Georgia Department of Natural Resources
Environmental Protection Division
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November 12, 2014

NOTICE OF THE OPPORTUNITY FOR PUBLIC COMMENT
GEORGIA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION
AIR PROTECTION BRANCH

STATE OF GEORGIA

NOTICE OF DRAFT Documentation of 2014 Exceptional Events – November 2014

To All Interested Parties:

The Georgia Environmental Protection Division announces its intent to submit Documentation of 2014 Exceptional Events to the U.S. Environmental Protection Agency in November 2014.

The Georgia Department of Natural Resources (DNR), Environmental Protection Division (EPD) has determined that the 24-hour fine particle data ($PM_{2.5}$) for a series of sites, obtained on varying dates in 2014, could have been biased by local events which were not representative of the air quality in the area. This data has been flagged in EPA's Air Quality System (AQS) database as an "exceptional event." The following documentation is to show the exploration of this data for possible reasons of exceptional data. Ultimately, this documentation would justify the flag, and EPD would request concurrence from the Environmental Protection Agency (EPA). This would exclude the affected monitoring data in calculations for determining the state's $PM_{2.5}$ NAAQS status.

The draft Documentation of 2014 Exceptional Events is available for review at the office of the Air Protection Branch, 4244 International Parkway, Atlanta Tradeport - Suite 120, Atlanta, Georgia 30354. Anyone interested in reviewing the draft documentation may also visit the following EPD Regional Offices from 8:30 a.m. – 4:00 p.m.: Coastal District (Brunswick), One Conversation Way, Brunswick, GA 31520 – 912-264-7284; East Central District (Augusta), 3525 Walton Way Extension, Augusta, GA 30906 – 706-667-4343; Mountain District (Atlanta), 4244 International Parkway, Suite 114, Atlanta, GA 30354 – 404-362-2671; Mountain District (Cartersville), 16 Center Road, Cartersville, GA 30120 – 770-387-4900; Northeast District (Athens), 745 Gaines School Road, Athens, GA 30605; Southwest District (Albany), 2024 Newton Road, Albany, GA 31701 – 229-430-4259; West Central District (Macon), 2640 Shurling Drive, Macon, GA 31211 – 478-751-6612. Columbus area residents can review the draft Documentation of 2014 Exceptional Events at the Columbus Public Library, 3000 Macon Road, Columbus, Georgia 31906 – 706-243-2669. Savannah area residents can review the draft Documentation of 2014 Exceptional Events at the Bull Street Library, 2002 Bull Street, Savannah, GA 31401 – 912-652-3600. Lowndes County residents can review the draft Documentation of 2014 Exceptional Events at the South Georgia Regional Library, 300 Woodrow Wilson Drive, Valdosta, GA 31602 – 229-333-0086.

The draft Documentation of 2014 Exceptional Events will be available at our internet sites: http://www.georgiaair.org/airpermit/html/hottopics.htm and http://www.air.dnr.state.ga.us/amp/ (Please note that the internet is generally accessible from most public libraries in Georgia and at the Air Protection Branch office listed above.)

If copies are desired, each page is $0.10 per copy. A copying machine for public use is provided by GA EPD at the Atlanta Air Protection Branch office only and is available on a first-come, first-served basis. Office hours are 8:30 a.m. to 4:00 p.m., Monday – Friday, excluding holidays.

Persons wishing to comment on the draft Documentation of 2014 Exceptional Events are required to submit their comments, in writing, to GA EPD at the following address:

Air Protection Branch
Attn: Annual Air Monitoring Plan Comments
4244 International Parkway, Suite 120
Atlanta, Georgia 30354

In addition, public comments can be submitted in writing to DeAnna Oser, Program Manager of the Ambient Monitoring Program, at DeAnna.Oser@dnr.state.ga.us

Comments must be received by GA EPD no later than 30 days after the date on which this document is published on http://www.georgiaair.org/airpermit/html/hottopics.htm and http://www.air.dnr.state.ga.us/amp/ (Should the comment period end on a weekend or holiday, comments will be accepted up until the next working day.) GA EPD, in soliciting comments for the final draft before submittal to EPA as required by 40CFR Part 50.14(c)(3)(i), will consider all comments received on or prior to that date.

After the comment period has expired, GA EPD will consider all comments received. GA EPD's responses to comments and any other relevant information will then be made available for public review during normal business hours at the office of the Air Protection Branch.

For additional information, contact the manager of the Ambient Air Monitoring Program, DeAnna Oser at the Atlanta address, or by phone at 404-363-7000. Please refer to this notice when requesting information.

GEORGIA DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

Air Protection Branch
Ambient Monitoring Program

Documentation of July 1-2, 2014 Exceptional Event

Supporting Documentation for July 1-2, 2014 $PM_{2.5}$ Exceptional Data for the State of Georgia

Purpose

The Georgia Department of Natural Resources (DNR), Environmental Protection Division (EPD) has determined that the fine particle data ($PM_{2.5}$) obtained on July 1-2, 2014 have been affected by a natural event and were not representative of the air quality in the area. The following documentation is to show that this data is exceptional and affected by a natural event that was not controllable or preventable. This data has been flagged in EPA's Air Quality System (AQS) database as an "exceptional event." Ultimately, this documentation will justify the exceptional event flag, and EPD will request concurrence from the Environmental Protection Agency (EPA). This will exclude the affected monitoring data in calculations for determining the state's $PM_{2.5}$ NAAQS status.

40 CFR § 50.14 addresses the treatment of air quality monitoring data influenced by exceptional events. It states, in part, "...a State may request EPA to exclude data showing exceedances or violations of the national ambient air quality standard (NAAQS) that are directly due to an exceptional event from use in determinations by demonstrating to EPA's satisfaction that such event caused a specific air pollution concentration at a particular air quality monitoring location." This is accomplished by flagging the data with the appropriate code in AQS and providing EPA with a demonstration that justifies data exclusion. This document serves as such a demonstration.

EPD will show that the following monitor values, as listed in Table 1 and Table 2, obtained on July 1 and July 2, 2014 are, in some cases, statistical outliers and were biased by an unusual natural event. This unusual event constitutes an "exceptional event", and in some cases this exceptional event leads to an increase in the $PM_{2.5}$ NAAQS for the 2012-2014 period. Therefore, the following data for the State of Georgia Ambient Air Monitoring Network should not be used in the calculations to determine the area's status in regards to the $PM_{2.5}$ NAAQS of each respective MSA in Georgia. $PM_{2.5}$ data above the 24-hour standard of 35 $\mu g/m^3$ are highlighted in yellow in Table 2.

Site	Concentration ($\mu g/m^3$)
Macon - Allied	24.8
Macon SE	23.2
Athens	24.2
Forest Park	27.5
Kennesaw	24.6
South DeKalb (primary, POC 1)	26.8
South DeKalb (continuous, POC 3)	27.2
Albany – Turner (primary, POC 1)	21.6
Albany - Turner (collocated, POC 2)	21.2
Albany - Turner (continuous, POC 3)	20.1
Rome	21.0
Fire Station #8	27.2
Gwinnett Tech	27.5
Gainesville	26.1
Warner Robins	22.2

Columbus - Health Dept.	21.8
Columbus - Airport	21.4
Columbus - Cusseta	23.2
Rossville	23.0
Sandersville	20.8
Gordon	24.6

Table 1: Statewide 24-Hour $PM_{2.5}$ Readings Affected on July 1, 2014

Site	Concentration ($\mu g/m^3$)
Macon - Allied	39.6
Kennesaw	22.0
South DeKalb (primary, POC 1)	22.7
South DeKalb (continuous, POC 3)	26.6
Albany – Turner (primary, POC 1)	39.6
Albany - Turner (collocated, POC2)	39.4
Albany - Turner (continuous, POC3)	39.3

Table 2: Statewide 24-Hour $PM_{2.5}$ Readings Affected on July 2, 2014

All $PM_{2.5}$ monitoring sites in Georgia have data that show attainment with the 2012 NAAQS using 2011-2013 data. However, all but one site [South DeKalb, which had a continuous $PM_{2.5}$ monitor (FEM) during the entire period] have incomplete design values due to one or more quarters that do not meet EPA's 75% data capture requirement as specified in 40 CFR 50 Appendix N. Therefore, in order for EPA to designate these areas as "attainment" using 2011 through 2013 data, the data had to be validated using the "maximum quarterly value data substitution test" (data substitution test) specified in section 4.1(c)(ii) of 40 CFR 50 Appendix N. EPD performed these calculations and some areas of the state passed the data substitution test. However, eight areas did not. Of these areas, EPA has indicated its intention to defer designations for five areas (Augusta, Columbus, Savannah, Valdosta, and Washington County) until 2014 data is certified on or before February 27, 2015. EPA has also indicated that it intends to designate the three other areas as "unclassifiable" (Atlanta, Brunswick, and Albany) because they believe they will not qualify for or pass the data substitution test following certification of the 2014 data. Also, since EPD will be early certifying 2014 data in 2015, any sites with incomplete data in 2012 through 2014 will have to be determined valid through the data substitution test.

There are eight monitors in Georgia that have one or more incomplete quarters in 2012, 2013, or 2014 (through 2nd quarter). Any monitors with one or more incomplete quarters during these three years will have to pass the data substitution test in order to have valid 2012-2014 design values. Monitors with incomplete quarters in 2012 through 2nd quarter of 2014 are shown below.

AQS Number	Monitor	2012 incomplete quarters	2013 incomplete quarters	2014 incomplete quarters (thru 2nd quarter)
13-095-0007	Albany	Q2, Q3, Q4		
13-059-0002	Athens	Q4		
13-115-0003	Rome			Q1
13-127-0006	Brunswick	Q1, Q2, Q3, Q4	Q1, Q2	Q1
13-051-0091	Savannah – Mercer	Q3, Q4	Q4	Q1

	Middle School			
13-185-0003	Valdosta	Q2		
13-295-0002	Rossville	Q2		
13-303-0001	Sandersville	Q2		

Table 3: Monitors with Incomplete Quarters in 2012, 2013, or first or second quarter, 2014

Since the only potential 2-day exceptional event identified in 2014 to date is in the third quarter, only data substitution tests performed on monitors with incomplete quarters during third quarter (Albany, Brunswick, and Savannah) could potentially be affected by the July 1 to 2 event. Of these three monitors, only the Albany monitor exhibited high $PM_{2.5}$ levels during the event. If any of the 2014 exceptional event data would be used in this data substitution test, then that event would have an impact on attainment designations for the 2012 $PM_{2.5}$ NAAQS. Therefore, these exceptional events should be considered by EPA for concurrence.

The following discussion provides an exploration of data that should be concurred by EPA as exceptional due to natural uncontrollable and unpreventable circumstances. The details for support of flagging these sites in respect to the $PM_{2.5}$ level on that day include (when available) an analysis of box and whisker plots from 2011 through July 2014, a yearly average comparison to the historical data dating back to 2011, an analysis of historical seasonal fluctuations, a comparison of the continuous $PM_{2.5}$ data, analysis of $PM_{2.5}$ speciation data, calculations of a Z test, calculation of annual averages with and without exceptional data, calculation of 24-hour and annual design values with and without exceptional data, an examination of meteorological data, and newspaper articles reporting exceptional happenings in the area.

Meteorological Conditions for July 1-2, 2014

On July 1-2, an increase in particle concentration was detected at several EPD monitoring stations across the state. Several sites across the state showed elevated $PM_{2.5}$ levels. This increase in particulate matter was believed to be due to the advection of the Saharan Aerosol Layer (SAL) as it was being entrained around Tropical Storm Arthur and circulated around a strong Gulf High pressure ridge (see Meteosat images below showing dry SAL layer across the Atlantic Basin, along with satellite surface chart composite, Figure 1, Figure 2, Figure 3). Preliminary back-trajectory analysis and 850 mb upper (Figure 4) shows this circulation of Saharan dust and transport across the Atlantic and Caribbean, in conjunction with MODIS satellite imagery (Figure 5) also shown below. VIRS AOD satellite imagery shows aerosol optical depth enhancement over portions of Georgia (Figure 6). CALIPSO lidar satellite imagery data further verifies an elevated dust layer near the Metro Atlanta latitude /longitude early on July 2nd (Figure 7). Chemical speciation data aides in further verification of Saharan Dust observed during this episode (graphs in discussion below).

