NOAA's Operational Dispersion Predictions

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NOAA operational dispersion predictions

Routine predictions

1. Smoke predictions: nationwide
2. Dust predictions: testing over CONUS

Incident support

3. Volcanic ash
4. Radiologic contamination: atmospheric releases

Smoke Forecast Tool

Major Components

NWP Model

NAM/WRF-NMM

NOAA/NWS

Weather Observations

NOAA

USFS

NESDIS HMS Fire Locations

HYSPLIT Module:

NOAA/OAR

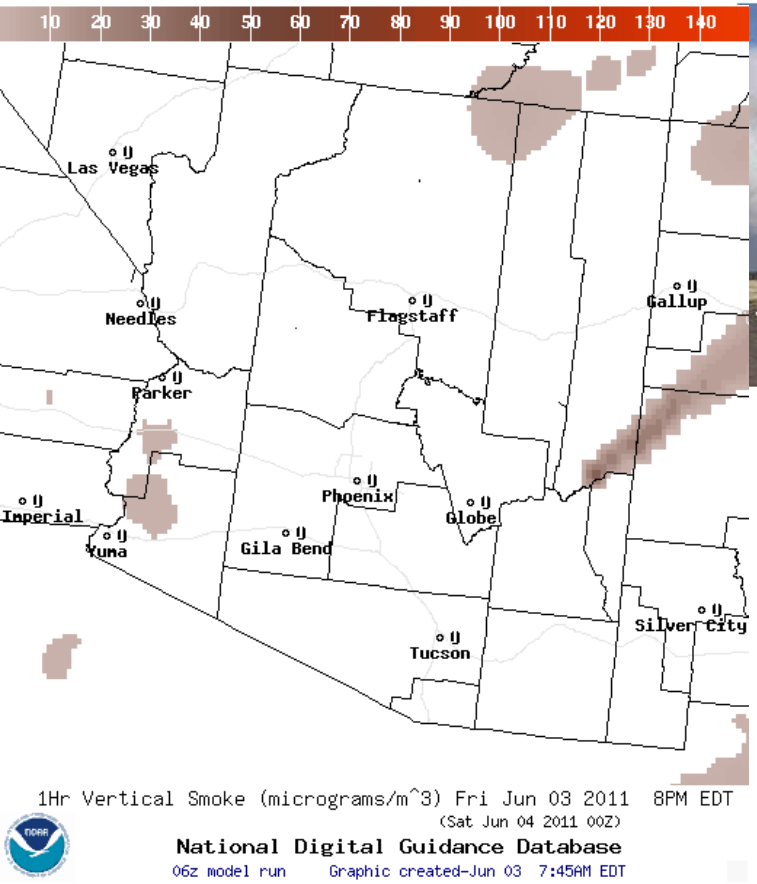
USFS's BlueSky Emissions Inventory:

USFS

Verification:

NESDIS/GASP Smoke

Wallow Wildfire
Arizona, May – July 2011



Animation of NOAA's prediction of smoke concentrations in column

www.weather.gov/aq

Wallow fire, June 3 [1]

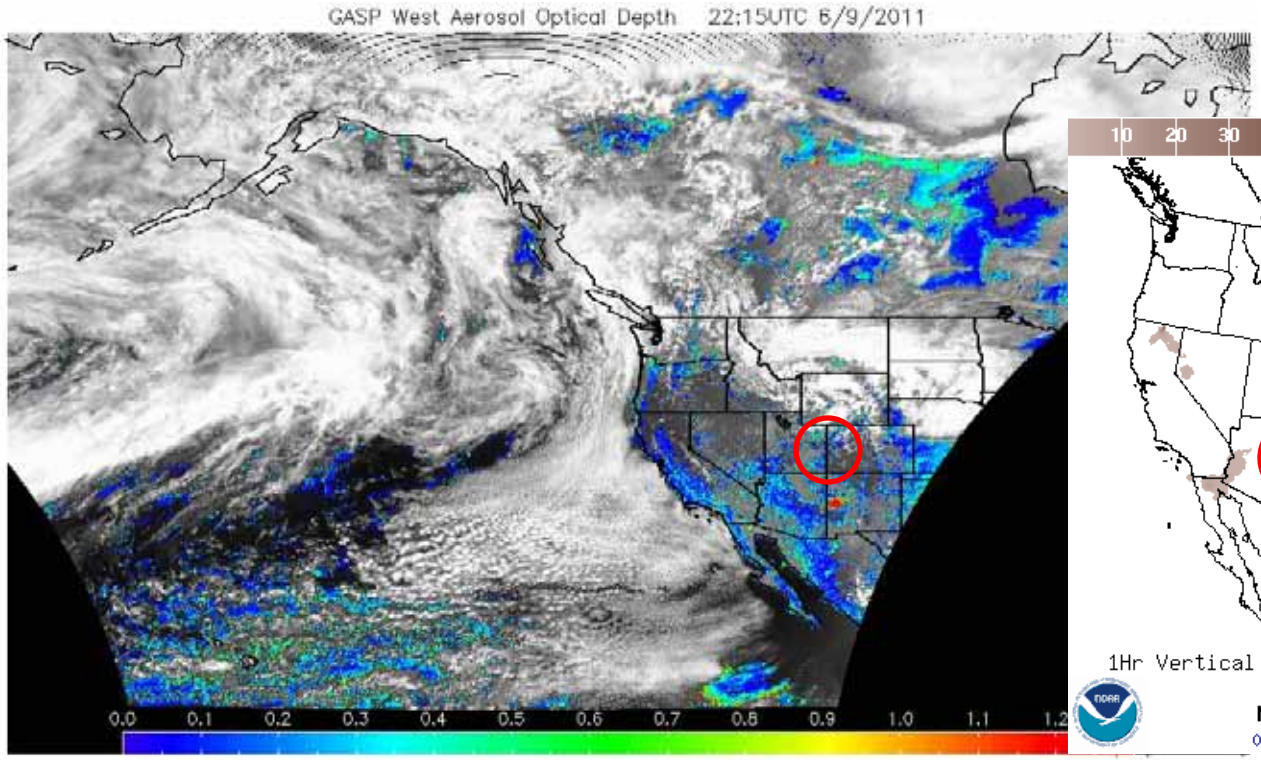
June 6 (Luna, NM, AP)

