodner, Andrew Orrison

** Guest Contributors*

NOAA/OAR

*Daewon Byun, Pius Lee, Shaocai Yu,, Hsin-Mu Lin,
Daniel Tong, Tianfeng Chai*

Roland Draxler, Glenn Rolph, Ariel Stein

NOAA/NESDIS

Shobha Kondragunta, Jian Zeng

Matt Seybold, Mark Ruminski

EPA/OAQPS

Chet Wayland, Phil Dickerson, Scott Jackson, Brad Johns

EPA/ORD

Rohit Mathur, Ken Schere, Jon Pleim, Tanya Otte,

Jeff Young, George Pouliot, Brian Eder

Outreach, Feedback

Data Communications

Dev. Verification

NDGD Product Development

Program Support

Product Archiving

NOAA AQ Matrix Manager

EMC AQF model interface development, testing and integration

Global data assimilation and feedback testing (NASA, NESDIS)

WRF/NAM coordination

Smoke Product testing and integration

NCO transition and systems testing

HPC coordination and AQF webdrawer

CMAQ development, adaptation of AQ simulations for AQF

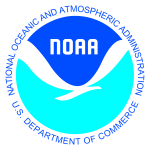
HYSPLIT adaptations

Smoke Verification product development

HMS product integration with smoke forecast tool

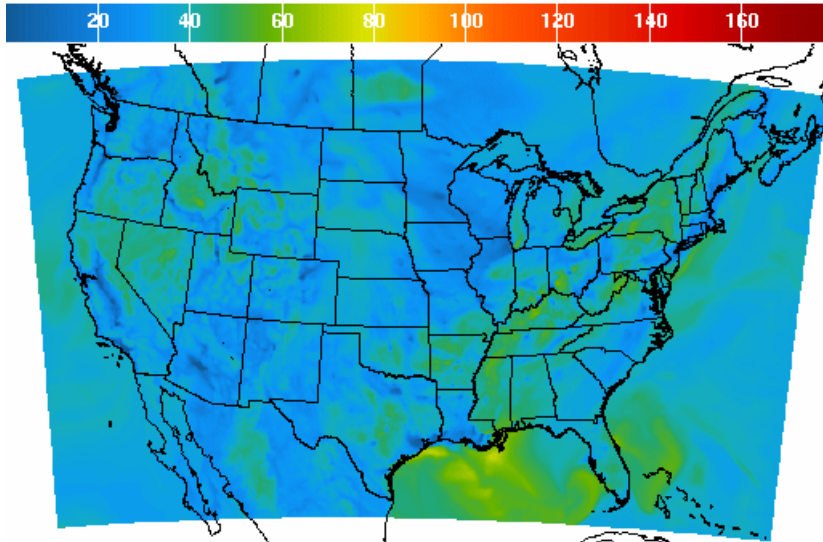
AIRNow development, coordination with NAQFC

CMAQ development, adaptation of AQ simulations for AQF



Where we are Today: Ozone and Smoke Predictions for CONUS

www.weather.gov/aq



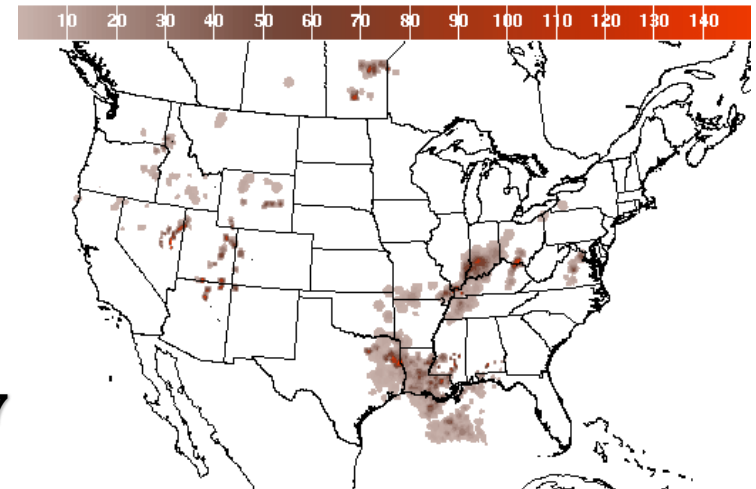
1Hr Avg Ozone Concentration(PPB) Ending Thu Sep 20 2007 10AM EDT
(Thu Sep 20 2007 14Z)



National Digital Guidance Database
06z model run Graphic created-Sep 20 7:23AM EDT