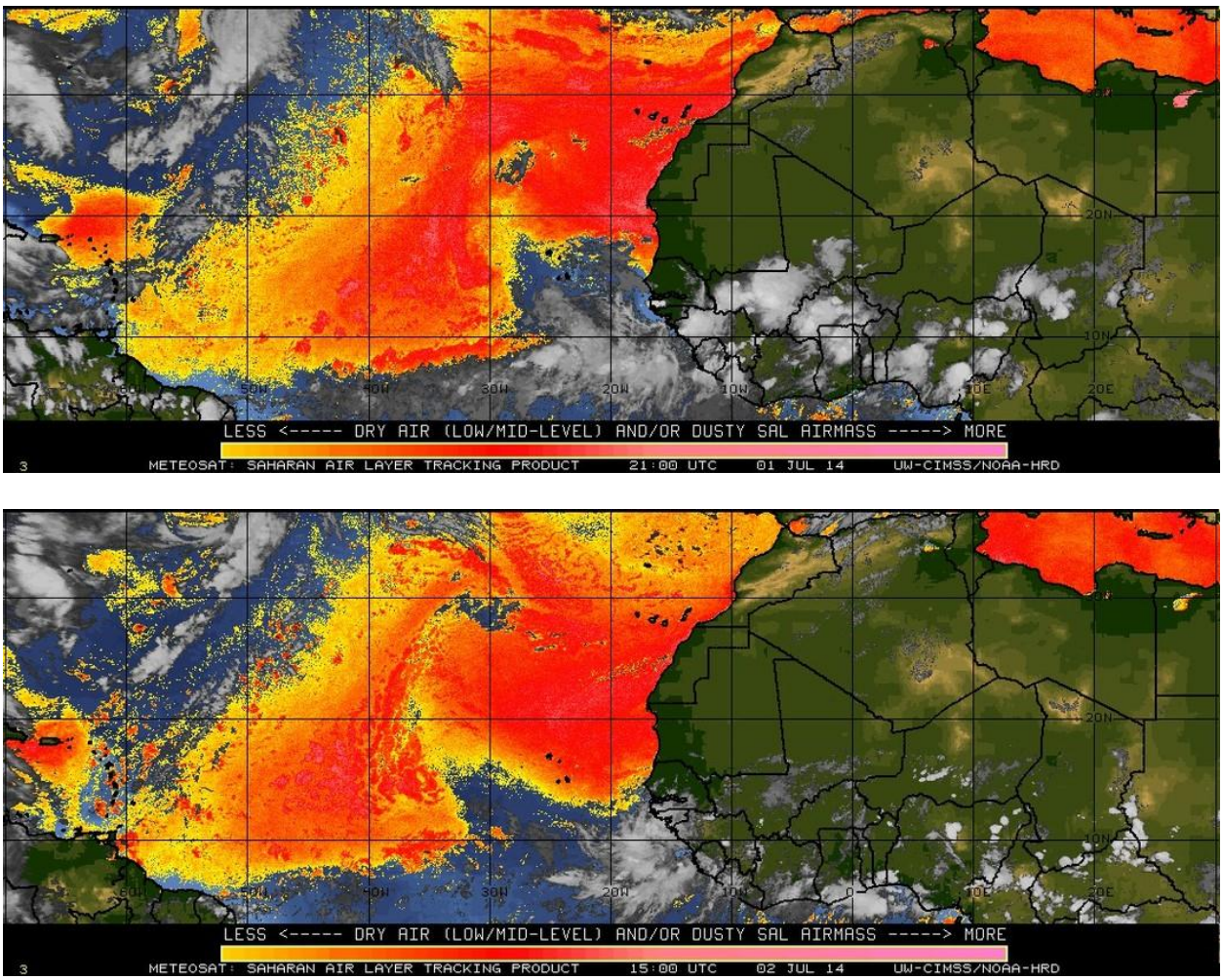


Figure 1: Metosat Images Showing Saharan Aerosol Layer

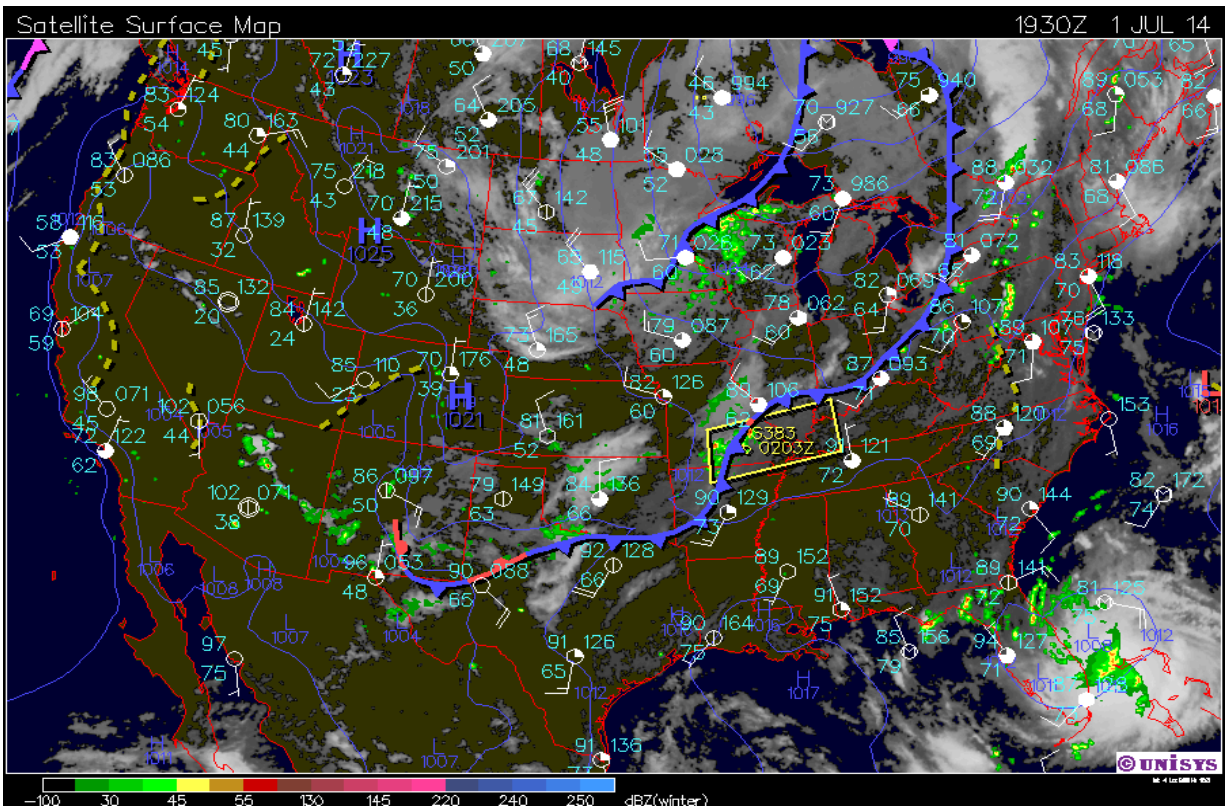


Figure 2: UNISYS Satellite Surface Map

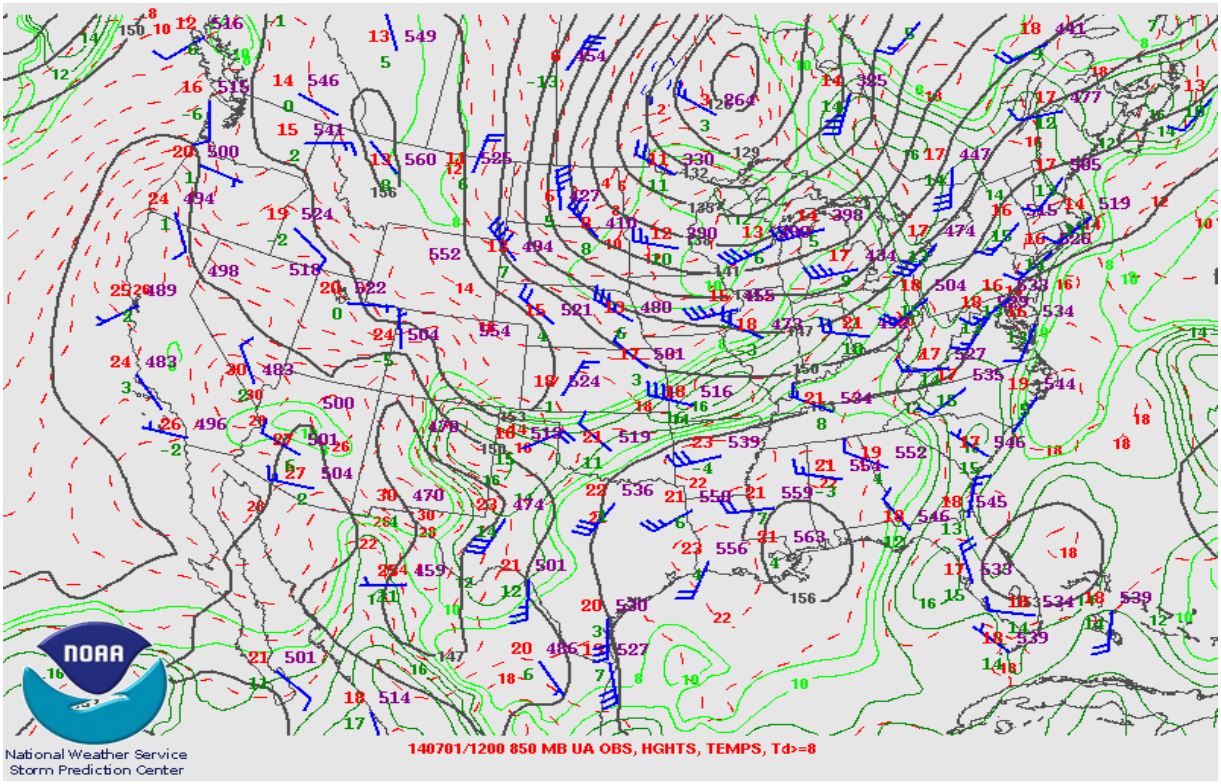


Figure 3: NOAA Wind Flow and Temperatures

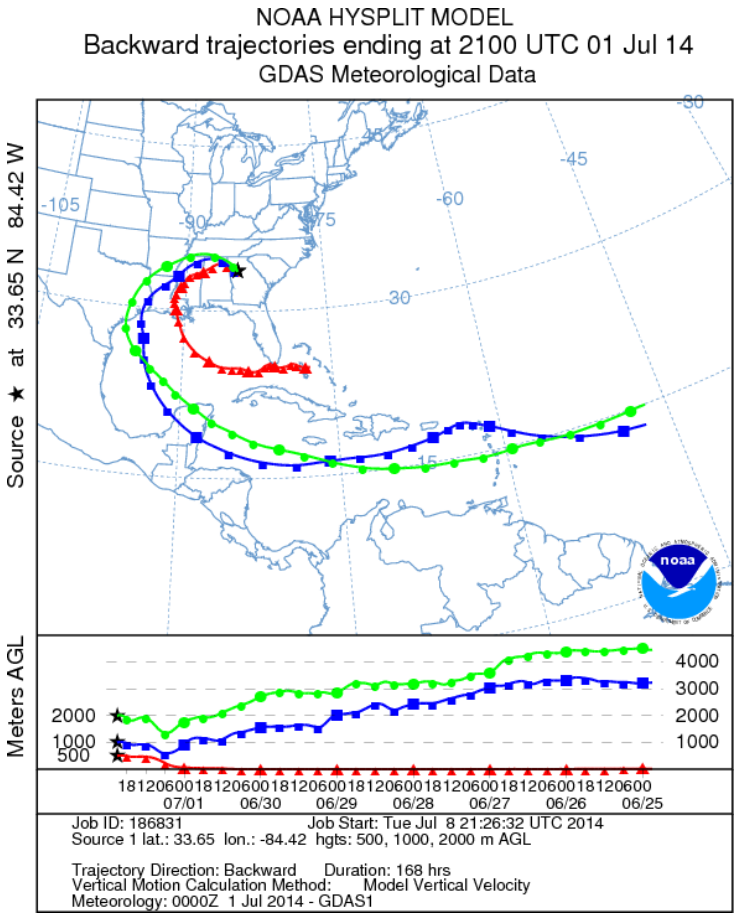


Figure 4: NOAA HYSPLIT Back Trajectory for July 1, 2014

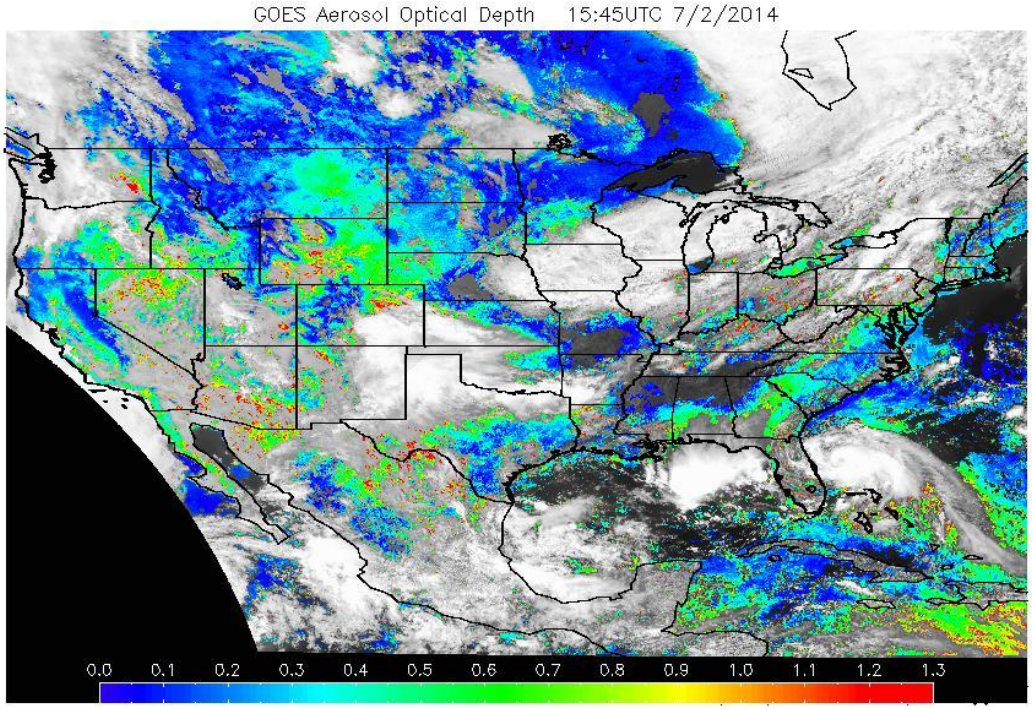


Figure 5: GOES Aerosol Optical Depth, July 2, 2014

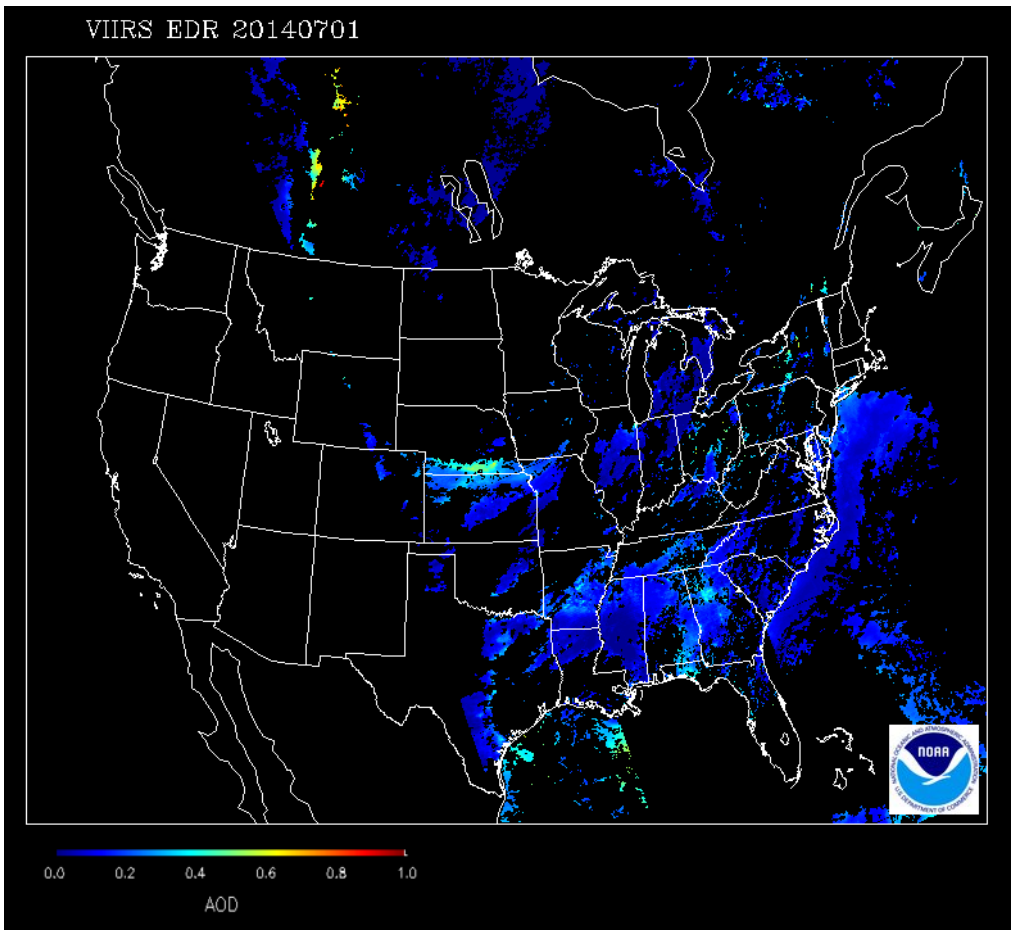


Figure 6: NOAA VIRS Imagery for July 1, 2014

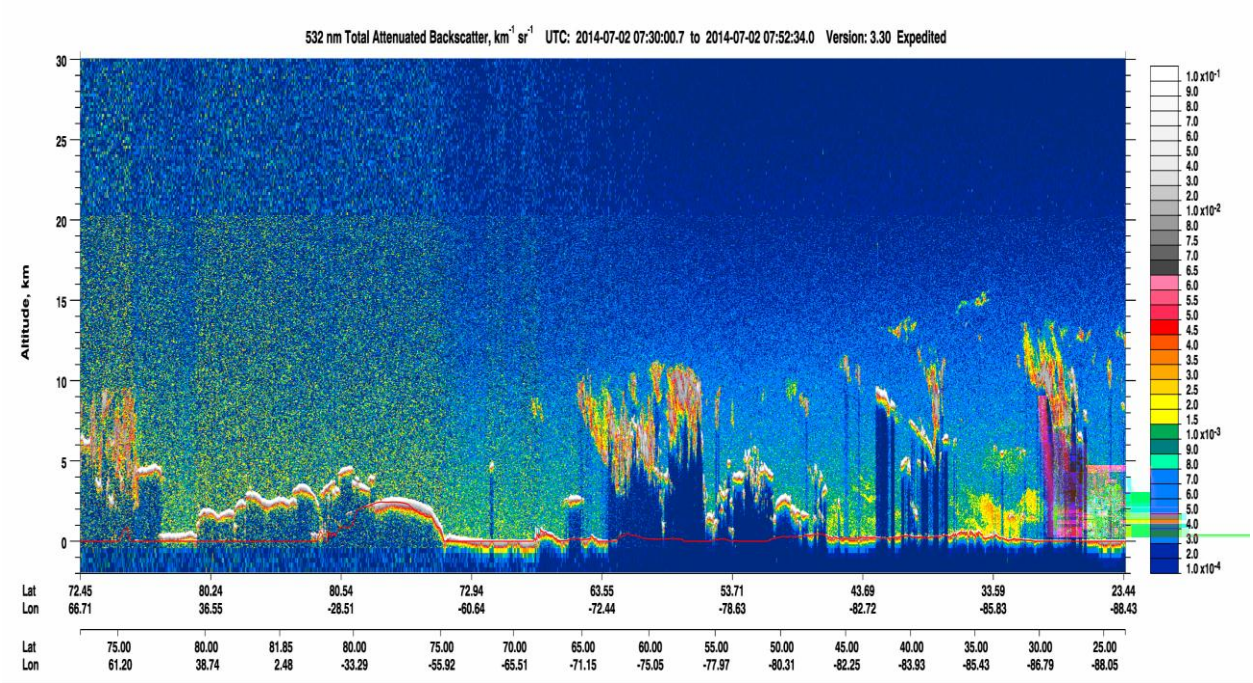


Figure 7: Lidar Satellite Imagery, July 2, 2014

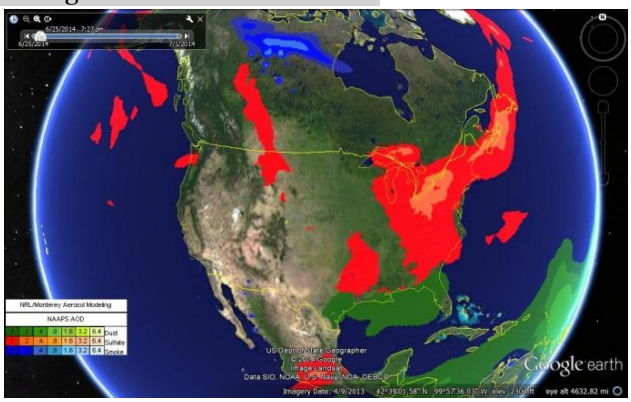
U.S. Air Quality: The Smog Blog for June 25-July 3, 2014

The following excerpts were taken from the U.S. Air Quality: The Smog Blog (http://alg.umbc.edu/usaq/archives/2014_06.html and http://alg.umbc.edu/usaq/archives/2014_07.html) for June 25 through July 3, 2014, as available. The discussion shows the movement of the Saharan dust and the effects that the Tropical Storm Arthur have on wind flow.