- **Fire began May 29, 2011, consumed more then 700 square miles and 32 homes; 58% contained (June 22); 100% (Jul 8) [2,3]**
- **Thru Jun 22: 12 injuries [3]; more then 9000 people evacuated [2]**
- **60mph winds contributed to its rapid spread [1]**
- **Code orange air quality forecast issued for Albuquerque for 4 days (June 6,8,9,13) - NWS prediction included high smoke concentrations**
- **Hazardous air quality predicted by NAQFC and observed in Springerville, AZ**
- **NAQFC joined coordination calls with state, local, federal agencies in AZ and NM, and USFS Fire Science Lab in Seattle**

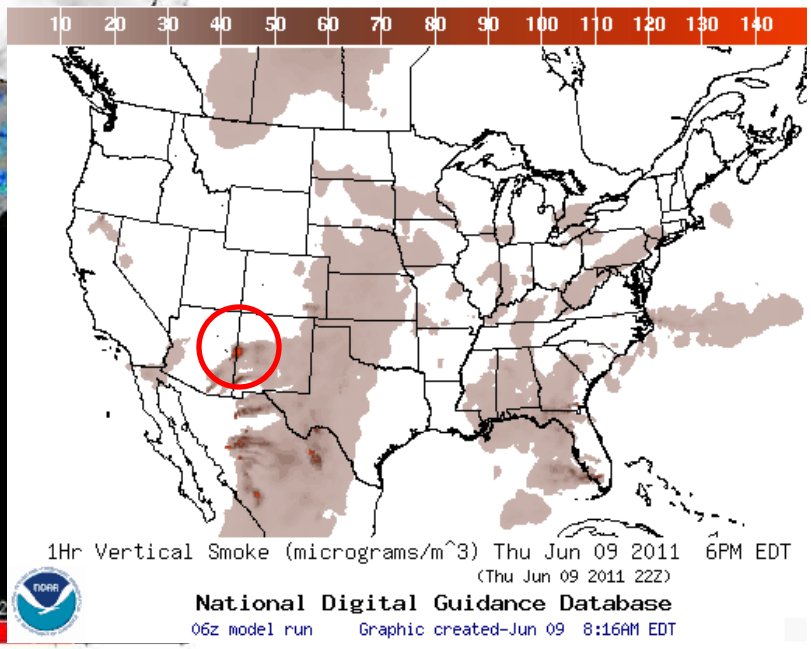
Wallow Wildfire

Verification: June 9, 2011

NESDIS GOES west Aerosol/Smoke Product



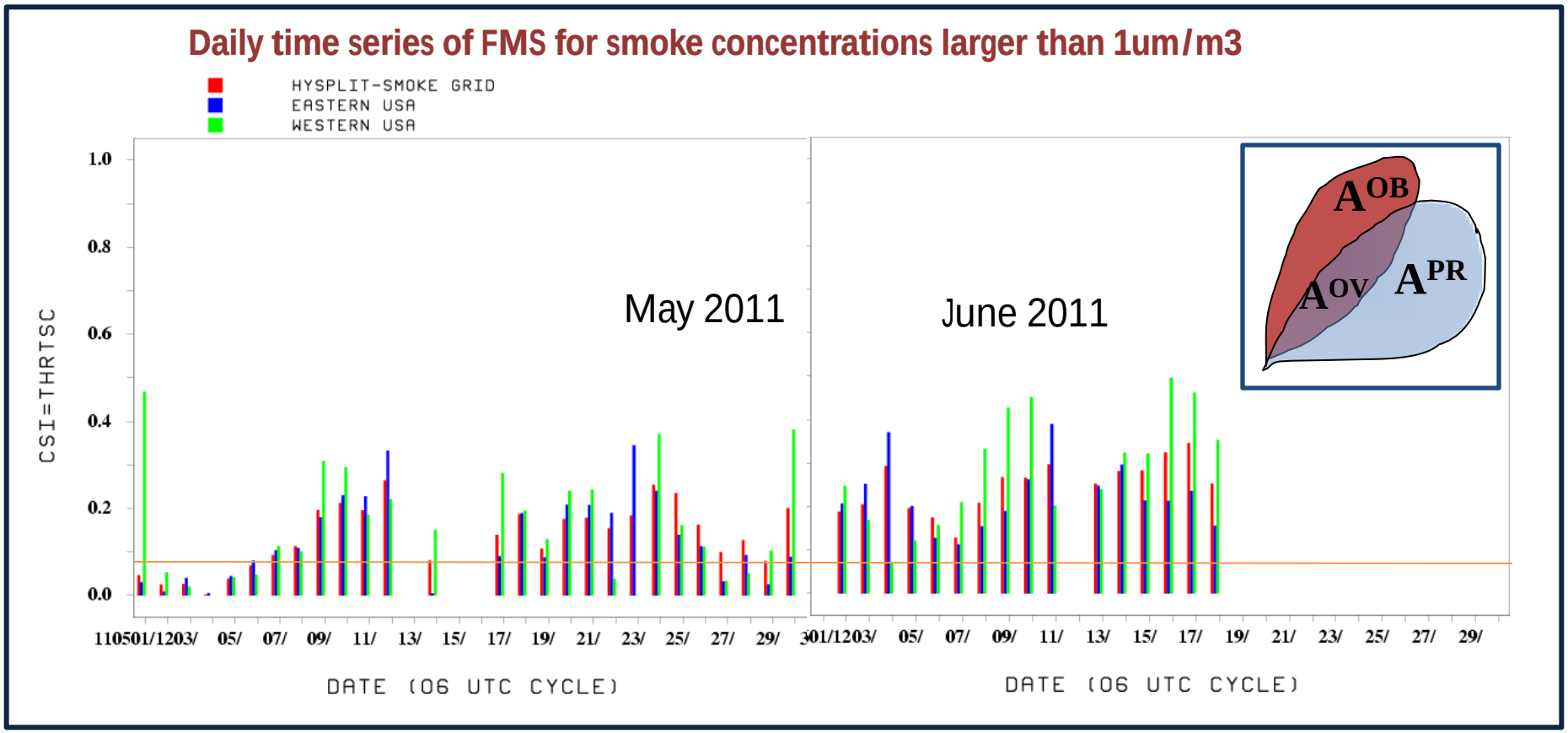
NWS smoke prediction



http://www.ssd.noaa.gov/PS/FIRE/GASP/gasp-west.html

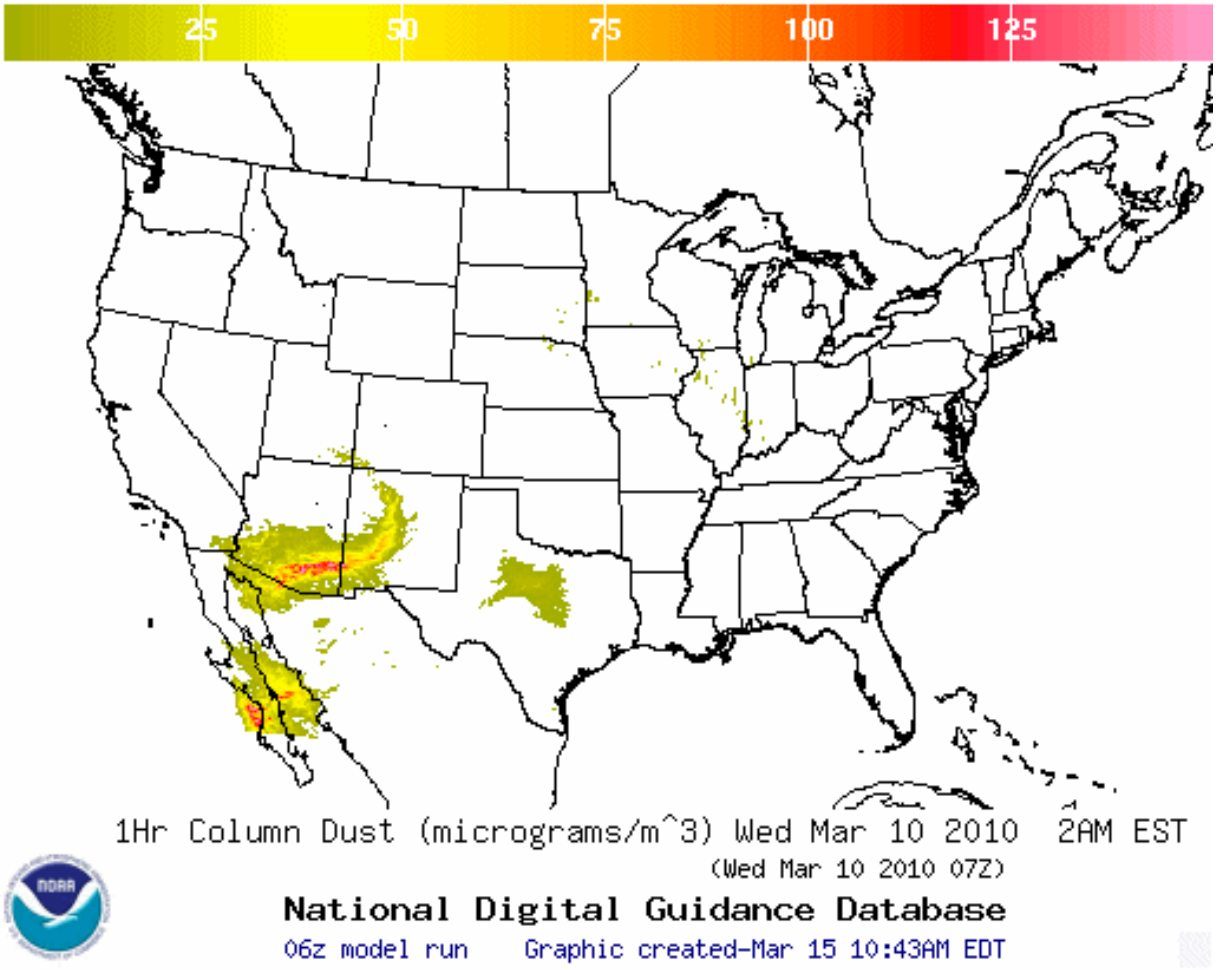
Smoke plume seen in NESDIS GOES west retrievals and NWS smoke predictions

Verification of smoke predictions



- Figure of merit in space (FMS), which is a fraction of overlap between predicted and observed smoke plumes, exceeds 0.08 in the western US since May 29 when Wallow wildfire began.
- NESDIS GOES Aerosol/Smoke Product is used for routine verification