CONUS Ozone
Expansion Implemented September, 2007



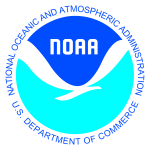
1Hr Surface Smoke (micrograms/m³) Thu Sep 20 2007 9AM EDT
(Thu Sep 20 2007 13Z)



National Digital Guidance Database
6z model run Graphic created-Sep 20 8:24AM EDT

Smoke Products
Implemented March, 2007

Further information: www.nws.noaa.gov/ost/air_quality



FY 09 Experimental Testing: Ozone and Smoke

Experimental Predictions

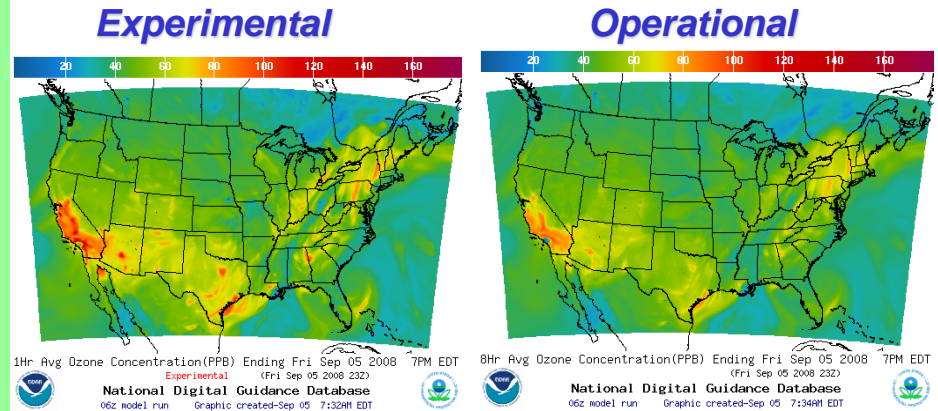
Publicly available, real-time

Ozone:

- *CMAQ with advanced gas-phase chemical mechanism CB05*
 - more comprehensive organic reactions, also important for formation of secondary organic aerosols– setting the stage for PM!
 - challenge: more O₃ with CB05
 - regional implications: CA, NE US

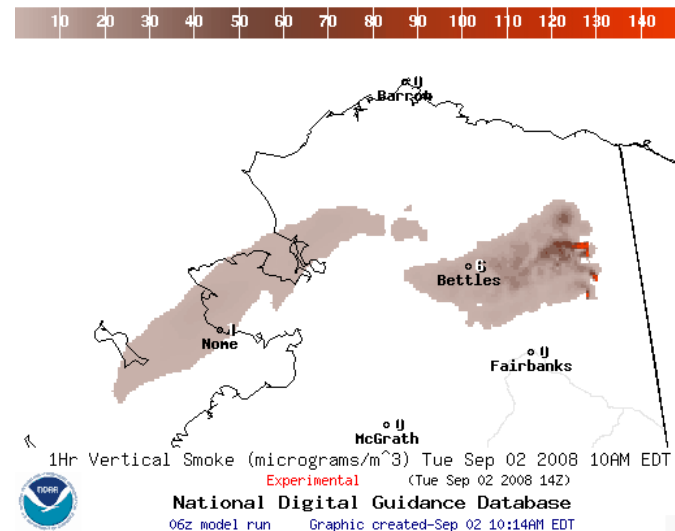
Smoke:

- *Testing over AK domain*
 - new GOES-W smoke verification in development
 - challenge: little fire activity in 2008



weather.gov/qa-expr

weather.gov/qa



FY 09 Developmental Testing

Developmental Predictions:

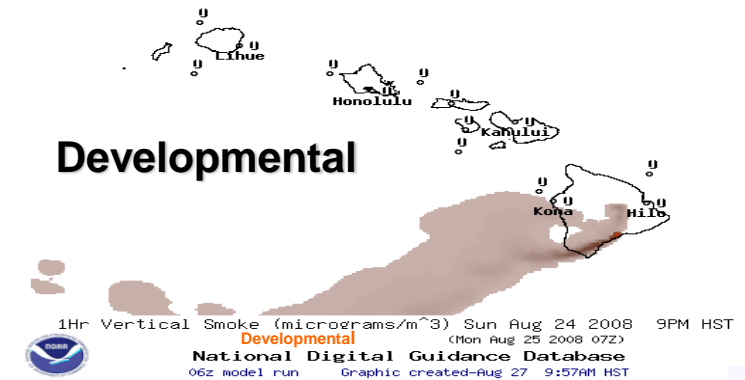
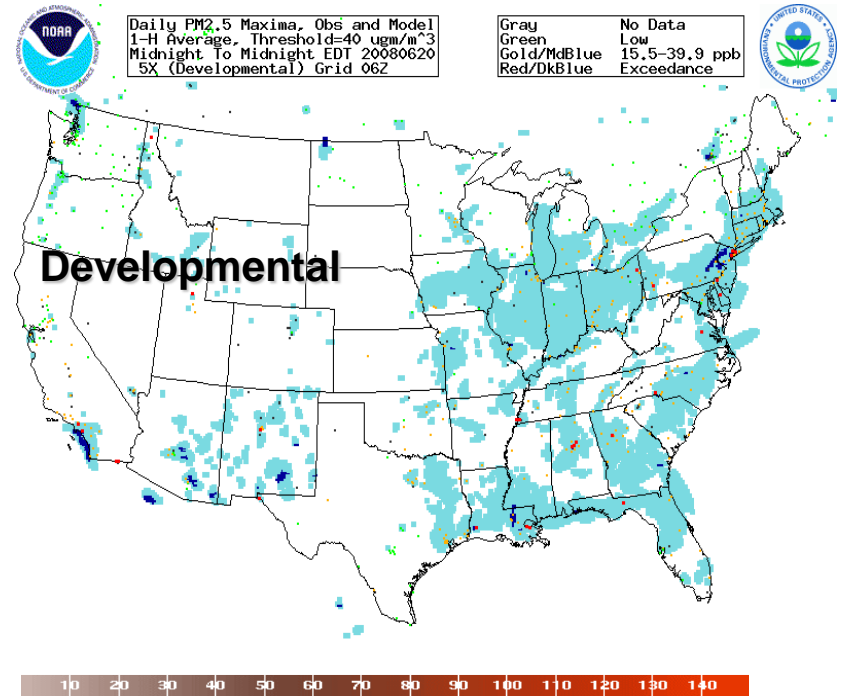
Focus group access; real-time as resources permit

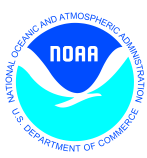
PM Components:

- *Aerosols from EPA's National Emissions Inventory (NEI) sources:*
 - CMAQ adaptation: Gas-phase (CB05), aerosol chemical reactions (AERO4), seasalt, heterogeneous pathways
- *Dust (passive transport)*

Completing Nationwide Coverage:

- *HI smoke*
- *HI, AK ozone*





National Air Quality Forecast Capability



Poor air quality responsible for losses each year in the US:

- 50,000 lives
- >\$100B

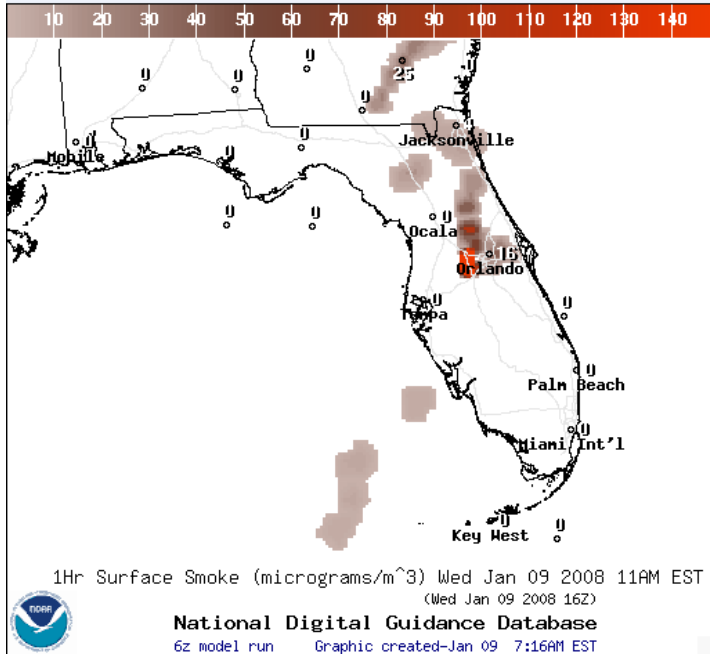
Vision:

National Air Quality Forecast System which provides the US with ozone, particulate matter and other pollutant forecasts with enough accuracy and advance notice to take action to prevent or reduce adverse effects

Strategy:

Work with EPA, State and Local Air Quality agencies and private sector to develop end-to-end air quality forecast capability for the Nation