June 25, 2014

SMOKE OVER CANADA; DUST IN THE GULF OF MEXICO; MODERATE AQI LEVELS: THE EAST IS DOMINATED BY PM2.5 AND THE WEST BY OZONE

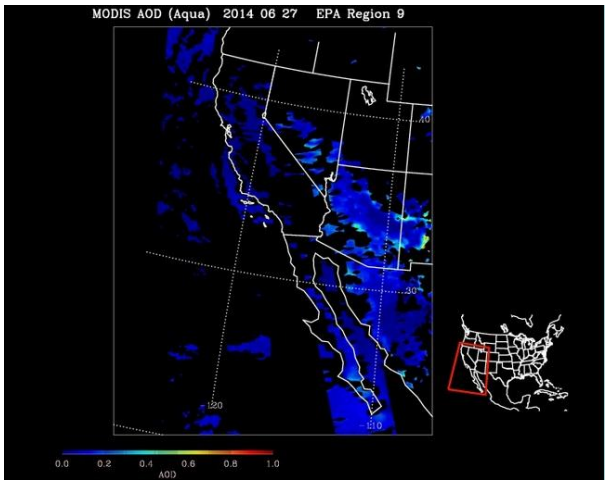
In addition shows the presence of dust in the Gulf of Mexico (possibly from the Saharan desert), also reported by NOAA HMS, may be contributing about 0.1. Sulfate aerosols are expected to dominate the makeup of particulate in eastern half of the US. Satellite AOD were hindered by the presence of clouds throughout of the United States.



June 27, 2014

SMOKE CONTINUES OVER MUCH OF NORTHERN CANADA; MODELS SHOW DUST TO THE WEST

...a plume comprised of mostly dust particles was found over Texas, Oklahoma, and Kansas. While the plume's direction of motion is uncertain, the MODIS Aqua AOD image (top right) is showing elevated AODs in New Mexico and Arizona, just west of where the HMS picked up the dust.



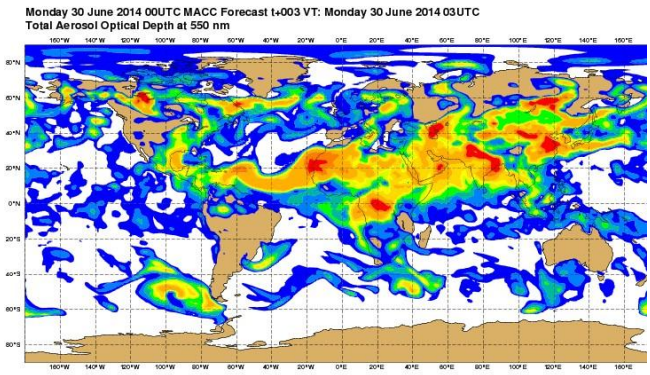
Update: June 29 11:00 EDT

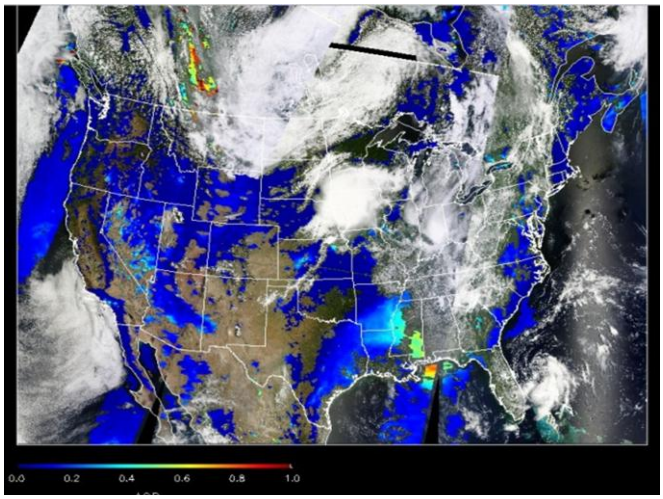
In the southeast, a tropical depression is forming and it might become Tropical Storm or Hurricane Arthur. The week forecast shows that the system will track parallel to the eastern seaboard. This will provide significant blocking to the normal west to east flow so we can expect stagnation in the Great Lakes and midwest to arise, bringing the possibility of increasing pollution.

June 30, 2014

SAHARAN DUST POLLUTING SOUTHERN US; HEAVY SMOKE PRODUCED FROM CANADIAN WILDFIRES

The ECMWF Global MACC AOD Forecast shows heavy Saharan dust crossing the Atlantic Ocean up to Texas, moving across into Louisiana--specifically affecting New Orleans. Southwesterly winds are transporting Saharan dust into the city, showing Unhealthy (Code Red) AQIs and elevated AOD levels (see MODIS Terra image, bottom left) over the area.

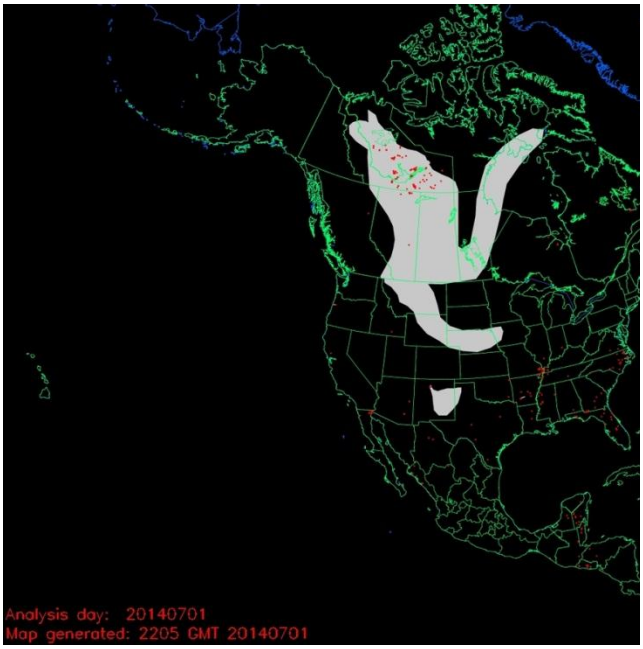


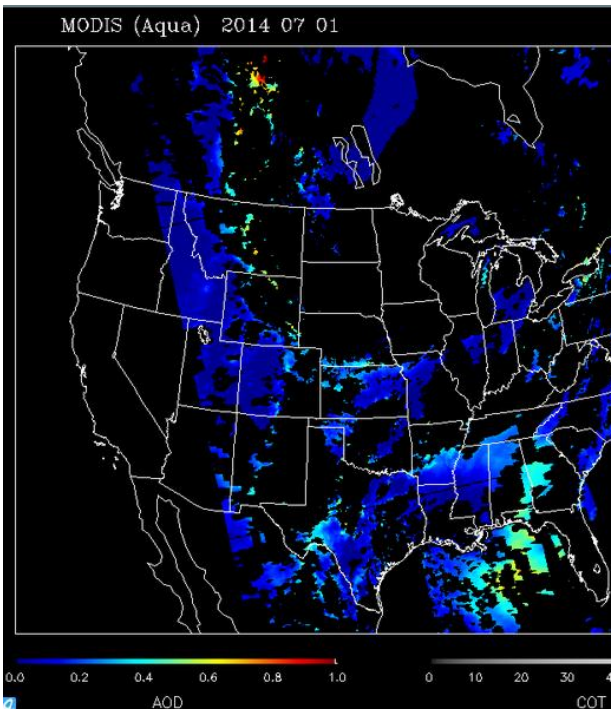


July 1, 2014

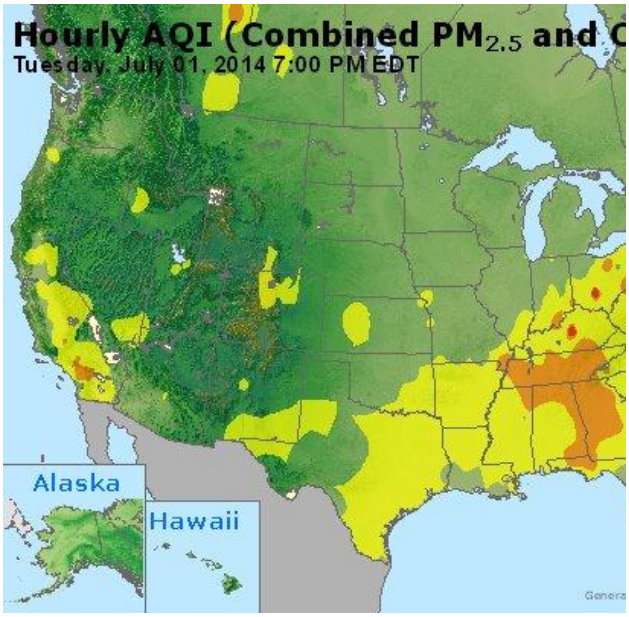
ELEVATED AQI IN MISSISSIPPI VALLEY, GREAT LAKES AND CALIFORNIA DUE TO PM 2.5.

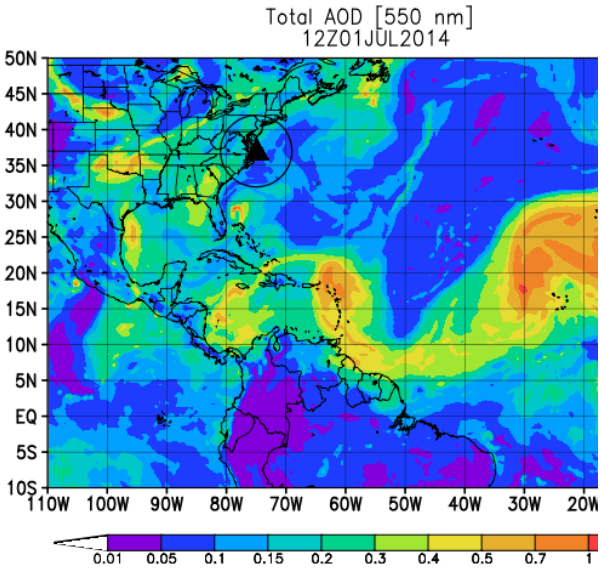
The first image, courtesy NOAA HMS, shows the widespread fire activity in the Mississippi Valley and Great Lakes regions of the U.S, stretching from Texas to Florida, with very little smoke aloft. There are sparse fires throughout the Pacific southwest region. There are also plumes in the center of the Plains region which appear to be originating from isolated fires throughout Central Canada. There is also a large smoke plume located in New Mexico, which appears to be of local origin. The next image, courtesy MODIS Aqua, shows an elevated AOD in the Rocky Mountain region, which are most likely due to the smoke plumes moving in a southerly direction from Canada. There is also a large increase in AOD in the Gulf region which may be the resultant of local fires.





The image below, courtesy EPA AIRNow, shows the current AQI for the country for 07:00 EST (23:00 UTC). Most of the eastern half of the U.S. had moderate to U.S.G. AQI conditions… The NAAPs forecast (not shown), has a large aerosol sulfate aerosol presence located over the southeastern portion of the country. This aerosol load is most likely causing the elevated AOD in these regions. The next image, courtesy GEOS Chem, shows a similar aerosol load moving across the Mississippi Valley and southern Great Lakes regions. Based on the concentration color scale, this aerosol may be more prevalent at the surface in the coming days for the eastern U.S.



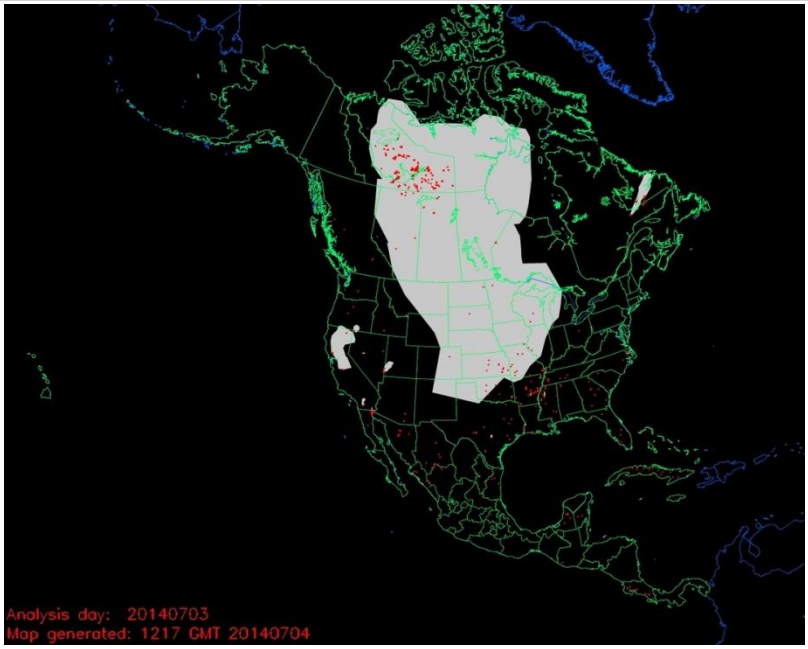


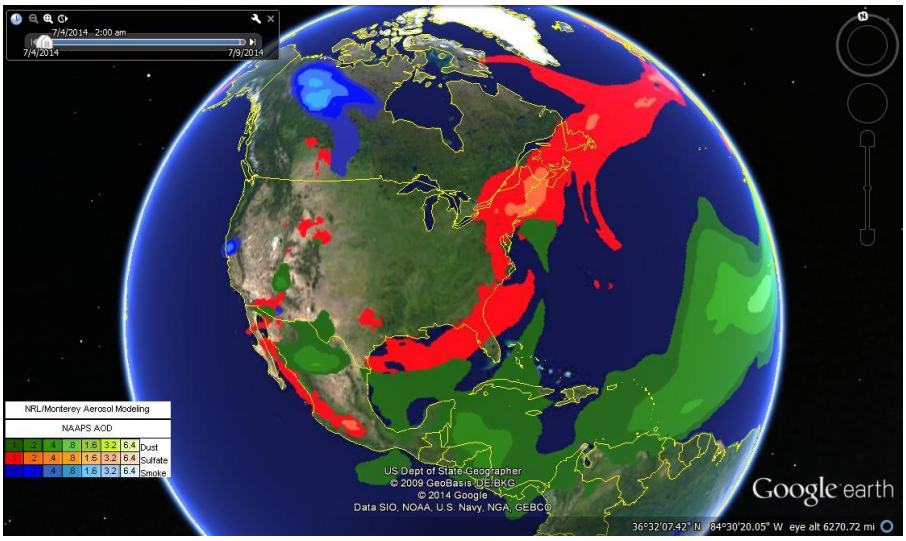
Posted by John Sullivan at 8:17 PM | Comments (0)

July 3, 2014

SMOKE AND SAHARAN DUST IN DIFFERENT REGIONS PERSIST

The air quality was moderate and unhealthy for sensitive groups in different regions throughout the day... High AOD levels were retrieved not only in the previously mentioned areas, but also in the Rocky Mountains states and in the Gulf of Mexico most likely to be a mixture of smoke and dust from Sahara. Monterrey Aerosol Modeling shows Sulfate belt extending from northeast to the Gulf of Mexico and Saharan dust reaching Florida and Central and South America (bottom).



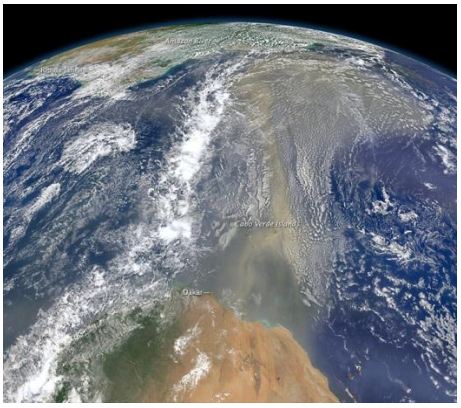


Posted by Daniel Orozco at 11:13 PM | Comments (0)

News Articles

To show how the population was affected by this Saharan dust event in Georgia on July 1-2, 2014, a search for news articles was conducted. The following articles were available from NASA and 11AliveNews.

Saharan Dust on the Move
July 5, 2014
http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=83966



acquired June 24, 2014 download large image (6 MB, JPEG, 3858x3375)

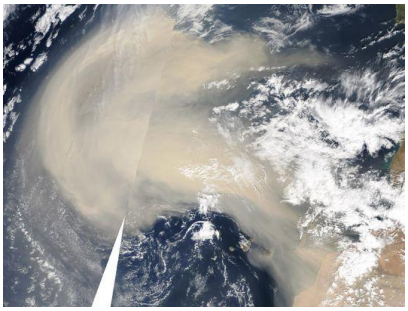
A piece of Africa—actually lots of them—began to arrive in the Americas in June 2014. On June 23, a lengthy river of dust from western Africa began to push across the Atlantic Ocean on easterly winds. A week later, the influx of dust was affecting air quality as far away as the southeastern United States.

This composite image, made with data from the Visible Infrared Imaging Radiometer Suite (VIIRS) on Suomi NPP, shows dust heading west toward South America and the Gulf of Mexico on June 25, 2014. The dust flowed roughly parallel to a line of clouds in the intertropical convergence zone, an area near the equator where the trade winds come together and rain and clouds are common. In imagery captured by the Moderate Resolution Imaging Spectroradiometer (MODIS), the dust appeared to be streaming from Mauritania, Senegal, and Western Sahara, though some of it may have originated in countries farther to the east.

Saharan dust has a range of impacts on ecosystems downwind. Each year, dust events like the one pictured here deliver about 40 million tons of dust from the Sahara to the Amazon River Basin. The minerals in the dust replenish nutrients in rainforest soils, which are continually depleted by drenching, tropical rains. Research focused on peat soils in the Everglades show that African dust has been arriving regularly in South Florida for thousands of years as well.

In some instances, the impacts are harmful. Infusion of Saharan dust, for instance, can have a negative impact on air quality in the Americas. And scientists have linked African dust to outbreaks of certain types of toxic algal blooms in the Gulf of Mexico and southern Florida.
NASA images by Norman Kuring, NASA's Ocean Color web. Caption by Adam Voiland.