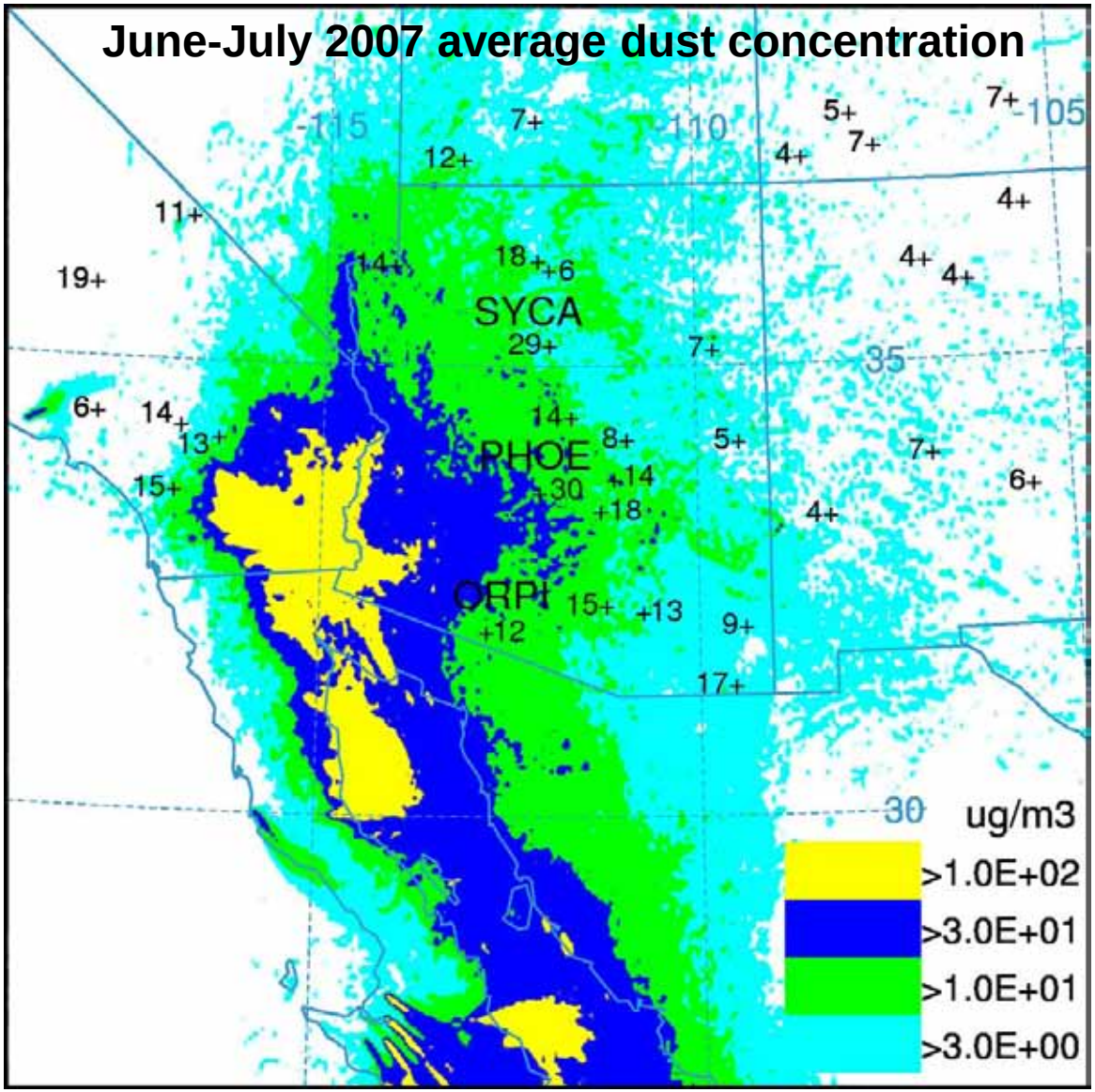
CONUS Dust Predictions:
Experimental Testing



Standalone prediction of airborne dust from dust storms:

- Wind-driven dust emitted where surface winds exceed thresholds over source regions
- Source regions with emission potential estimated from monthly MODIS deep blue climatology (2003-2006)
- HYSPLIT model for transport, dispersion and deposition
- Updated source map in experimental testing (Draxler et al., JGR, 2010)