Smoke Prediction: Potential Life-saver



Florida, 1/09/08

- Dense morning smoke predicted near Orlando
- Accident on I-4 caused 50-vehicle crash with 3 fatalities
- Evacuation concerns for PM exposure: senior citizen facilities

www.cnn.com/2008/US/01/09/florida.pileup.ap



NESDIS GOES-12

Partnership with EPA: *Reaching out to the Public*

Be Air Aware Keep an Eye on the AQI

**Air Quality Awareness Week
April 30 - May 4, 2007**

www.airnow.gov/airaware/

National Digital Guidance Database

Air Quality Outlook
June 21-22, 2006



AIRNOW Quality of Air Means Quality of Life

**Air Quality Outlook
June 12-13, 2007**

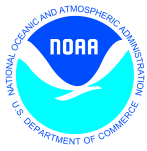
www.airnow.gov

- Only Moderate and above forecasts on the Air Quality Index are shown.
 - For local air quality conditions and forecasts, visit www.airnow.gov.
 - Surface weather based on NOAA forecasts valid 7pm EDT Jun 12.
 - Outlook issued 4pm EDT Jun 11 and valid through 1pm EDT Jun 13.

AQI
AIR QUALITY INDEX

Good Moderate Unhealthy for Sensitive Groups Unhealthy Very Unhealthy

www.airnow.gov



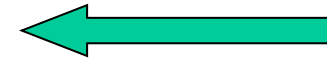
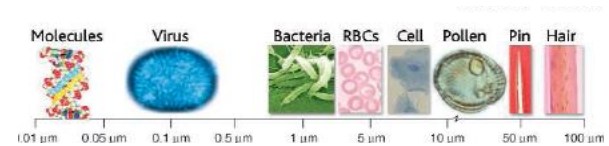
National AQF Capability: Next Steps

Expanding Ozone and Smoke Nationwide

- Development of AK, HI capabilities; target operational implementation in FY10
- Smoke from large fires: experimental testing in AK, HI
- Setting the groundwork for PM: closer coupling of AQ with NAM; treatments/resolution, horizontal boundary conditions...

Increasing Emphasis on Particulate matter components:

- **Additional components for quantitative PM forecast capability:**
 - Objective satellite products for verification (ongoing)
 - Aerosols from anthropogenic source emissions in inventories: continued development/testing/analysis– testing advanced chemical mechanisms
 - Dust prediction
 - Chemical data assimilation, speciated fire emissions, closer coupling of weather and AQ simulation
- **Integrated quantitative PM capability:**
 - Developmental and experimental testing, to begin FY12
 - Target operational implementation for initial PM forecasts, NE US: FY14
 - Full Operational Capability, per FY09 Pres. Bud: FY15

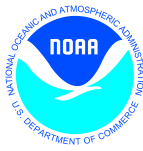


fine particles

PM_{2.5}

Further ahead:

- Extend forecast range to Day 2 and beyond
- Include other pollutants of interest



Phased Testing for Transition to Operations: *AK smoke example*

Phased Testing

Research
Does the science work?



Developmental Testing
Does it work with operational systems?



Experimental Testing
Does it meet deployment readiness criteria?



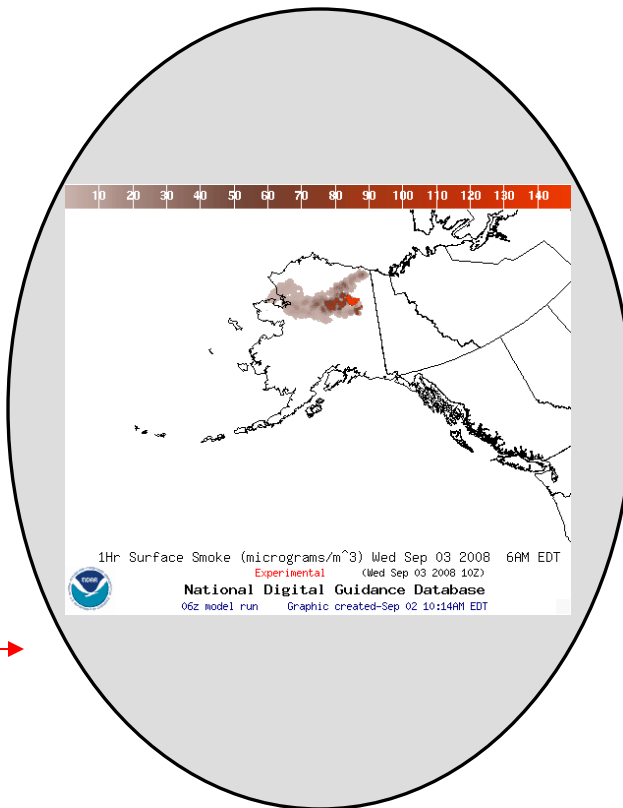
Deploy into Operations

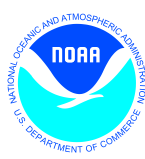
Key S&T Tests *AK Smoke*

Adapt CONUS approach to AK: satellite fire detects, USFS fire emissions, HYSPLIT dispersion