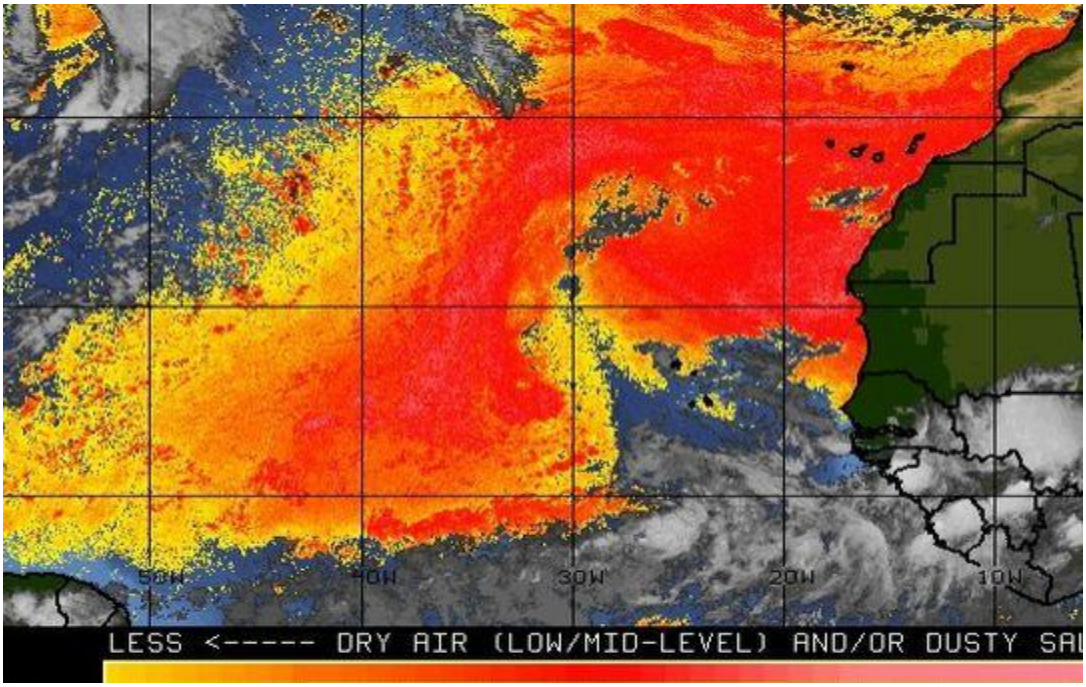
Lower Visibility in Georgia today due to Saharan Dust
Chris Holcomb, WXIA, 10:30 p.m. EDT July 1, 2014
http://www.11alive.com/story/news/nation/2014/07/01/saharan-dust/11942545/



(Photo: NASA)

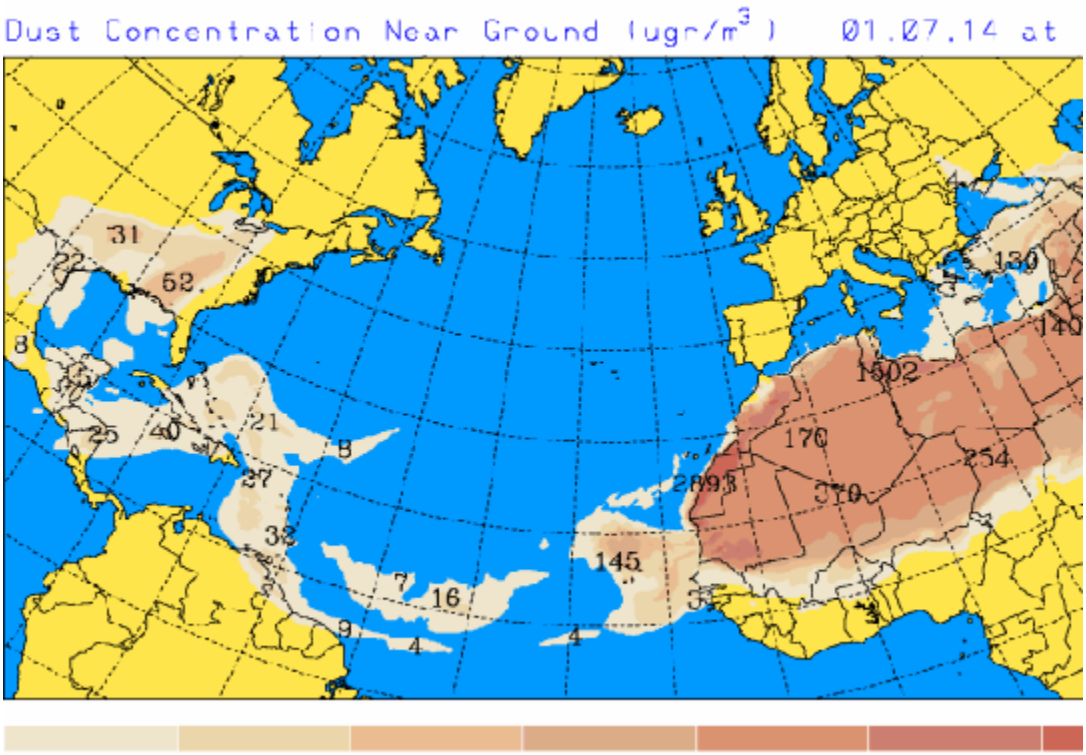
Did you notice the haze in the sky Tuesday? This haze was different from the normal smog that we usually have. What you were seeing today was dust that traveled across the Atlantic from Africa. It's called the Saharan Air Layer. Believe it or not, dust and minerals from the Sahara Desert in Africa get caught up in low level winds and can travel across the Atlantic. The dust has managed to move into the Gulf of Mexico and surge northward into the southeast. We will continue to see some of this dust early Wednesday, then disappear later Wednesday.

Here's a look at an enhanced satellite picture that shows the concentration of Saharan dust as it leaves Africa and moves across the Atlantic.



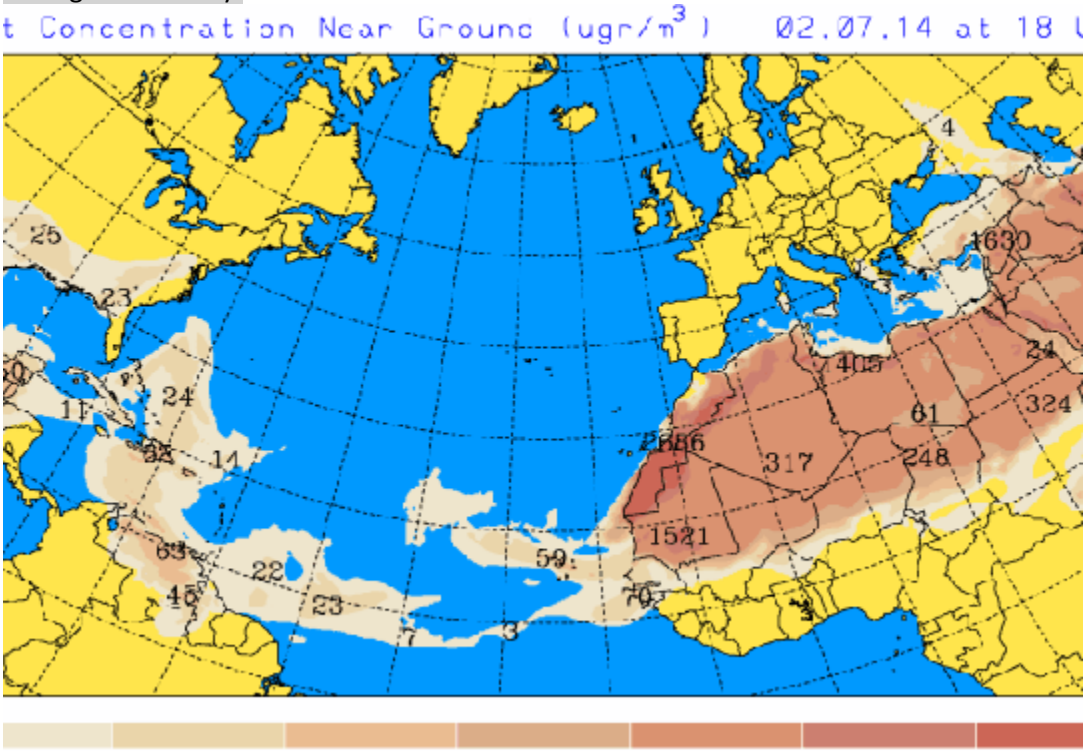
Saharan dust coming off the coast of Africa (Photo: NOAA)

Here is another image that shows the concentration of dust over the Atlantic and into the southeastern United States. This was from the afternoon hours on Tuesday.



Concentration of dust on Tuesday afternoon (Photo: University of Athens)

Here is the forecast map showing the dust layer still with us Wednesday, but at lower concentrations throughout the day.



Saharan Dust Forecast for Wednesday (Photo: University of Athens)

The dust layer is forecast to disappear later in the day Wednesday as cleaner air rotates around Tropical Storm Arthur.

NOAA Satellite and Information Service, 2014 Satellite Smoke Text Product

The following excerpts were taken from NOAA Satellite and Information Service, tracking the movement of the Saharan dust. The Satellite Smoke Text Product can be found at http://www.ssd.noaa.gov/PS/FIRE/smoke.html.

Saturday, June 28, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1445Z June 28, 2014

```
Dust/Sand:
Gulf of Mexico:
Large and dense SAL (Saharan Air Layer) has been tracked across the
Caribbean and has now turned NW into the southern and central Gulf of
Mexico as far north as 26N between 90-92W.  This is anomalously far west
to be tracked so well with distinct edges and is likely to be pulled north
into LA and continue west into S TX over the next day or so.  The SAL
outbreak covers all of the Yucatan to Tabasco, N Guatemala, N Belize
(clear over Roatan, Island) but covers the eastern tip of Honduras...then
extends ENE to cover the Caymans (though clearing in the next few hours),
Jamaica and the far E tip of Haiti. The northern boundary then covers
all of SE of Cuba (South of 22N, the Isle of Youth and the western tip
of Cuba (this leaves northern Cuba clear at this time).
```

Saturday, June 28, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 0300Z June 29, 2014

```
DUST:
Gulf of Mexico/southeastern Texas:
Large and dense Saharan Air Layer is currently tracking across central
and western portions of the Gulf of Mexico, protruding into the U.S. over
southeastern Texas and likely into Oklahoma and southern Kansas.
```

Sunday, June 29, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1530Z June 29, 2014

```
DUST:
Gulf of Mexico/Central US Gulf Coast:
Well defined moderately to dense Saharan Air Layer can be seen across the
entire Western Gulf of Mexico but also being pulled north covering much
of SE TX, all of LA and portions of SW MS and S AR.  Highest density can
be seen over the Southern Gulf and Yucatan Peninsula.  A 2-3 degree wide
west to east band extends back from the NE tip of Yucatan to central Cuba
and just south of Andros into Long Island in the South Central Bahamas.
(Southern Cuba and Turks/Caicos are clear).
```

Sunday, June 29, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 0245Z June 30, 2014

```
DUST:
Gulf of Mexico/Central US Gulf Coast:
A well defined moderately to dense Saharan Air Layer can be seen across
the entire Western Gulf of Mexico and also spreading to the north covering
much of southeastern Texas, Louisiana, and portions of Mississippi,
Arkansas, and Alabama. The most dense portion of the Saharan dust was
visible over the western and southern Gulf of Mexico including the Bay
of Campeche. Earlier this morning, a 2-3 degree wide west to east band
extended back from the northeastern tip of the Yucatan to central Cuba
```

and just south of Andros into Long Island in the South Central Bahamas.

Monday, June 30, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 1445Z June 30, 2014
DUST:
Gulf of Mexico/Central US Gulf Coast:
A well defined moderately dense Saharan Air Layer can be seen across the Western Gulf of Mexico, west of 95W and entering TX and SW LA under strong southerly winds and covers nearly all of SE TX east of 100W to 31N, much of LA and NE TX before turning east under SW and W flow to cover S AR, much of MS and S AL into the far western FL panhandle. Some lighter SAL can also be seen across Yucatan along 21N to the Cuban coast.

Monday, June 30, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 0245Z July 1, 2014
DUST:
Gulf of Mexico/Central US Gulf Coast:
A well defined moderately dense Saharan Air Layer was still seen across the Western Gulf of Mexico, the eastern third of Texas, southeastern Oklahoma, Arkansas, Louisiana, Mississippi, western Tennessee, Alabama, and the Florida panhandle. Some lighter Saharan dust can also be seen across the Yucatan Peninsula along 21N to the Cuban coast.
JS/Gallina

Tuesday, July 1, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 1400Z July 1, 2014
DUST:
Gulf of Mexico/Central US Gulf Coast:
A well defined moderately dense Saharan Air Layer was still seen across the western and central Gulf of Mexico, the eastern third of Texas, southeastern Oklahoma, Arkansas, Louisiana, Mississippi, Tennessee, Kentucky, Georgia, South Carolina and Florida. Dust was becoming entrained in the circulation of Tropical Depression One off the east coast of Florida.

Tuesday, July 1, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 0300Z July 2, 2014
DUST:
Southeast:
An area of moderate-density Saharan blowing dust is visible moving slightly east in eastern Alabama, Georgia, and western South Carolina.

Lower Mississippi:
An area of moderate-density Saharan blowing dust is visible moving eastward in eastern Texas, Oklahoma, Arkansas, and Alabama.
Oegerle

Wednesday, July 2, 2014
DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 1630Z July 2, 2014
DUST:
Eastern U.S:
A band of Saharan Dust is visible moving eastward across Alabama, Georgia, South Carolina, North Carolina and southern Virginia.

Lower Mississippi/Gulf of Mexico

```
An area of moderate density Saharan dust remains over eastern Texas,
southern Arkansas, Louisiana, and western Mississippi. The Saharan
dust can also been seen over northern and central portions of the Gulf
of Mexico.
Heeps
```

Comparison to Other Sites

The following tables compare the $PM_{2.5}$ FRM data collected across the state on July 1 and July 2, 2014. The $PM_{2.5}$ samplers have varying sample schedules; therefore, data is shown in these tables when available. The majority of the state was affected by this natural event. The only sites that appear to not be affected are the Savannah, Brunswick, Yorkville sites, and possibly the Valdosta site.

Site	Concentration (µg/m^3)
Macon - Allied	24.8
Macon SE	23.2
Savannah – Mercer	6.3
Athens	24.2
Forest Park	27.5
Kennesaw	24.6
South DeKalb	26.8
Albany - Turner	21.6
Albany - Turner (collocated)	21.2
Rome	21.0
Fire Station #8	27.2
Brunswick	6.1
Gwinnett Tech	27.5
Gainesville	26.1
Warner Robins	22.2
Valdosta	15.3
Columbus - Health Dept.	21.8
Columbus - Airport	21.4
Columbus - Cusseta	23.2
Yorkville	7.1
Augusta - Bungalow Rd.	14.6
Rossville	23.0
Sandersville	20.8
Gordon	24.6

Table 4: Statewide 24-Hour $PM_{2.5}$ Readings for July 1, 2014

The following table compares the $PM_{2.5}$ FRM data collected across the state on July 2, 2014. Again, the Savannah and Brunswick sites appear to not be affected, and possibly the Rome site. The $PM_{2.5}$ data exceeding the 24-hour NAAQS is highlighted in yellow.

Site	Concentration (µg/m^3)
Macon - Allied	39.6
Savannah - Mercer	9.5
Kennesaw	22.0
South DeKalb	22.7
Albany - Turner	39.6
Albany - Turner (collocated)	39.4
Rome	15.4
Brunswick	6.2

Table 5: Statewide 24-Hour $PM_{2.5}$ Readings for July 2, 2014

The corresponding map shows the site locations that were affected by the Saharan dust, along with the $PM_{2.5}$ FRM concentrations (µg/m3) on July 1 and July 2, 2014. The values shown in black are July 1 data, and the values shown in red are the July 2, 2014 data.