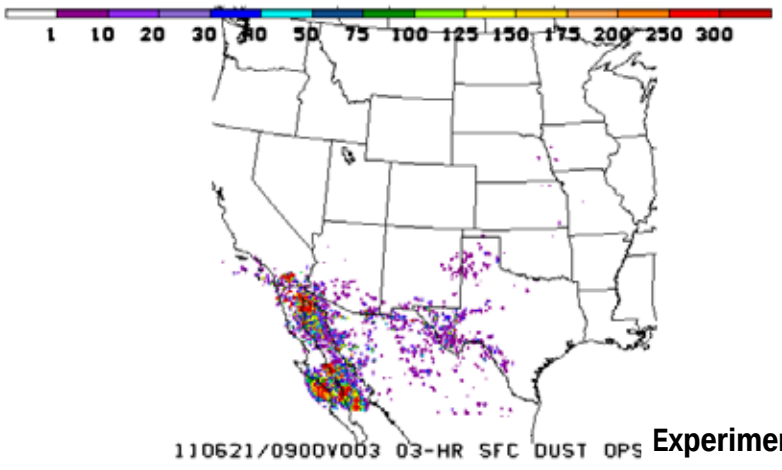
Dust simulation vs. IMPROVE data



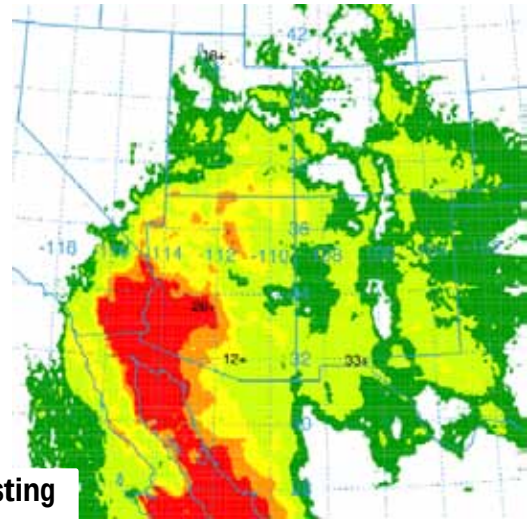
- HYSPLIT simulations: contours
- IMPROVE dust concentration: numbers next to “+“
- Model and IMPROVE concentrations comparable in 3-10 ug/m^3 range
- Spotty pattern indicates under-prediction. Considering ways for improving representation of smaller dust emission sources.

(Draxler et al., JGR, 2010)

Dust Prediction Improvements

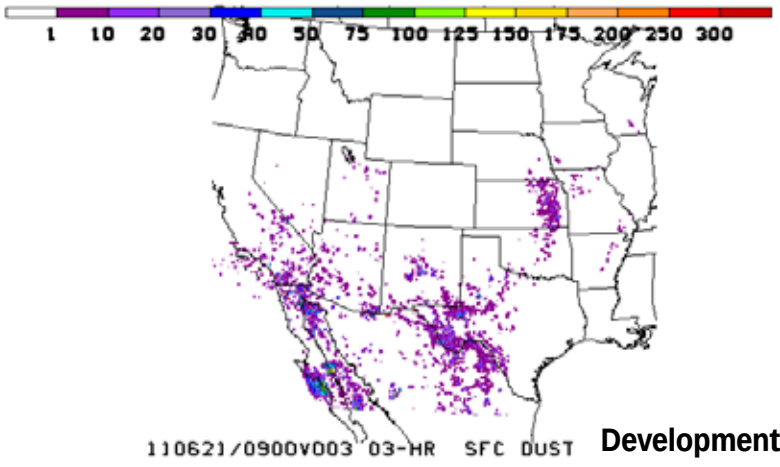


Experimental testing

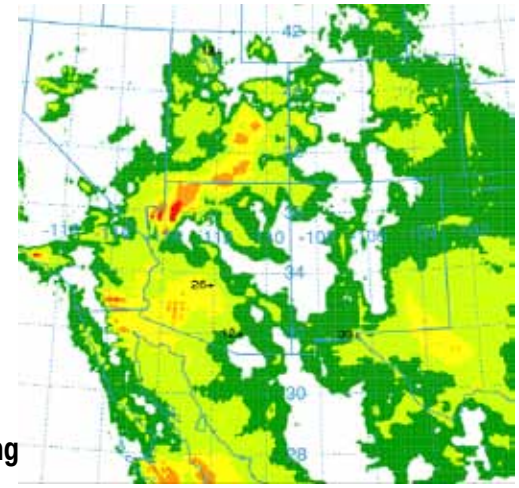


Dust concentration for
29 Mar- 01 Jul 2010

>2.0E+01 ug/m3
>1.0E+01 ug/m3
>5.0E+00 ug/m3
>2.0E+00 ug/m3
>1.0E+01 ug/m3



Developmental testing

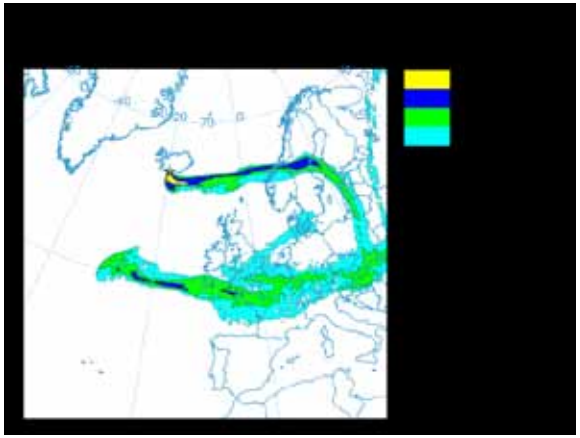


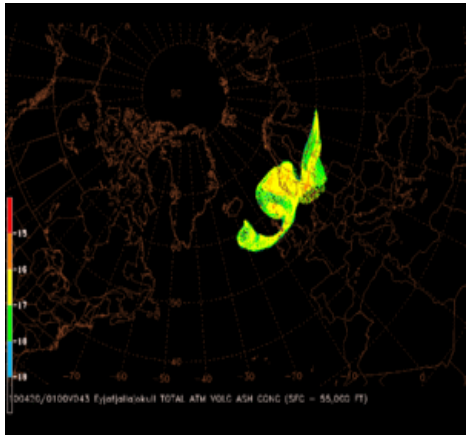
In more recent developmental test version soil moisture modulates dust emissions