Evaluating predicted smoke plumes with satellite observations

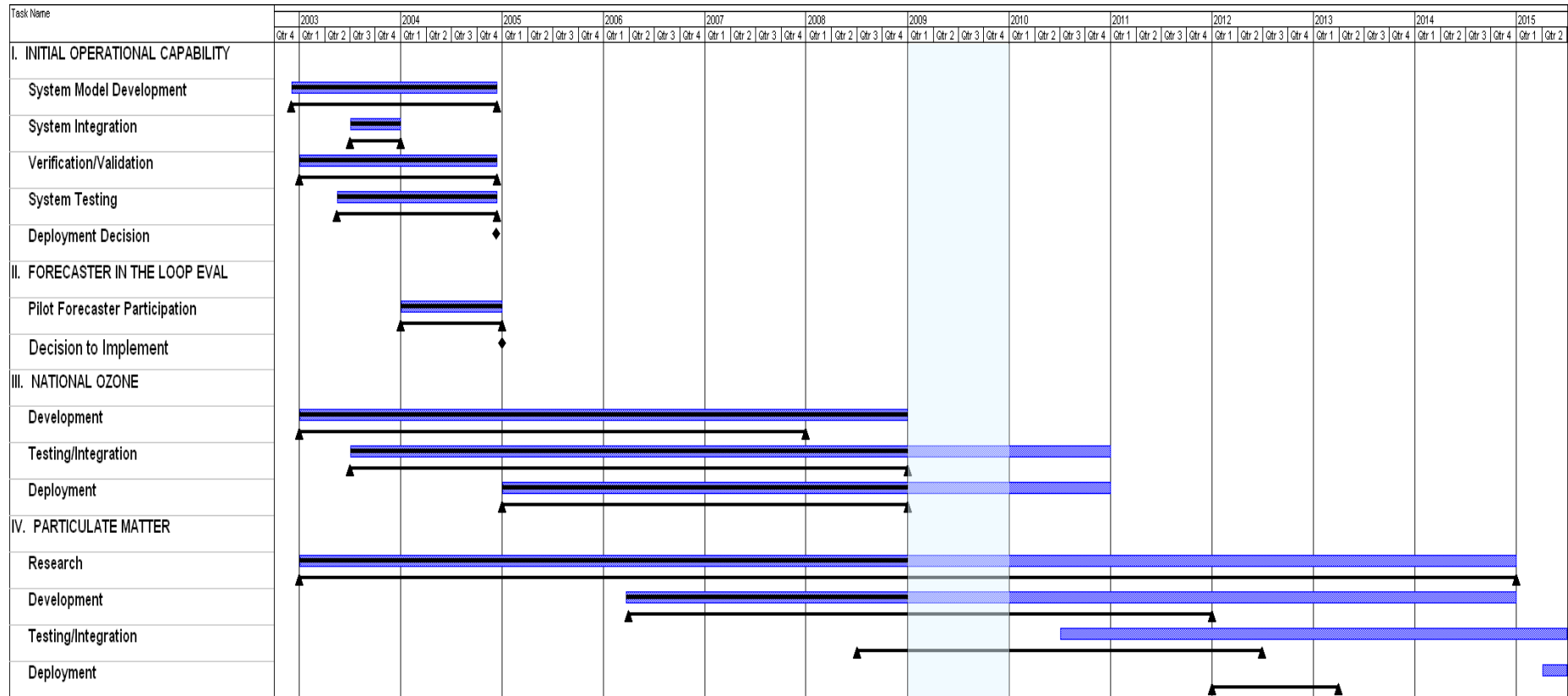
Operational Target :
Q4 FY09





NAQFC Schedule

2009



Impacts of budget reductions in FY05 and FY06:

Delayed development toward later deployments:

Ozone for AK, HI from FY09 to FY10

Particulate matter predictions from FY13 to F15