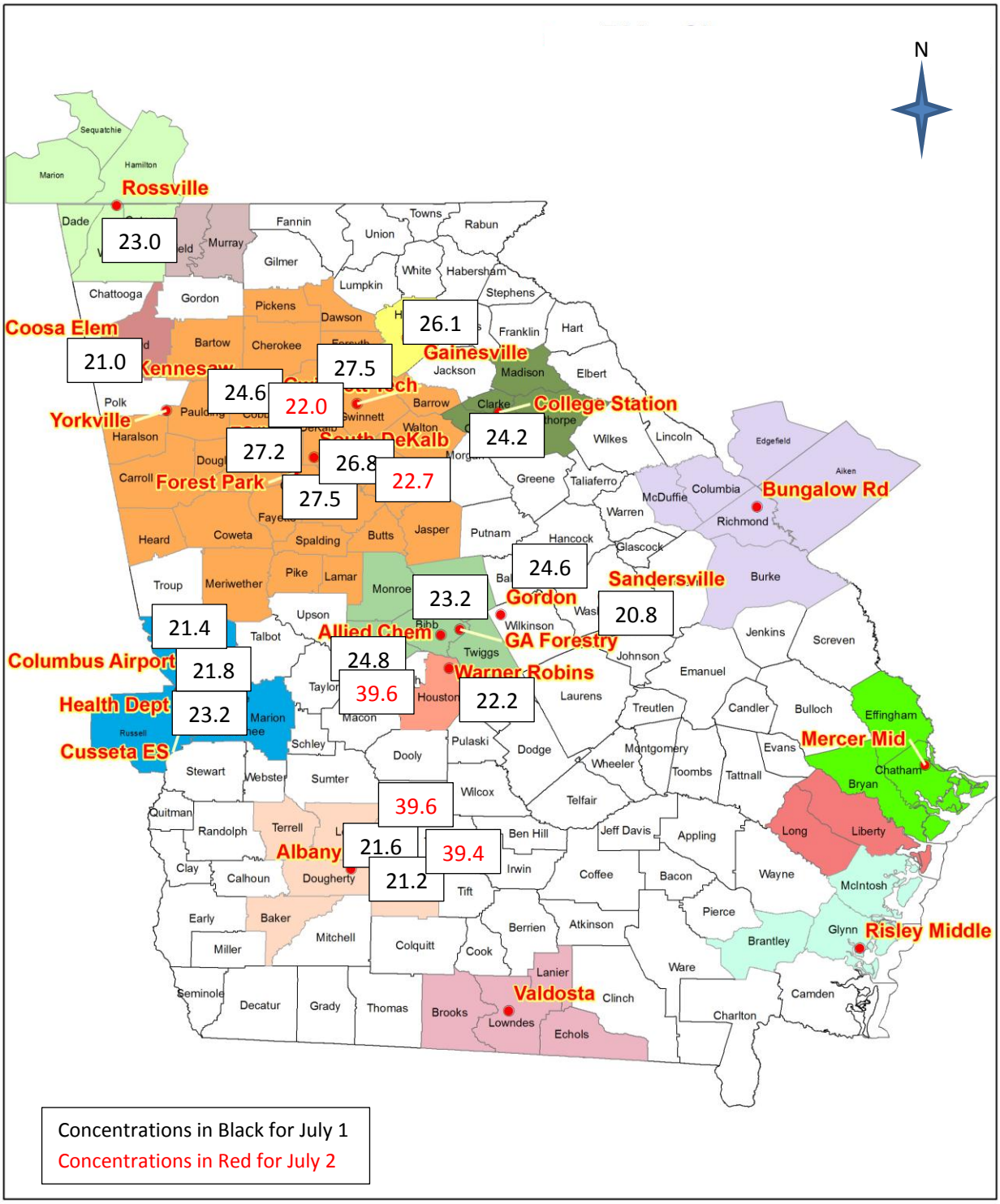


Figure 8: Map of $PM_{2.5}$ Sites Affected by Saharan Aerosol and Concentrations (shown in µg/m^3) on July 1 and 2, 2014

In the following figure, the continuous 1-hour $PM_{2.5}$ data collected statewide is displayed from June 30 through July 2, 2014. Most of the monitors across the state were affected by the Saharan aerosol that was being circulated globally. As shown in the following figure, the bulk of the continuous $PM_{2.5}$ readings start increasing during the early hours of July 1 and continue with higher concentrations through the early hours of July 2. The continuous $PM_{2.5}$ monitor at the Albany-Turner Elementary site (shown in red) peaked at 53.0 µg/m^3 on July 2, and the continuous $PM_{2.5}$ monitor at the Macon-SE site (shown in dark blue) peaked at 55.2 µg/m^3 on July 2. Additionally, higher concentrations were sustained for over 48 hours for both of these sites. The highest reading from a continuous $PM_{2.5}$ monitor was at the Warner Robins site (shown in orange), with a peak hourly concentration of 60 µg/m^3 on July 2. The Warner Robins monitor is located in Houston County, which adjoins Bibb County, the county where the Macon-SE monitor is located.

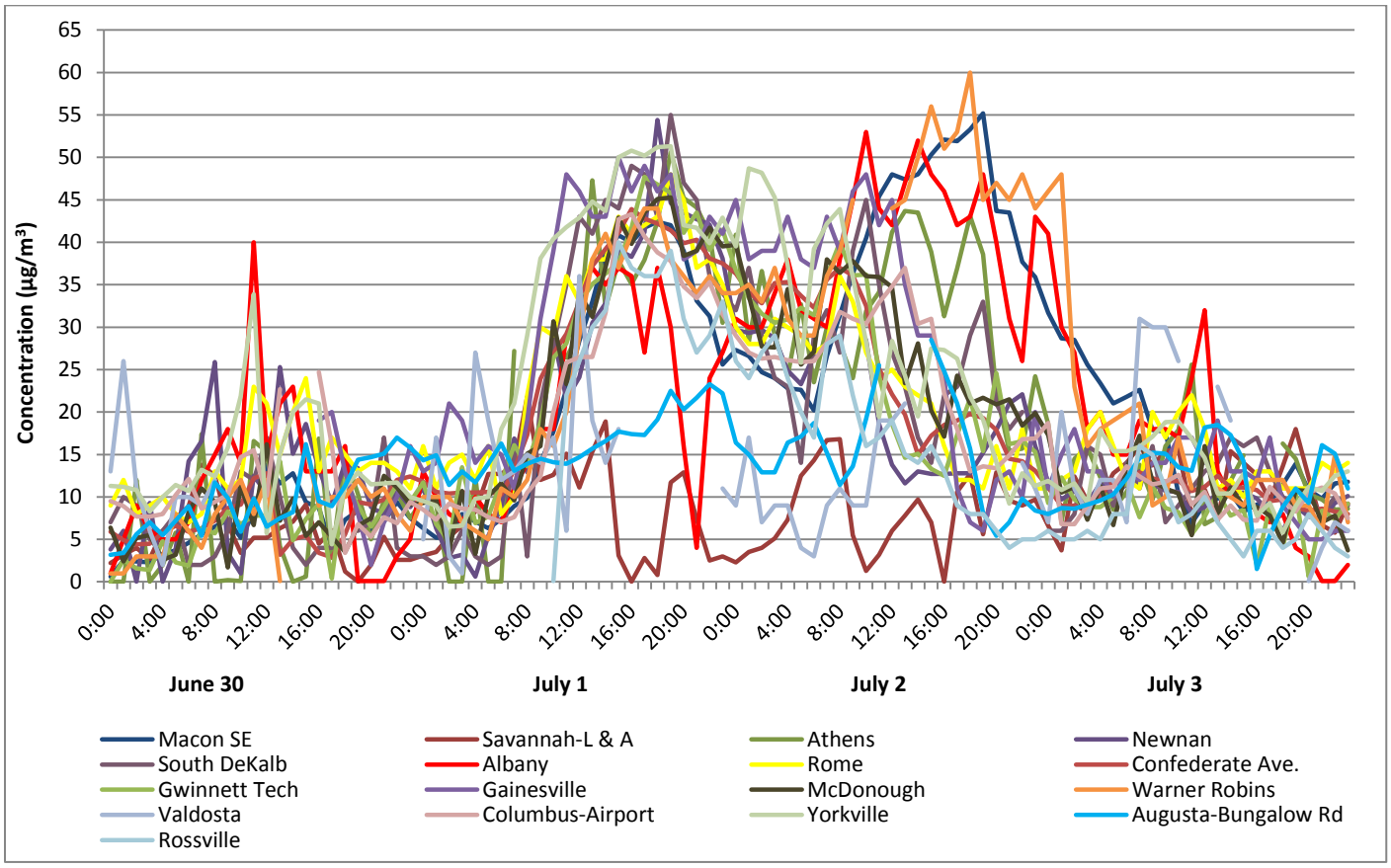
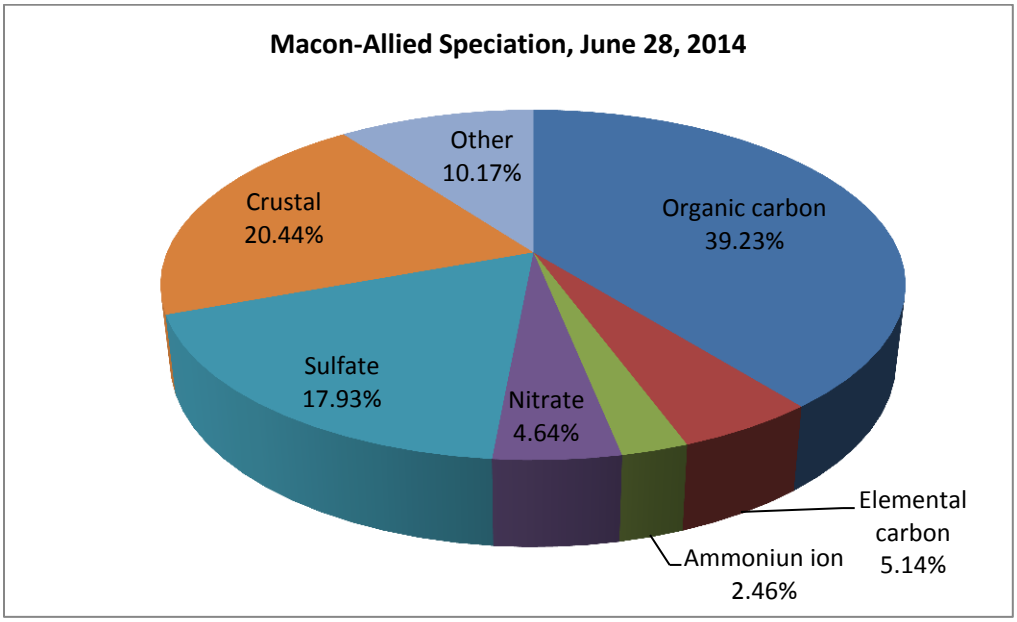


Figure 9: Statewide Continuous $PM_{2.5}$ Concentrations for June 30 through July 3, 2014

Speciation Data

To support that the $PM_{2.5}$ samples collected on July 1 and 2 were affected by the Saharan aerosol, the $PM_{2.5}$ speciation samples were examined. Within the $PM_{2.5}$ chemical speciation data, there are certain parameters that can be used as elemental tracers of dust, or crustal species, including aluminum, calcium, iron, titanium, and silicon. These crustal parameters were explored at limited sites across the state where GA EPD has $PM_{2.5}$ speciation monitors. Note that the Albany-Turner Elementary site does not collect $PM_{2.5}$ speciation data. Also, the $PM_{2.5}$ speciation monitor at the South DeKalb collects data every three days, whereas the other monitors collect data every six days. Because of this schedule, the South DeKalb site has data available for July 1, 2014, while the other sites have data on June 28, 2014,

and none of the sites have data available for July 2, 2014. Both the major components of the $PM_{2.5}$ speciation data were analyzed and graphed for the specific day that data was available (June 28 or July 1), and the 2014 trend of crustal portion was graphed with available data. The graphs are shown below with both the major components graph and the trend graph grouped together by site. As expected, the crustal portion of the samples collected on either June 28 or July 1 was higher than average. Historically, the average crustal portion is 3-5% of the whole sample for Georgia's sites, and these graphs show 11-46% attributed to the crustal data (shown in orange), significantly higher than normal. Additionally, the trend graphs show higher concentrations of the crustal species on June 28 or July 1, especially at the South DeKalb, General Coffee, and Rome sites.



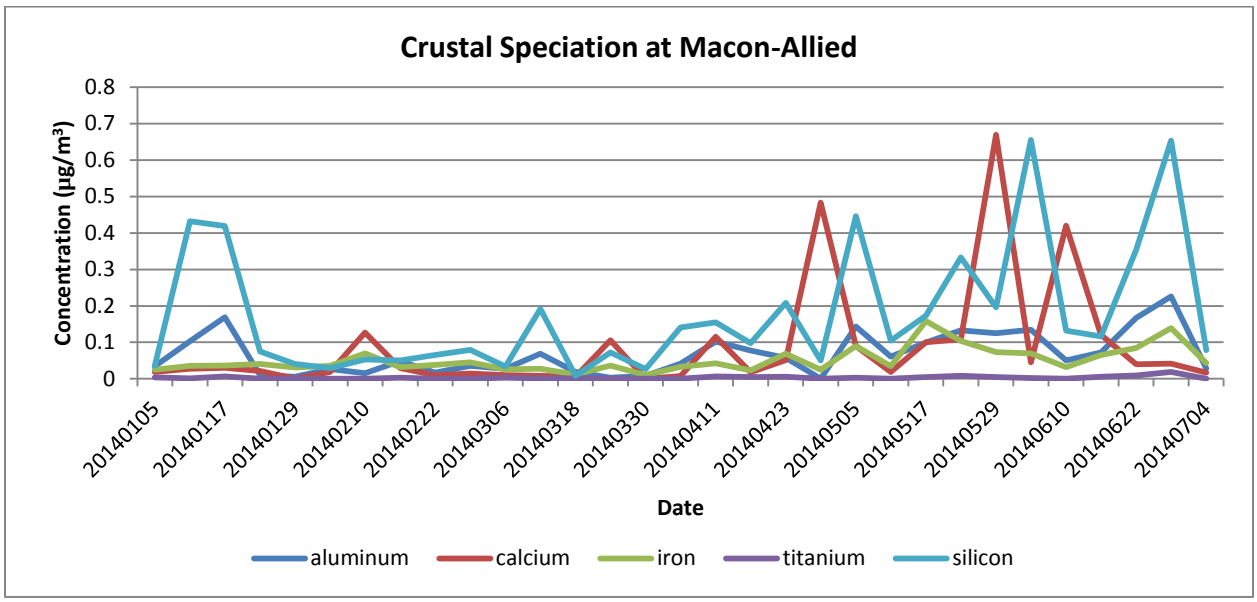
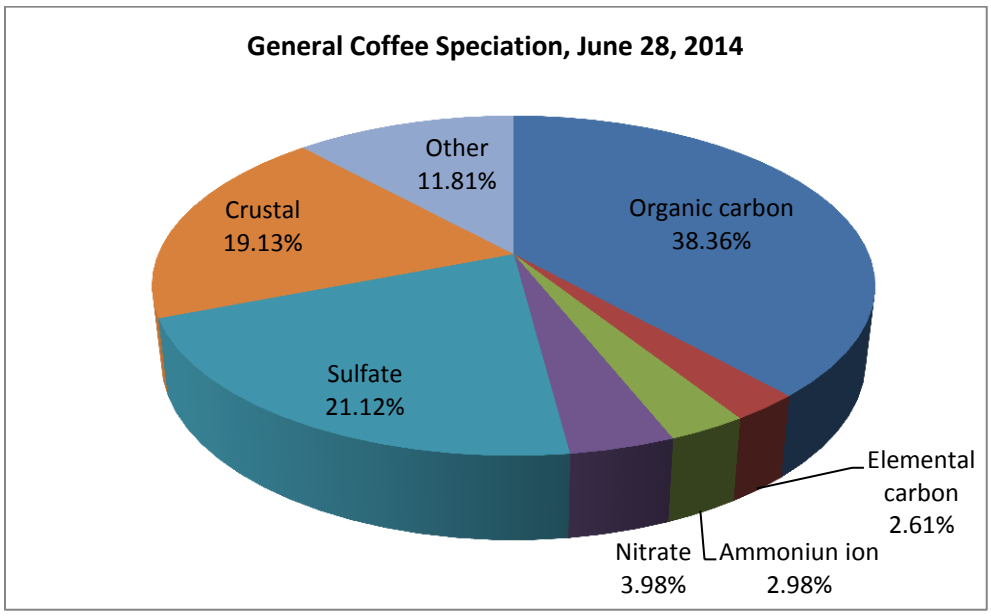