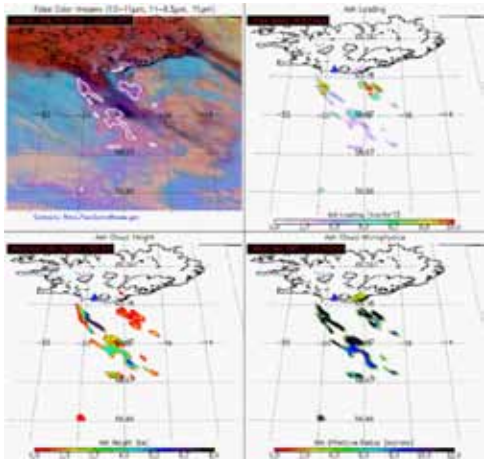
Volcanic Ash Monitoring/Prediction

Response to the Eruptions of Eyjafjallajokull *Volcano*

- NESDIS (Satellite imagery resources – top and horizontal extent of cloud)
- Washington and Anchorage VAACs (detection/tracking, forecasting)
- NWS/OAR (modeling -- HYSPLIT volcanic ash dispersion)
- Meteorological Watch Offices (Aviation Warnings for Volcanic Ash – SIGMETs)
  - NWS/NCEP Aviation Weather Center, NWS WFO Honolulu, NWS Alaska Aviation Weather Unit
- Center Weather Service Unit (1 per FAA Air Route Traffic Control Center)



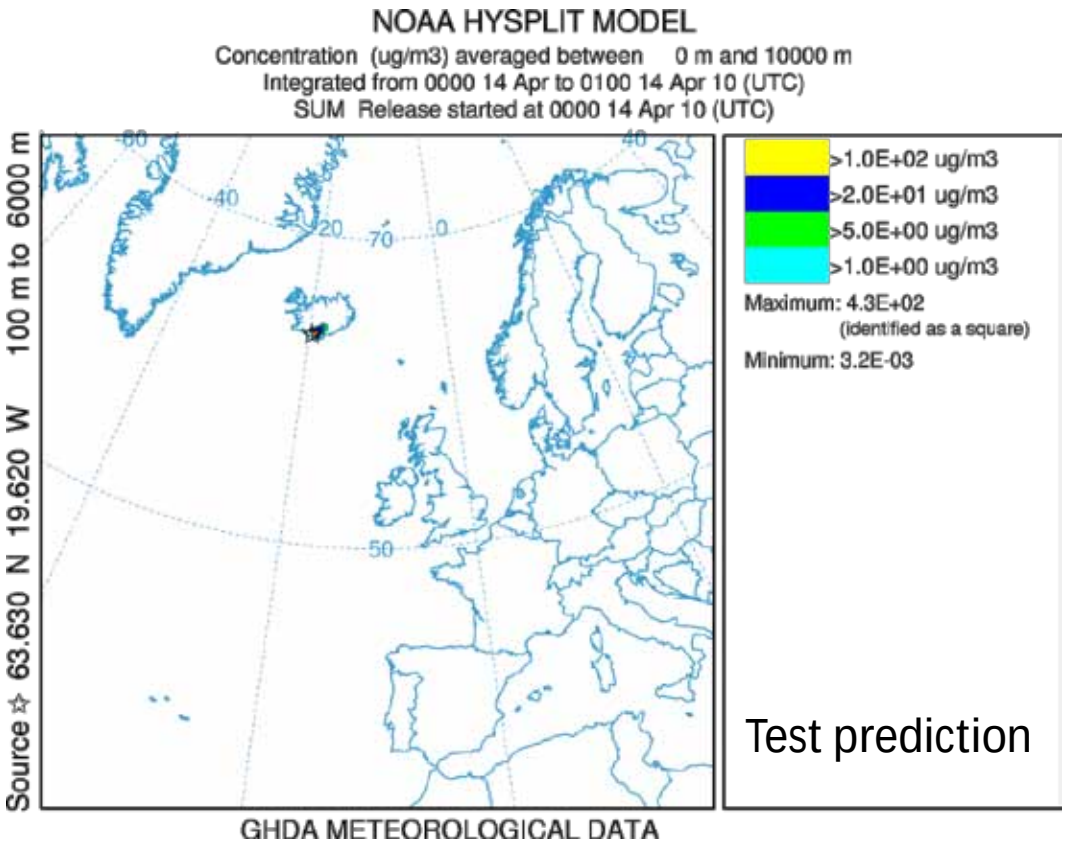




NOAA's Volcanic Ash Program

Test Predictions for Volcanic Ash Dispersion NOAA HYSPLIT model

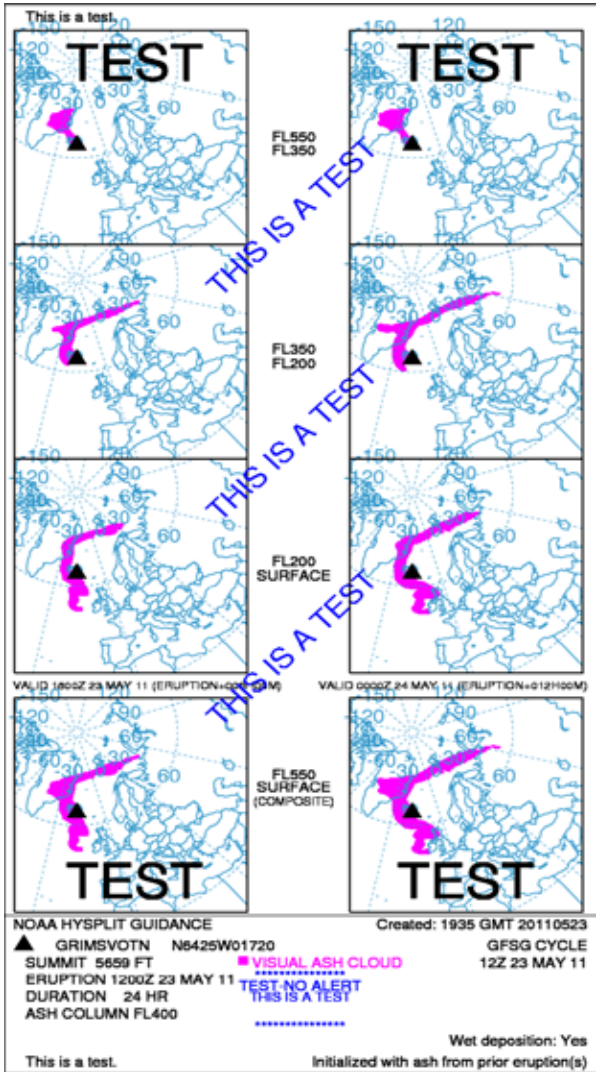
2010 Eyjafjallajokull eruption



Test prediction using GFS meteorology at ½ degree resolution

2011 Grimsvotn eruption

24-hour (May 23rd 2011) test prediction of volcanic ash run by NCEP. Predicted visible ash cloud is shown in pink.



- Predictions are also being tested in NOAA research models (WRF-Chem and FIM-chem) with promising results.

T/D simulations for radioactive releases

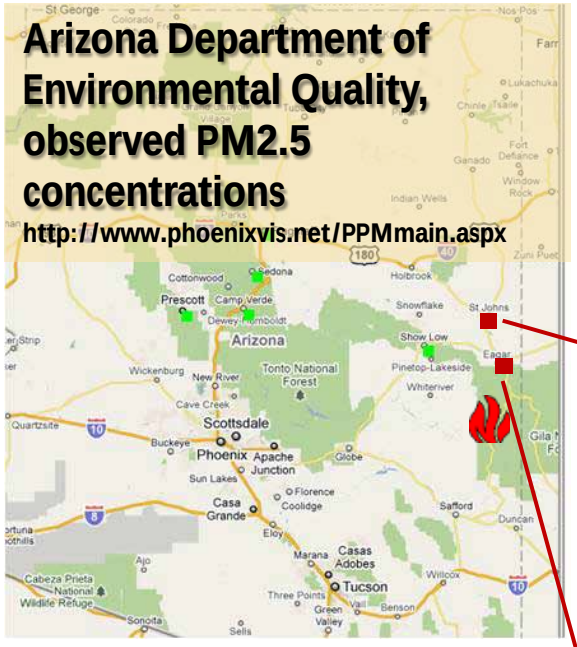
- NOAA is the home for the U.S. Regional Specialized Meteorological Center under WMO that supports International Atomic Energy Agency (IAEA)