Figure 10: Macon-Allied $PM_{2.5}$ Speciation on June 28, 2014 and 2014 Trend



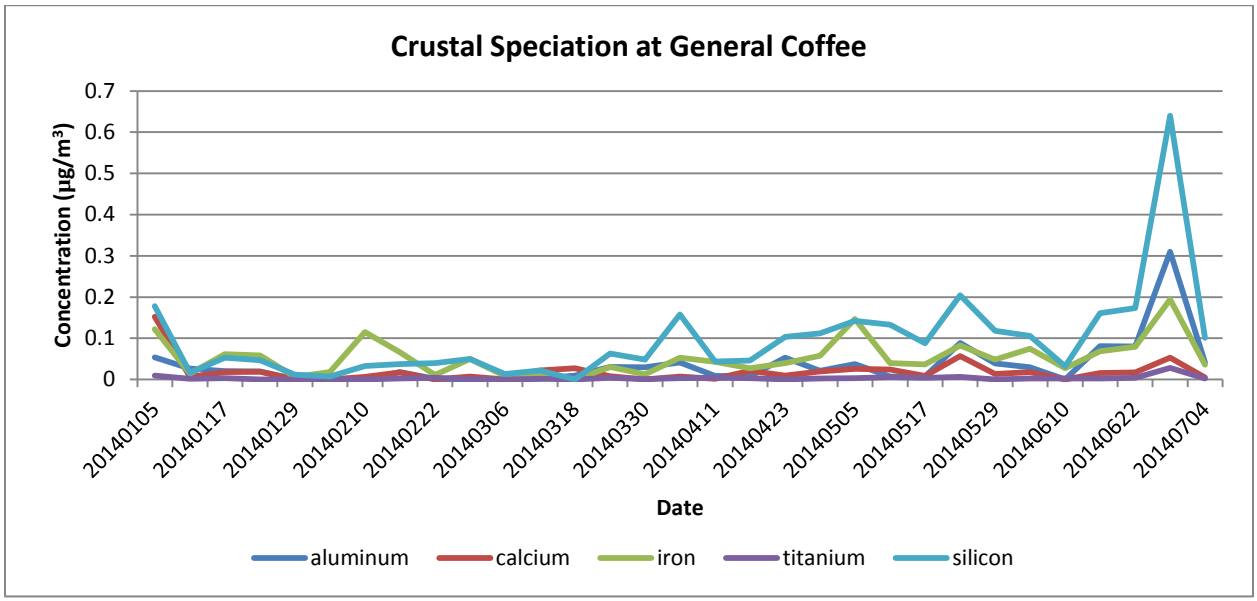
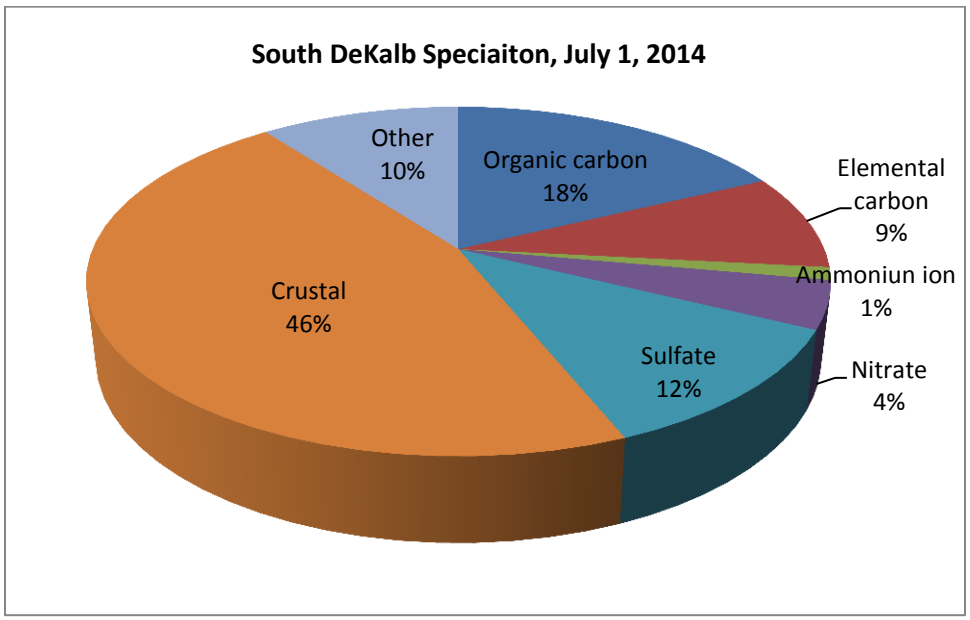


Figure 11: General Coffee $PM_{2.5}$ Speciation on June 28, 2014 and 2014 Trend



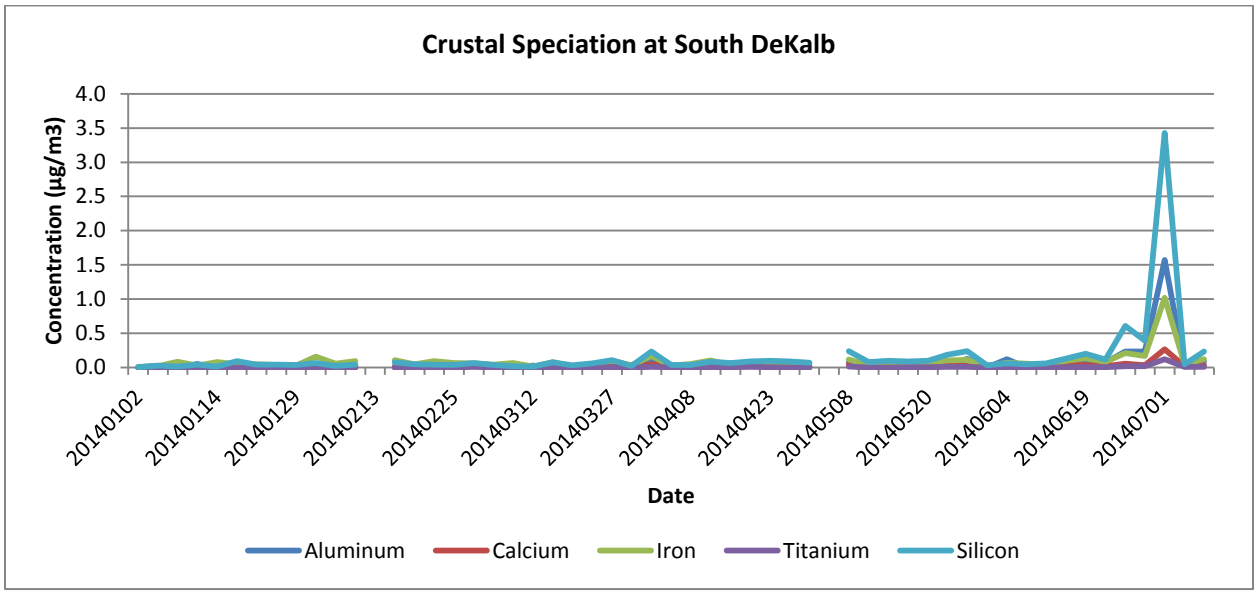
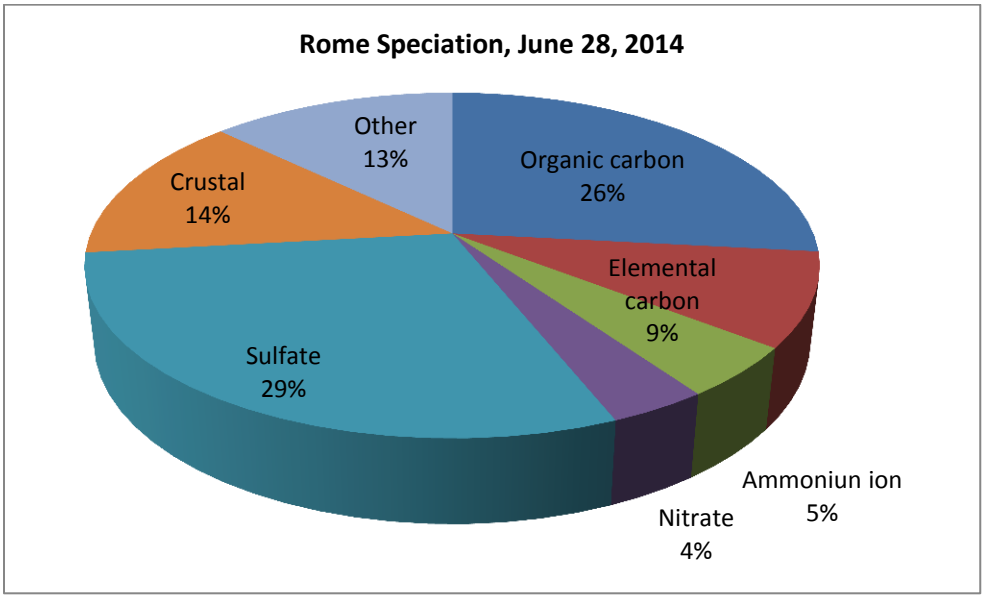


Figure 12: South DeKalb $PM_{2.5}$ Speciation on July 1, 2014 and 2014 Trend



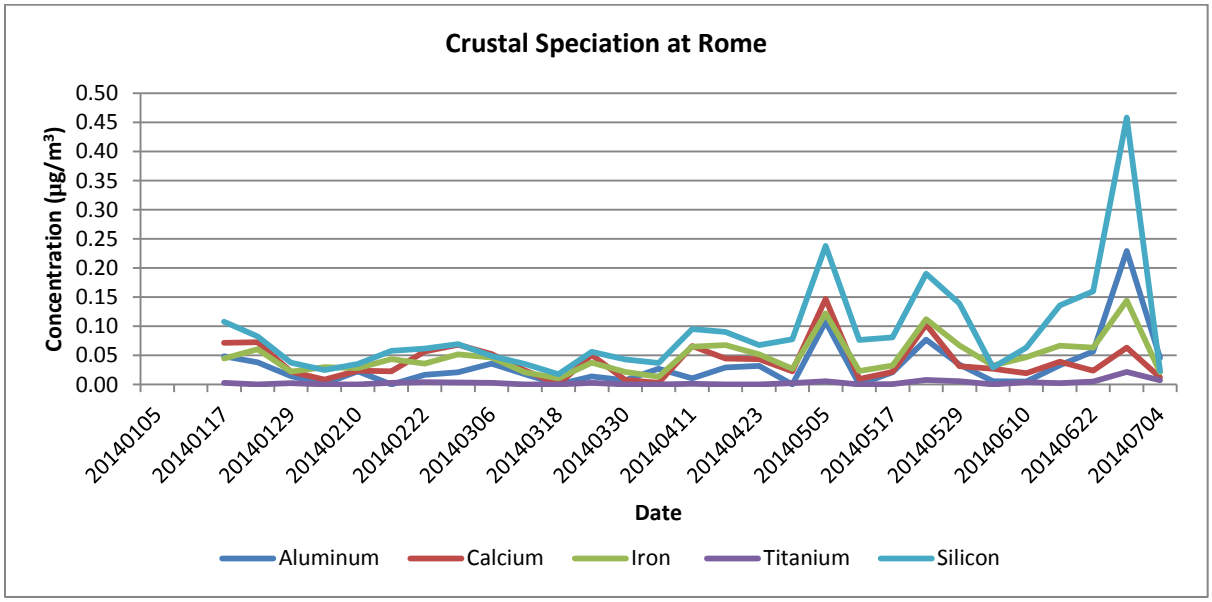
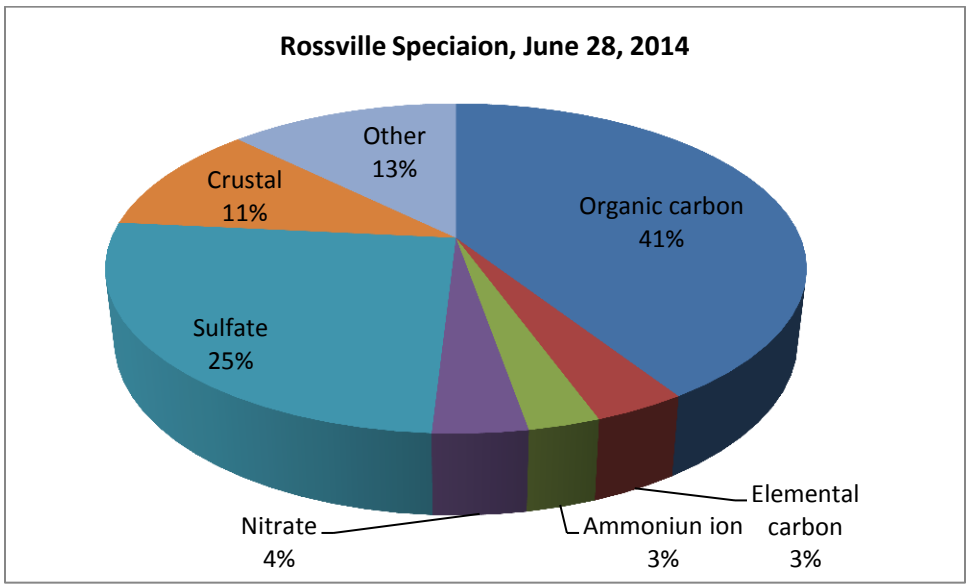


Figure 13: Rome $PM_{2.5}$ Speciation on June 28, 2014 and 2014 Trend



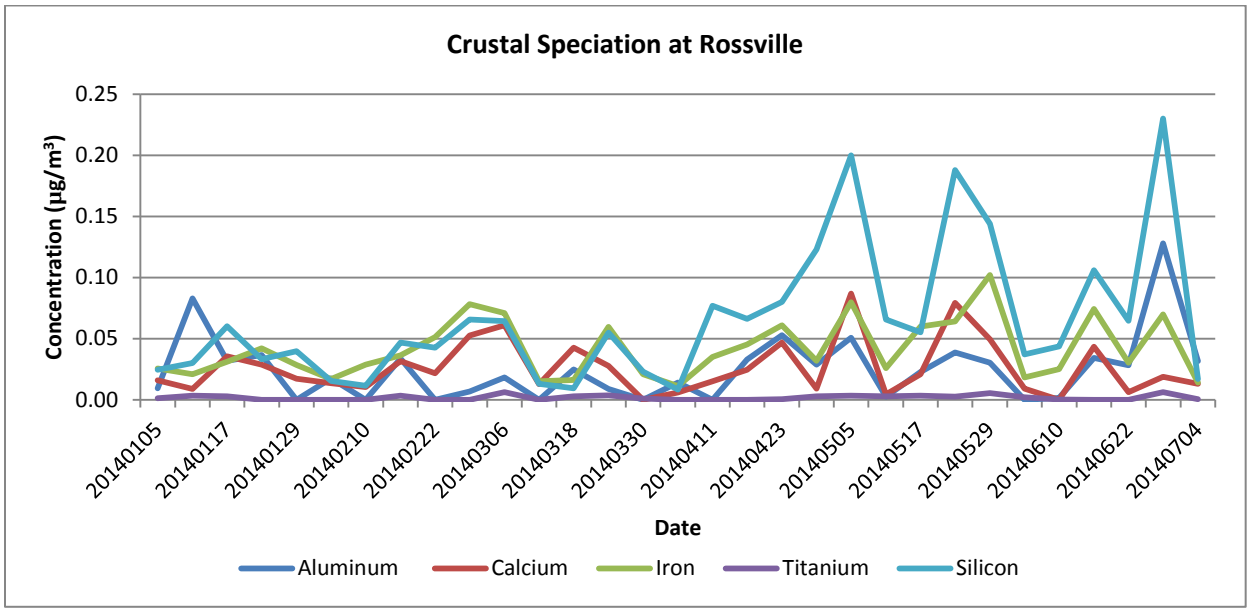


Figure 14: Rossville $PM_{2.5}$ Speciation on June 28, 2014 and 2014 Trend

Albany – Turner Elementary

13-095-0007

July 1, 2014 – Primary Monitor 21.6 µg/m^3, Collocated Monitor 21.2 µg/m^3, Continuous Monitor 20.1 µg/m^3

July 2, 2014 – Primary Monitor 39.6 µg/m^3, Collocated Monitor 39.4 µg/m^3, Continuous Monitor 39.3 µg/m^3

Historical Data

The following section explores a comparison of the high $PM_{2.5}$ data points recorded with the primary, collocated, and continuous monitors at the Albany-Turner Elementary site on July 1 and 2, 2014 to historical $PM_{2.5}$ levels. In accordance with 40CFR50.14(c)(3)(iii)(C), an analysis is provided to show that these concentrations exceed normal historical fluctuations and typical background levels in the next figures. The first three figures (Figure 15, Figure 16, Figure 17) show historical data as box plots from 2011 to July 2014 and include a comparison for 2014, omitting the high $PM_{2.5}$ concentrations under consideration that were affected by the Saharan dust. The collocated and continuous monitors began collecting data January of 2013; therefore' those figures show one full year of data for 2013 through July 2014. Historical seasonal fluctuations of each year are plotted in the second set of figures (Figure 18, Figure 19, Figure 20). $PM_{2.5}$ concentrations previously flagged as exceptional and sent to EPA for concurrence are indicated.

To compare the data points to historical data collected at this site, box plots were created and shown in the next three figures. The distribution of 2011 to July 2014 data for the primary monitor, and 2013 to July 2014 for the collocated and continuous monitor, is shown with 25% quartile, 75% quartile, median, and bars showing minimum and maximum values (outlying data points). The 2014 data is shown with and without the July 1 and 2 data points for comparison. Potential 2012 exceptional events that have been previously submitted to EPA for concurrence are also identified.

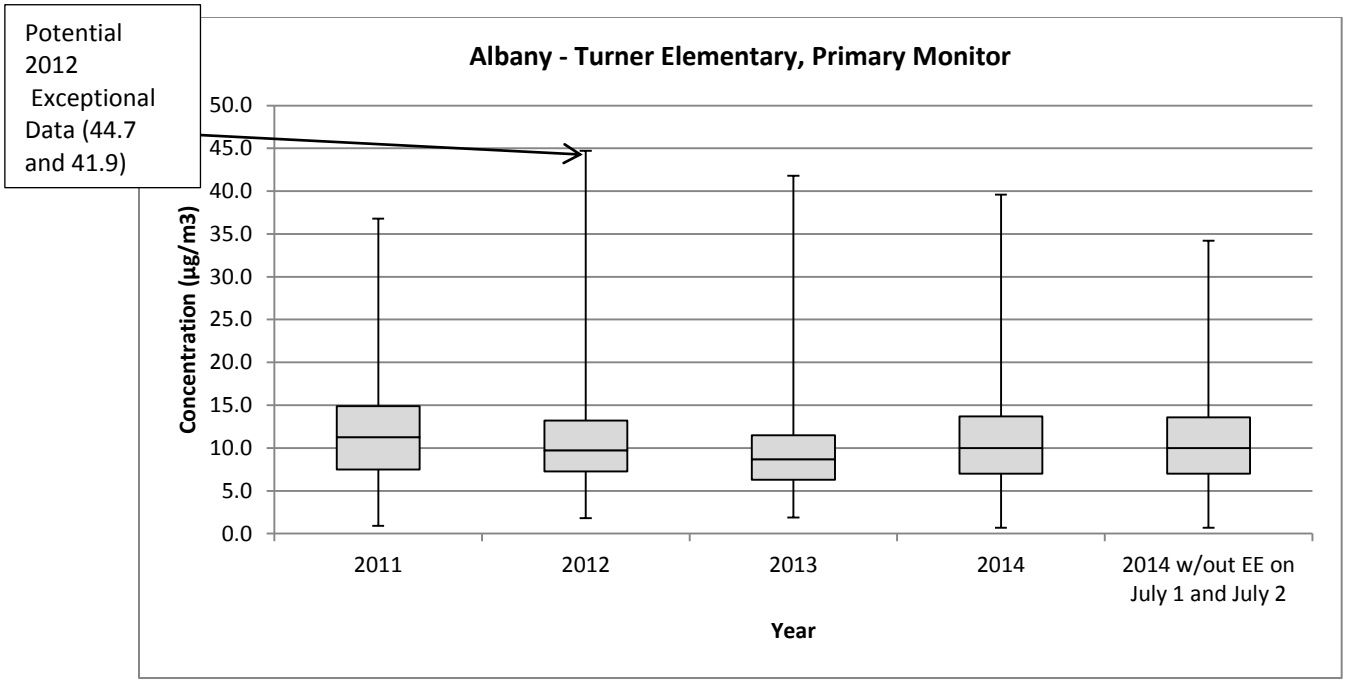


Figure 15: The Distribution of 2011 to July 2014 $PM_{2.5}$ FRM Data at Albany-Turner Elementary, Primary Monitor

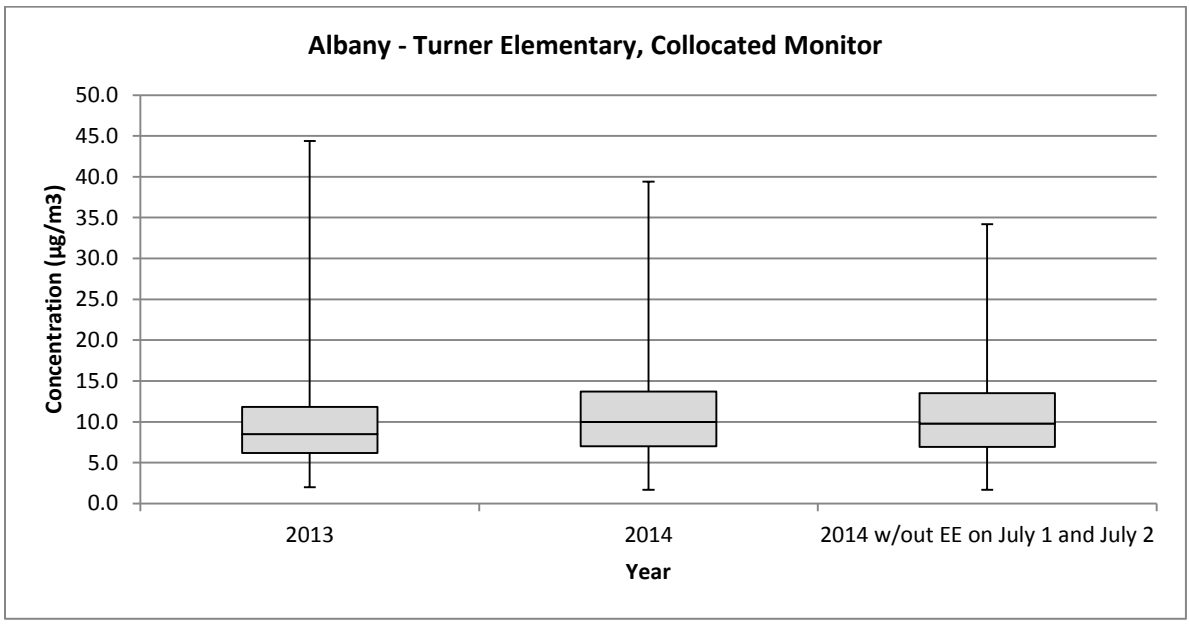


Figure 16: The Distribution of 2013 to July 2014 $PM_{2.5}$ FRM Data at Albany-Turner Elementary, Collocated Monitor

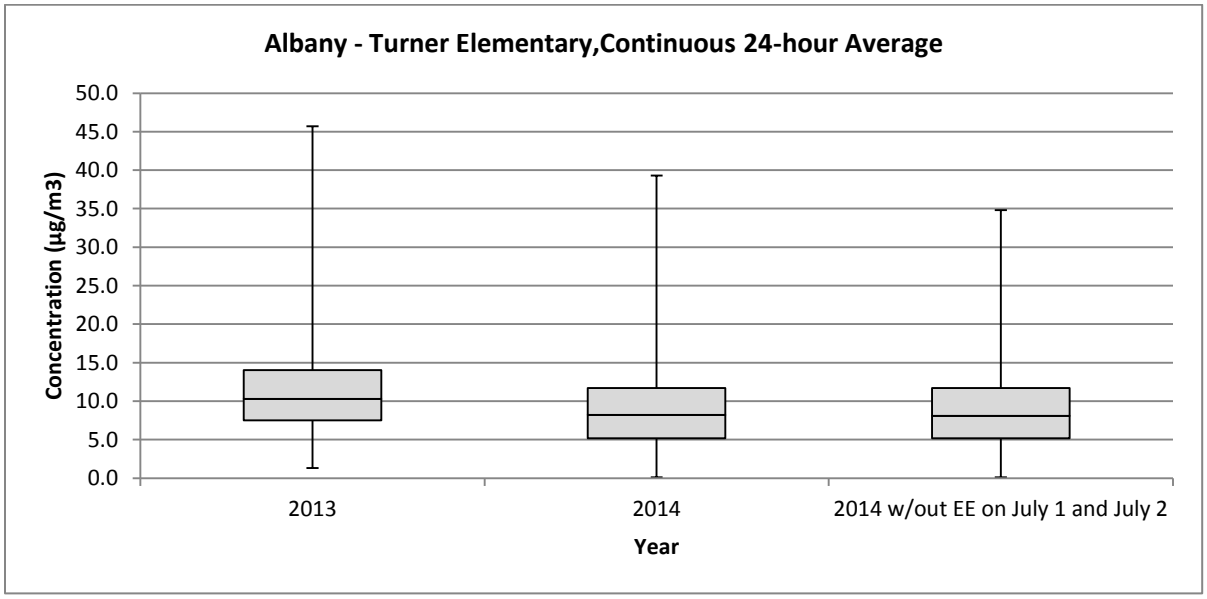


Figure 17: The Distribution of 2013 to July 2014 $PM_{2.5}$ FRM Data at Albany-Turner Elementary, Continuous Monitor

In the following three figures, the historical seasonal fluctuations of the data are shown. The 2011 through July 2014 is shown for the $PM_{2.5}$ primary data, and 2013 through July 2014 is shown for the collocated and continuous data. The 2014 data is shown in dark blue, and the potentially exceptional data points are identified. The 2012 potentially exceptional data is also pointed out, since this data was submitted to EPA for consideration as exceptional data. It can be seen that the July 1 and 2, 2014 data points are elevated compared to the historical data.

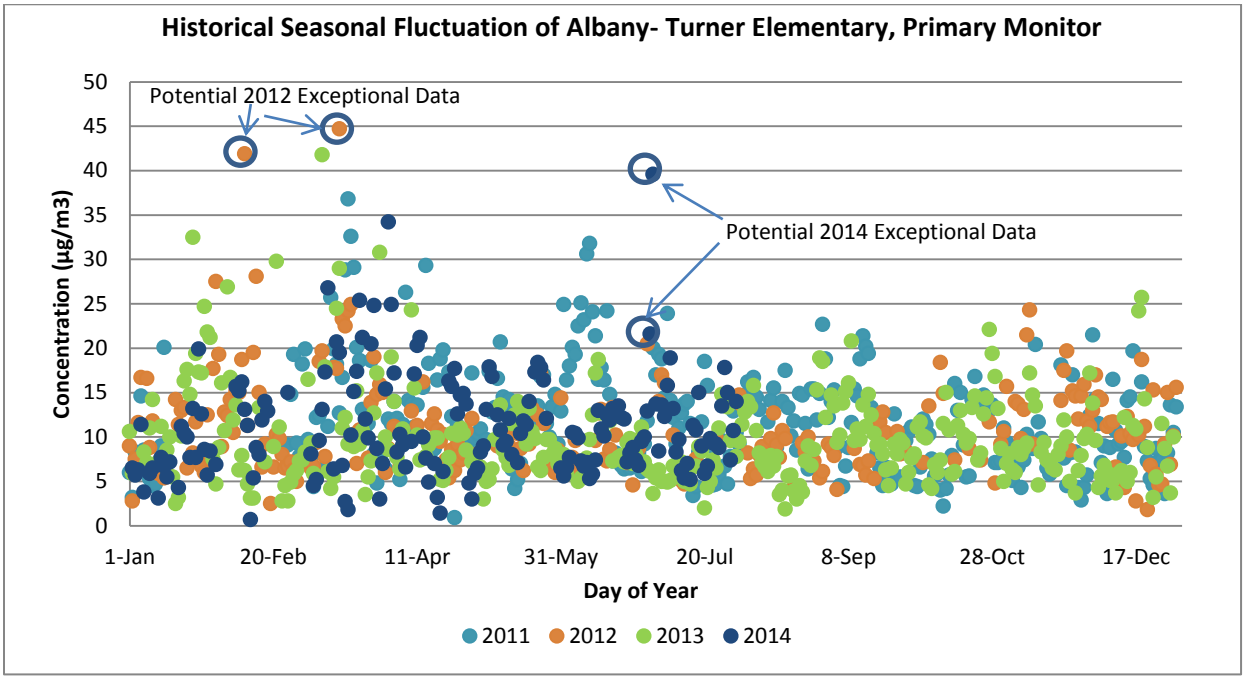


Figure 18: Historical Seasonal Fluctuation of Albany-Turner Elementary $PM_{2.5}$, Primary Monitor

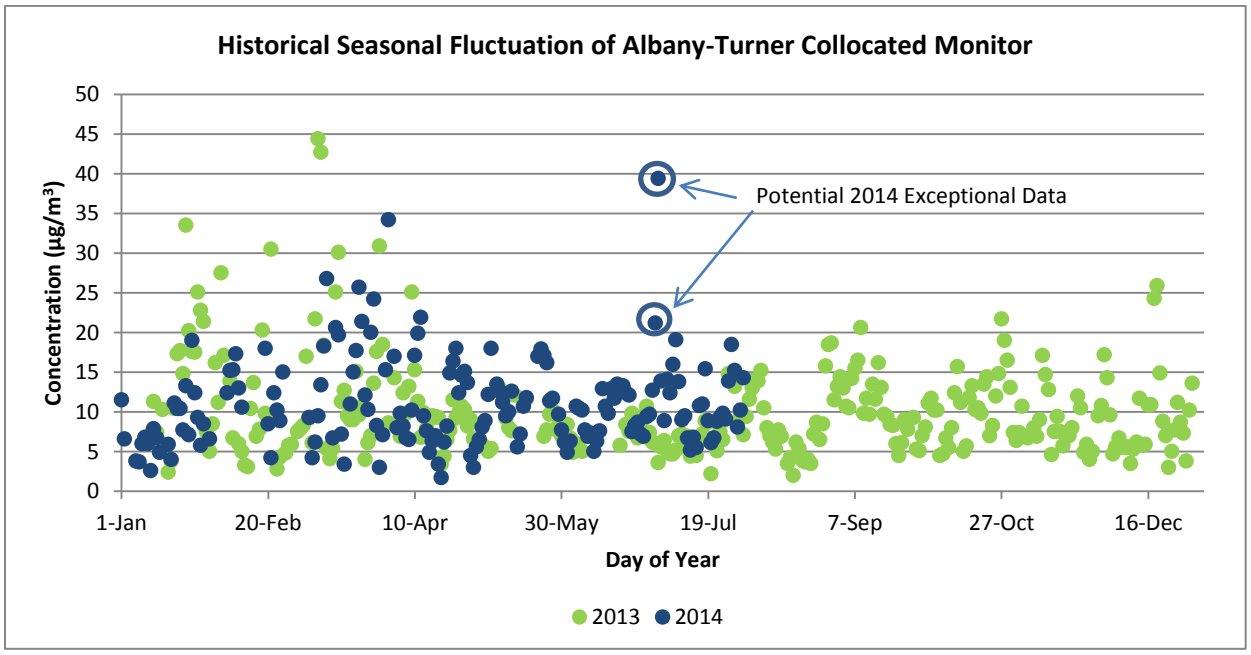


Figure 19: Historical Seasonal Fluctuation of Albany-Turner Elementary $PM_{2.5}$, Collocated Monitor

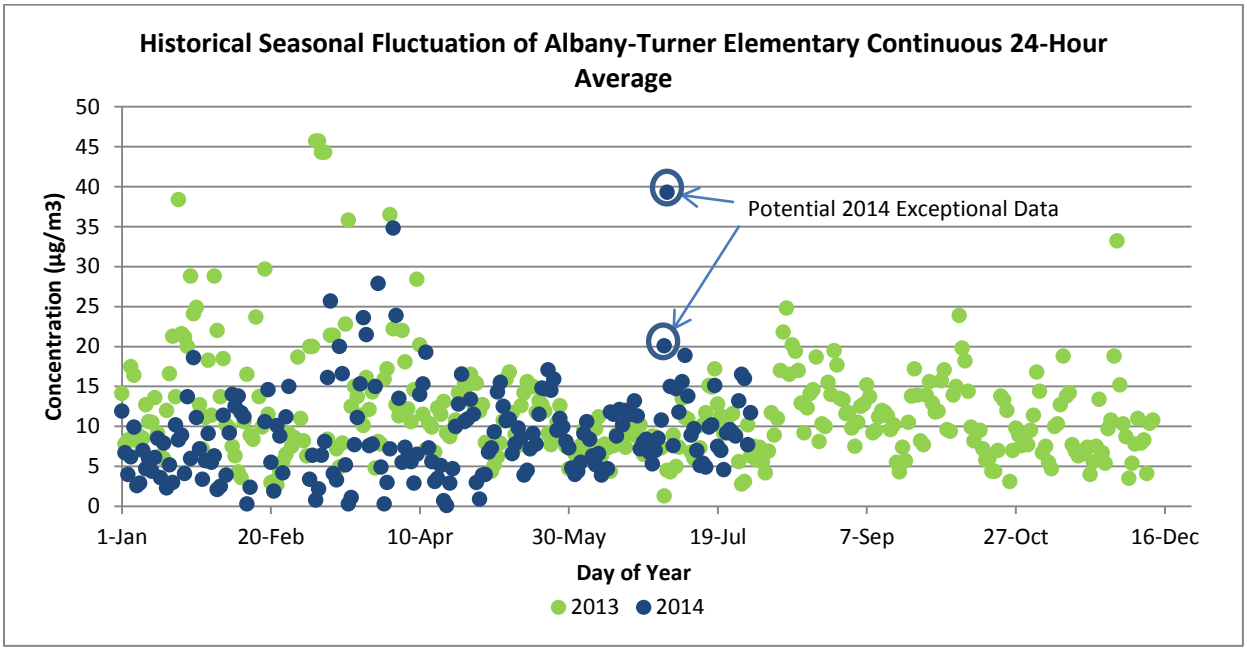


Figure 20: Historical Seasonal Fluctuation of Albany-Turner Elementary $PM_{2.5}$, Continuous Monitor

Comparisons and Conclusion

A test of significance was done for the data collected from January through July 2014 on the Graphic Pad Software website (http://www.graphpad.com/quickcalcs/Grubbs1.cfm). This calculator performs Grubbs' test, also called the ESD method (extreme studentized deviate), to determine whether one of the values in the list is a significant outlier compared to the data set with a significance level of 0.05 (two-sided). Using all of the 24-hr average readings collected from January through July of 2014, as shown in Table 6, the critical value of Z for the primary data set is 3.567. The 39.6 µg/m^3 reading has a Z value of 4.972, concluding that it is a significant outlier. The critical value of Z for the collocated data set is 3.568. The 39.4 µg/m^3 reading has a Z value of 5.090, concluding that it is a significant outlier. The critical value of Z for the continuous data set is 3.613. The 39.3 µg/m^3 reading has a Z value of 5.169, concluding that it is a significant outlier.

Site ID	Site Name	EE Value	Mean	Standard Deviation	Critical value of Z	Z Value of EE	Significant Outlier
130950007	Albany-Turner Elementary (primary, POC 1)	39.6 µg/m^3	11.1 µg/m^3	5.7	3.567	4.972	Yes
130950007	Albany-Turner Elementary (collocated, POC 2)	39.4 µg/m^3	11.0 µg/m^3	5.6	3.568	5.090	Yes
130950007	Albany-Turner Elementary (continuous, POC 3)	39.3 µg/m^3	9.2 µg/m^3	5.8	3.613	5.169	Yes

Table 6: Albany-Turner Elementary January-July 2014 Statistics

The following table shows the difference in the January-July 2014 annual averages with and without the exceptional data on July 1 and 2 for the primary monitor.