- For the Fukushima Daiichi nuclear power plant incident:
  - IAEA requested NOAA transport simulations, which were shared with IAEA member countries
  - NOAA worked with DOE and Nuclear Regulatory Commission to inform the federal community about the transport of radiation
  - NOAA atmospheric modeling group provided estimates of deposition into the ocean for NOAA's ocean radiation simulations
  - HYSPLIT runs were used for these simulations (NOAA/ARL, NOAA/NCEP)

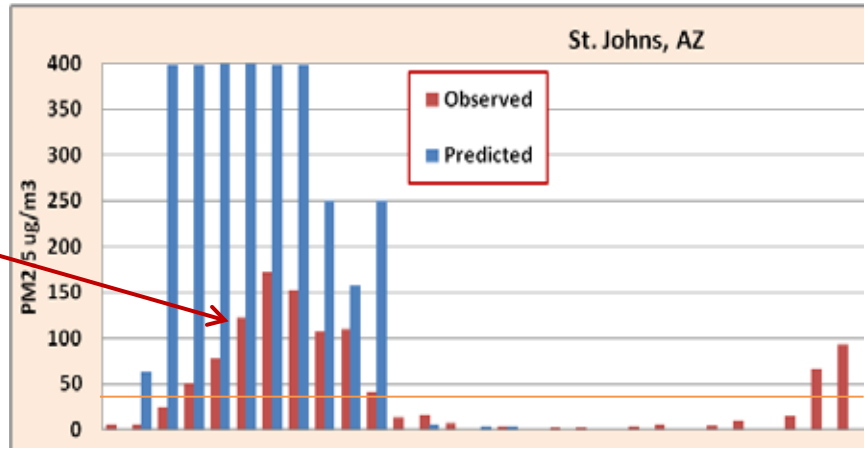
Backup

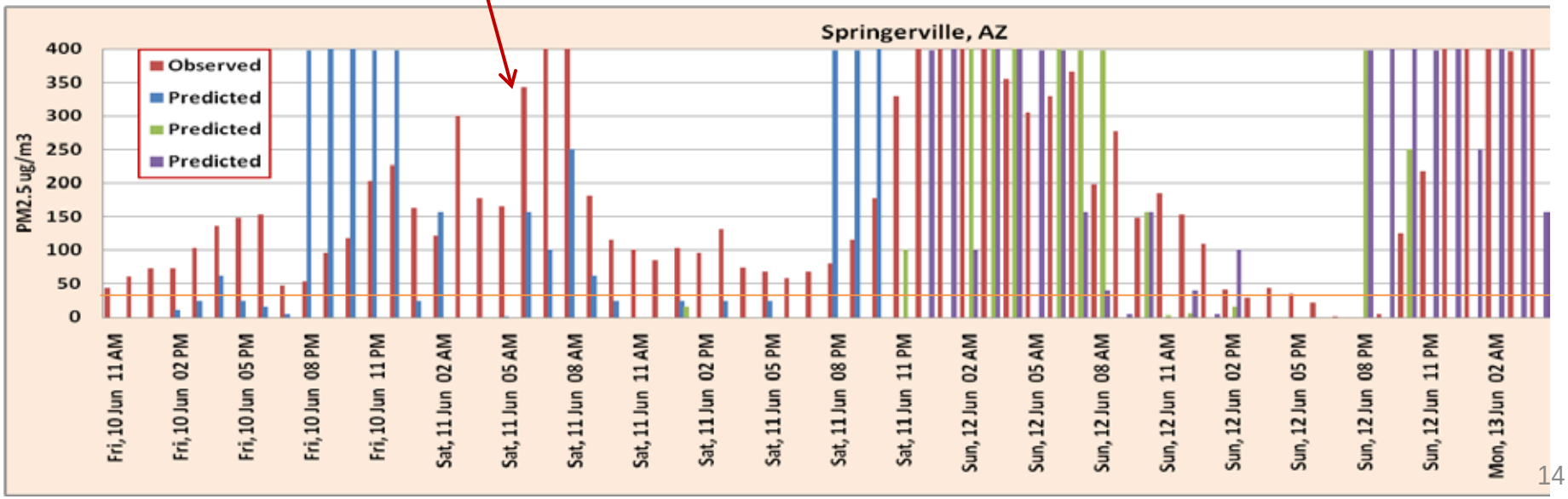
Springerville and St. Johns, Arizona portable particulate monitors

Arizona Department of Environmental Quality, observed PM2.5 concentrations
http://www.phoenixvis.net/PPMmain.aspx

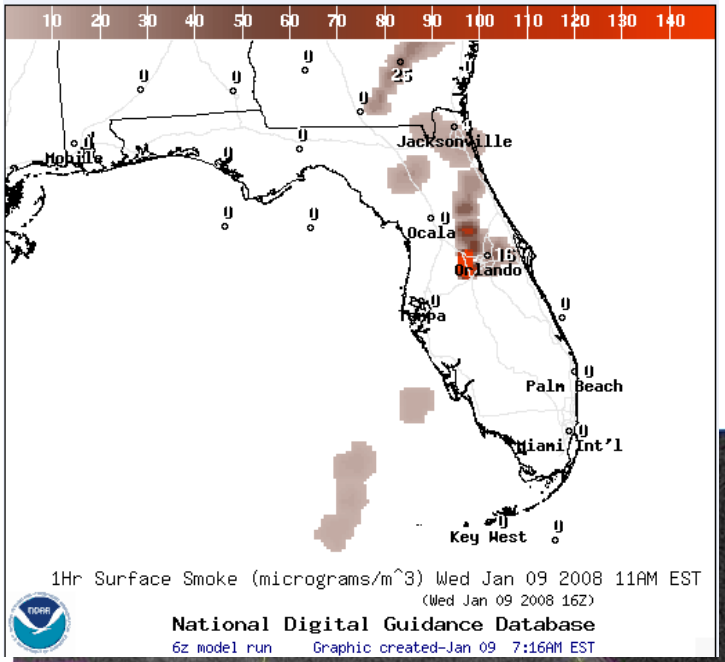


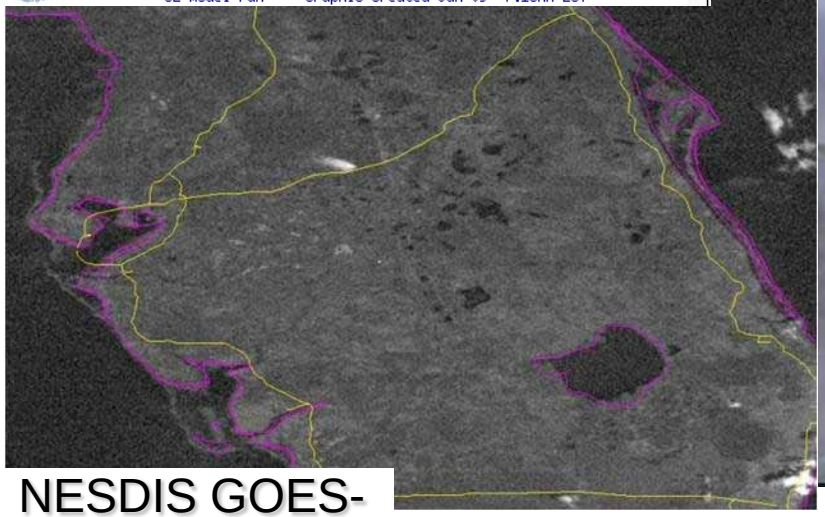
NOAA smoke predictions from 6z runs on June 10-12





Smoke Prediction: Potential Life-saver





NESDIS GOES-12

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

Sources

- Smoke predictions: http://www.weather.gov/aq/images/arizona/dynamic/
- GASP imagery: http://www.ssd.noaa.gov/PS/FIRE/GASP/gasp-west.html
- MODIS Imagery: http://rapidfire.sci.gsfc.nasa.gov/gallery/
- GASP verification scores: http://www.emc.ncep.noaa.gov/mmb/aq/
- Albuquerque surface observations and AQ forecasts: http://www.airnowtech.org/
- Arizona surface observations: http://www.phoenixvis.net/PPMmain.aspx
- Dust parallel run comparison: http://www.emc.ncep.noaa.gov/mmb/gmanikin/dustpara/

1. Eastern Arizona wildfire still rages, AP, June 5, 2011. http://www.latimes.com/news/la-na-arizona-wildfires-20110606-pictures,0,6897558.photogallery
2. As Arizona wildfire rages, officials allow some to return home, CNN, June 12, 2011 http://www.cnn.com/2011/US/06/12/arizona.wildfires/
3. InciWeb, Incident information system, accessed on June 16, 2011 http://www.inciweb.org/incident/article/2262/