2014 Annual Averages (µg/m^3) Primary					
Site ID	Site Name	2014	Sample Value Removed	Sample Date (2014)	2014 w/o EE
130950007	Albany–Turner School	11.2	21.6, 39.6	7/1, 7/2	10.9

Table 7: Albany–Turner Elementary Annual Averages, Primary Monitor

Table 8 below explores the annual design values for the primary monitor. The January-July 2014 annual mean including the data points in question is 11.2 µg/m^3. When the data points in question are removed, the January-July 2014 annual mean becomes 10.9 µg/m^3. The 3-year annual design value for 2012-2014 decreases from 10.6 µg/m^3 to 10.5 µg/m^3 without the data points.

Albany-Turner	With Exceptional Events	Without Exceptional Events
2012	10.6 µg/m^3	10.6 µg/m^3
2013	10.0 µg/m^3	10.0 µg/m^3
2014	11.2 µg/m^3	10.9 µg/m^3
Average	**10.6 µg/m^3**	**10.5 µg/m^3**

Table 8: Annual Design Values, Primary Monitor

Table 9 below explores the 24-hour design values for this site. The January-July 2014 98th percentile value including the data points in question is 24.9 µg/m^3. When the data points in question are removed, the 2014 98th percentile is 24.8 µg/m^3. The 3-year 24-hour design value for 2012-July 2014 is 25.2 µg/m^3 with the July 1 and 2 data and 25.1 µg/m^3 without the data points.

Albany-Turner	With Exceptional Events	Without Exceptional Events
2012	24.9 µg/m^3	24.9 µg/m^3
2013	25.7 µg/m^3	25.7 µg/m^3
2014	24.9 µg/m^3	24.8 µg/m^3
Average	**25.2 µg/m^3**	**25.1 µg/m^3**

Table 9: 24-hour Design Values, Primary Monitor

The following table shows the difference in the January-July 2014 annual averages with and without the exceptional data on July 1 and 2 for the collocated monitor.

2014 Annual Averages (µg/m^3) Collocated (POC 2)					
Site ID	Site Name	2014	Sample Value Removed	Sample Date (2014)	2014 w/o EE
130950007	Albany–Turner School	11.1	21.2, 39.4	7/1, 7/2	10.8

Table 10: Albany–Elementary Annual Averages, Collocated Monitor

Table 11 below explores the annual design values for the collocated monitor. The January-July 2014 annual mean including the data points in question is 11.1 µg/m^3. When the data points in question are removed, the January-July 2014 annual mean becomes 10.8 µg/m^3. The 3-year annual design value for 2012-2014 decreases from 10.6 µg/m^3 to 10.5 µg/m^3 without the data points.

Albany-Turner collocated	With Exceptional Events	Without Exceptional Events
2012	10.6 µg/m^3	10.6 µg/m^3
2013	10.0 µg/m^3	10.0 µg/m^3
2014	11.1 µg/m^3	10.8 µg/m^3
Average	**10.6 µg/m^3**	**10.5 µg/m^3**

Table 11: Annual Design Values, Collocated Monitor

Table 12 below explores the 24-hour design values for the collocated monitor. The January-July 2014 98th percentile value including the data points in question is 24.2 µg/m^3. When the data points in question are removed, the 2014 98th percentile becomes 21.9 µg/m^3. The 3-year 24-hour design value for 2012-July 2014 decreases from 24.9 µg/m^3 with the data points to 24.2 µg/m^3 without the data points.

Albany-Turner collocated	With Exceptional Events	Without Exceptional Events
2012	24.9 µg/m^3	24.9 µg/m^3
2013	25.7 µg/m^3	25.7 µg/m^3
2014	24.2 µg/m^3	21.9 µg/m^3
Average	**24.9 µg/m^3**	**24.2 µg/m^3**

Table 12: 24-hour Design Values, Collocated Monitor

The following table shows the difference in the January-July 2014 annual averages with and without the exceptional data on July 1 and 2 for the continuous monitor.

2014 Annual Averages (µg/m^3) Continuous (POC 3)					
Site ID	Site Name	2014	Sample Value Removed	Sample Date (2014)	2014 w/o EE
130950007	Albany–Turner School	9.3	20.1, 39.3	7/1, 7/2	9.0

Table 13: Albany–Elementary Annual Averages, Continuous Monitor

Table 14 below explores the annual design values for the continuous monitor. The January-July 2014 annual mean including the data points in question is 9.3 µg/m^3. When the data points in question are removed, the January-July 2014 annual mean becomes 9.0 µg/m^3. The 3-year annual design value for 2012-2014 decreases from 10.0 µg/m^3 with the data points to 9.9 µg/m^3 without the data points.

Albany-Turner continuous	With Exceptional Events	Without Exceptional Events
2012	10.6 µg/m^3	10.6 µg/m^3
2013	10.0 µg/m^3	10.0 µg/m^3
2014	9.3 µg/m^3	9.0 µg/m^3
Average	**10.0 µg/m^3**	**9.9 µg/m^3**

Table 14: Annual Design Values, Continuous Monitor

Table 15 below explores the 24-hour design values for the continuous monitor. The January-July 2014 98th percentile value including the data points in question is 23.9 µg/m^3. When the data points in question are removed, the 2014 98th percentile becomes 21.5 µg/m^3. The 3-year 24-hour design value for 2012-July 2014 decreases from 24.8 µg/m^3 with the data points to 24.0 µg/m^3 without the data points.

Albany-Turner continuous	With Exceptional Events	Without Exceptional Events
2012	24.9 µg/m^3	24.9 µg/m^3
2013	25.7 µg/m^3	25.7 µg/m^3
2014	23.9 µg/m^3	21.5 µg/m^3
Average	**24.8 µg/m^3**	**24.0 µg/m^3**

Table 15: 24-hour Design Values, Continuous Monitor

In summary, after reviewing all of the evidence it is EPD's conclusion that the Saharan Aerosol Layer (SAL) was entrained around Tropical Storm Arthur and circulated around a strong Gulf High pressure ridge resulting in statistical outlier concentrations for the primary, collocated and continuous monitors at the Albany-Turner Elementary site on July 1 and 2, 2014. The data should be viewed as an "exceptional event" and EPA should concur with the flagging of the data. The concurrence is based on the fact that:

1. The event satisfies the criteria set forth in 40 CFR 50.1(j).
2. There is a clear causal relationship between the measurement under consideration and the Saharan aerosol transported in proximity to the site on July 1 and 2, 2014.

3. The event is associated with a measured concentration in excess of normal historical fluctuations, including background as seen in the above figures.
4. There would have been no exceedances or violation "but for" the event.

Macon – Allied

13-021-0007
July 1, 2014 –24.8 µg/m^3
July 2, 2014 –39.6 µg/m^3

Historical Data

The following section explores a comparison of the high $PM_{2.5}$ data points recorded at the Macon-Allied site on July 1 and 2, 2014 to historical $PM_{2.5}$ levels. In accordance with 40CFR50.14(c)(3)(iii)(C), an analysis is provided to show that these concentrations exceed normal historical fluctuations and typical background levels in the next figures. The first figure (Figure 21) shows historical data as box plots from 2011 to July 2014 and include a comparison for 2014, omitting the high $PM_{2.5}$ concentrations under consideration that were affected by the Saharan dust. Historical seasonal fluctuations of each year are plotted in the second figure (Figure 22).

To compare these data points to historical data collected at this site, a box plot was created using and shown in Figure 21. The distribution of 2011 to July 2014 data is shown with 25% quartile, 75% quartile, median, and bars showing minimum and maximum values (outlying data points). The 2014 data is shown with and without the July 1 and 2 data points for comparison.

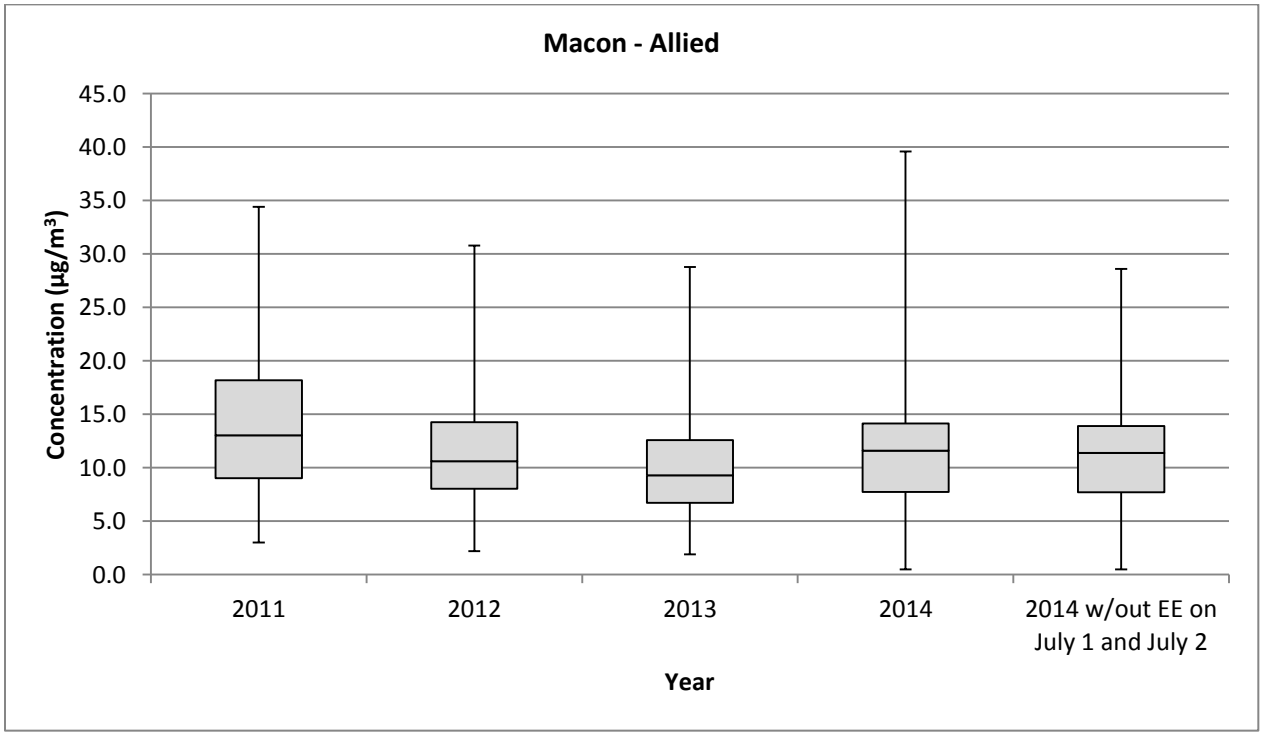


Figure 21: The Distribution of 2011 through July 2014 $PM_{2.5}$ Data for Macon-Allied

In the following figure, the 2011 through July 2014 $PM_{2.5}$ FRM data is graphed showing historical seasonal fluctuations of the data. The potentially exceptional data points are identified. It can be seen that the July 1 and 2, 2014 data points are elevated compared to the historical data collected in July 2011 through July 2014.

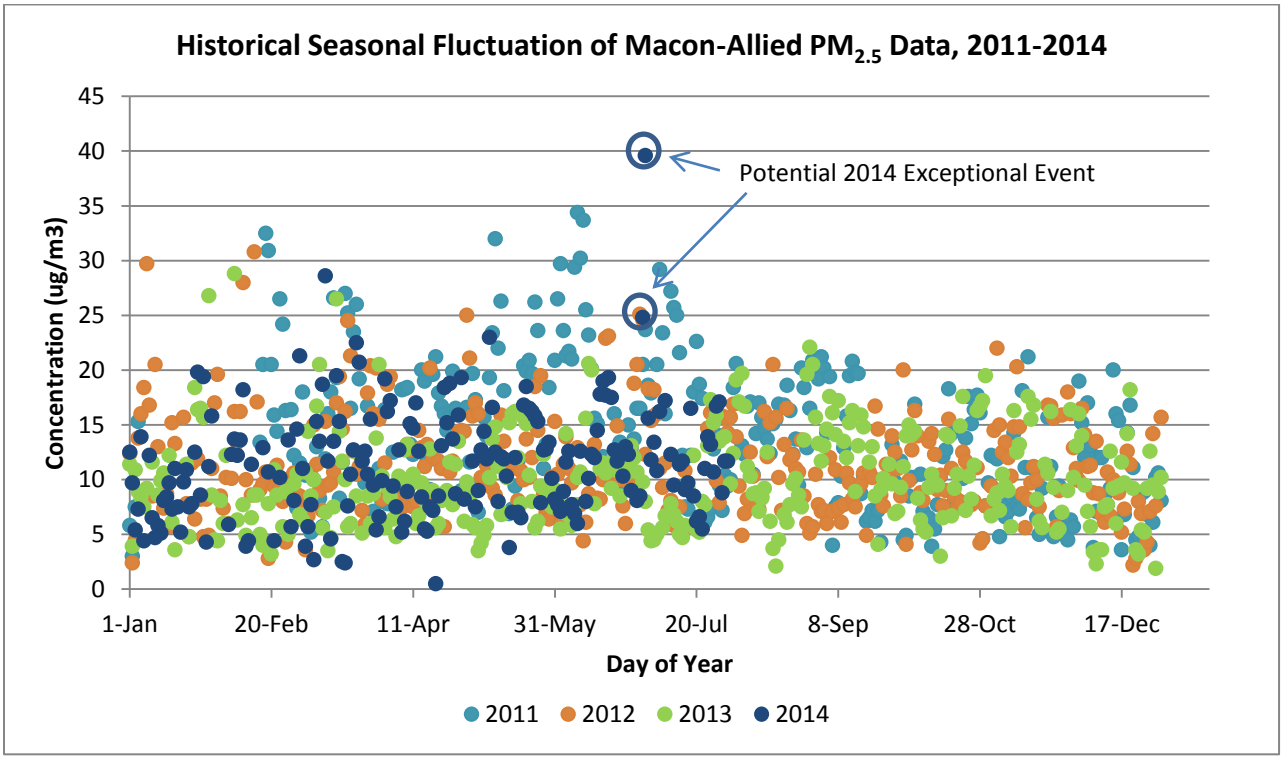


Figure 22: Historical Seasonal Fluctuation of Macon-Allied $PM_{2.5}$, 2011-July 2014

Comparisons and Conclusion

A test of significance was done for the data collected from January through July 2014 on the Graphic Pad Software website (http://www.graphpad.com/quickcalcs/Grubbs1.cfm). This calculator performs Grubbs' test, also called the ESD method (extreme studentized deviate), to determine whether one of the values in the list is a significant outlier compared to the data set, with a significance level of 0.05 (two-sided). Using all of the 24-hr average readings collected from January through July of 2014, as shown in Table 16, the critical value of Z for the entire data set is 3.592. The 39.6 µg/m^3 reading has a Z value of 5.442, concluding that it is a significant outlier.

Site ID	Site Name	EE Value	Mean	Standard Deviation	Critical value of Z	Z Value of EE	Significant Outlier
130210007	Macon-Allied	39.6 µg/m^3	11.5 µg/m^3	5.2	3.592	5.442	Yes

Table 16: Macon-Allied January-July 2014 Statistics

The following table shows the difference in the 2014 annual averages with and without the exceptional data.

2014 Annual Averages (µg/m^3)					
Site ID	Site Name	2014	Sample Value Removed	Sample Date (2014)	2012 w/o EE
130210007	Macon–Allied	11.6	24.8, 39.6	7/1, 7/2	11.4

Table 17: Macon–Allied Annual Averages

Table 18 below explores the annual design values for this site. The 2014 annual mean including the data points in question is 11.6 µg/m^3. When the data point in question is removed, the 2014 annual mean becomes 11.4 µg/m^3. The 3-year annual design value for 2012-2014 decreases from 11.0 µg/m^3 to 10.9 µg/m^3 without the data point.

Macon-Allied	With Exceptional Events	Without Exceptional Events
2012	11.3 µg/m^3	11.3 µg/m^3
2013	10.0 µg/m^3	10.0 µg/m^3
2014	11.6 µg/m^3	11.4 µg/m^3
Average	**11.0 µg/m^3**	**10.9 µg/m^3**

Table 18: Annual Design Values

Table 19 below explores the 24-hour design values for this site. The 2014 98th percentile value including the data points in question is 22.5 µg/m^3. When the data point in question is removed, the 2014 98th percentile becomes 20.7 µg/m^3. The 3-year 24-hour design value for 2012-2014 decreases from 22.5 µg/m^3 with the data points to 21.9 µg/m^3 without the data points.

Macon-Allied	With Exceptional Events	Without Exceptional Events
2012	24.5 µg/m^3	24.5 µg/m^3
2013	20.5 µg/m^3	20.5 µg/m^3
2014	22.5 µg/m^3	20.7 µg/m^3
Average	**22.5 µg/m^3**	**21.9 µg/m^3**

Table 19: 24-hour Design Values

In summary, after reviewing all of the evidence it is EPD's conclusion that the Saharan Aerosol Layer (SAL) was entrained around Tropical Storm Arthur and circulated around a strong Gulf High pressure ridge resulting in statistical outlier concentrations for the PM2.5 monitor at the Macon-Allied site on July 1 and 2, 2014. The data should be viewed as an "exceptional event" and EPA should concur with the flagging of the data. The concurrence is based on the fact that:

1. The event satisfies the criteria set forth in 40 CFR 50.1(j).
2. There is a clear causal relationship between the measurement under consideration and the Saharan aerosol transported in proximity to the site on July 1 and 2, 2014.
3. The event is associated with a measured concentration in excess of normal historical fluctuations, including background as seen in the above figures.
4. There would have been no exceedances or violation "but for" the event.