Demonstration to Justify Data Exclusion of Data Influenced by Exceptional Events

Date of Event: July 1, 2006

Mecklenburg County LUESA Air Quality
700 North Tryon Street
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Date of Event:
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1.0 Background

The following analysis provides evidence to document an exceptional event associated with $PM_{2.5}$ measurements that exceeded the 24 hour National Ambient Air Quality Standard (NAAQS). These concentrations were measured in the Mecklenburg County (MCAQ), North Carolina ambient air monitoring network.

Large forest fires in the Canadian provinces (primarily Saskatchewan, Lat: 58.55 N, Lon: -108.46W) resulted in high $PM_{2.5}$ readings on July 1, 2006. The high readings were recorded at two air quality monitoring sites operating in Mecklenburg County. The data are listed below:

Site:	37-119-0041	37-119-0043
Sampler:	R-P 2025 Sequential	R-P 2025 Sequential
Interval:	24 hr	24 hr
July 1, 2006-	35.8 μg/m3	35.7 μg/m3

This data has been flagged in AQS with an E-Forest Fire (e) validity flag.

Figure 1. Hazard Mapping System – July 1, 2006[1]

This demonstration is submitted for EPA concurrence or non-concurrence as indicated by 40 CFR Part 50 § 50.14- Treatment of Air Quality Monitoring Data Influenced by Exceptional Events.

2.0 Definition of an Exceptional Event

An exceptional event as defined by 40CFR Part 50 § 50.1 is "an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event."

3.0 Evidence Event Occurred

3.1 Location of Event

The event occurred primarily in Saskatchewan, Canada. Figure 1 displays areas of Saskatchewan near Lake Athabasca that burned between June 3, 2006 and June 28, 2006 (yellow and orange). The names of the wildfires are displayed in red. To grasp the scale of the fires, Lake Athabasca is 175 miles long and covers 3000 square miles.

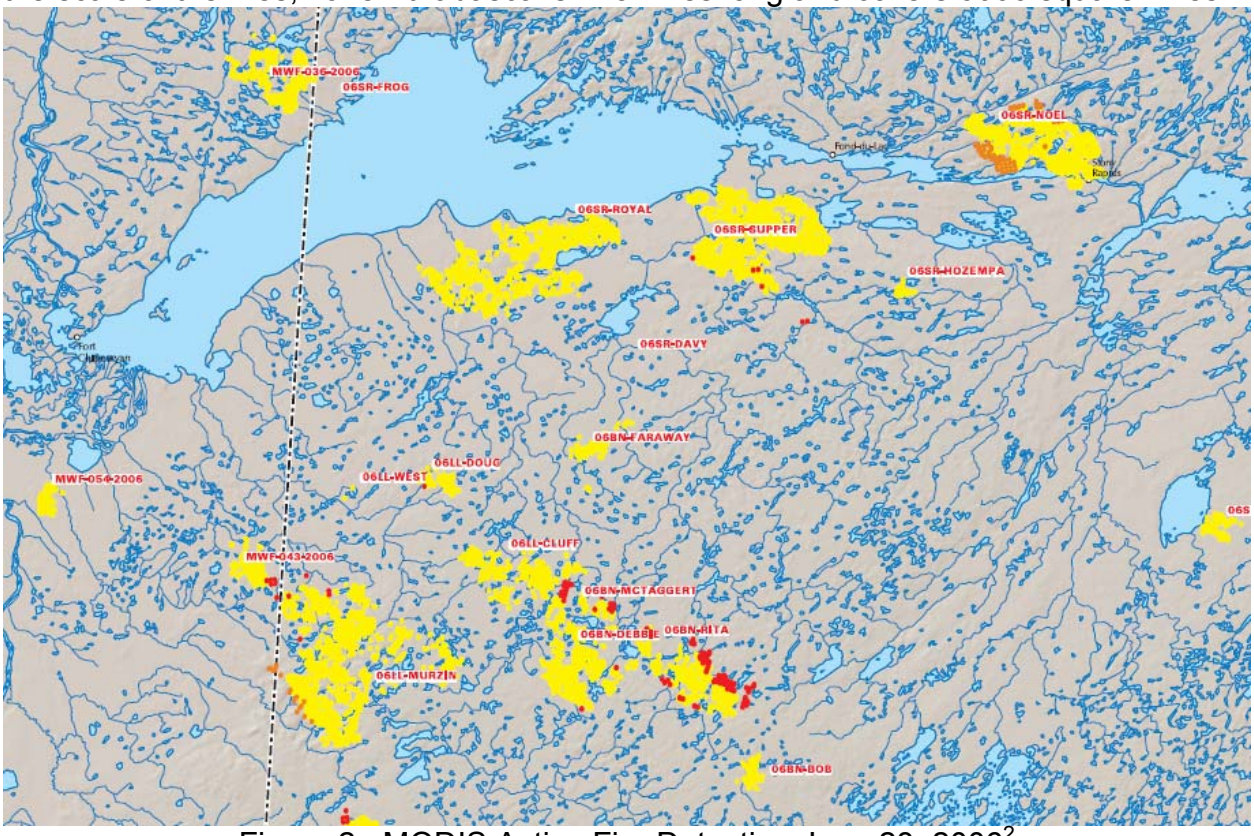


Figure 2. MODIS Active Fire Detection June 28, 2006[2]
Saskatchewan, Canada

South of Lake Athabasca, Lat: 58.55 N, Lon: -108.46W

Figure 3. Map of Canada.[3]

3.2 National Oceanic and Atmospheric Administration's National Environmental Satellite, Data, and Information Service (NESDIS)[4] Information

Listed below is the National Oceanic and Atmospheric Administration's National Environmental Satellite, Data, and Information Service (NESDIS) report from July 1, 2006. The report has been edited to provide data specific to this event. See Appendix A to review a detailed timeline of the development of the wildfires and resultant smoke detected by NESDIS.

THROUGH 0132Z **July 1, 2006.**

"...Canada and Eastern U.S. :
Numerous fires in the Canadian Provinces of Alberta, Saskatchewan and Manitoba produced an extensive plume of dense to moderately dense smoke that extended southeastward across Ontario through the Great Lakes to the Ohio Valley and the Middle Atlantic states. Thin smoke extended from NE Texas across the N Gulf of Mexico to Florida..."

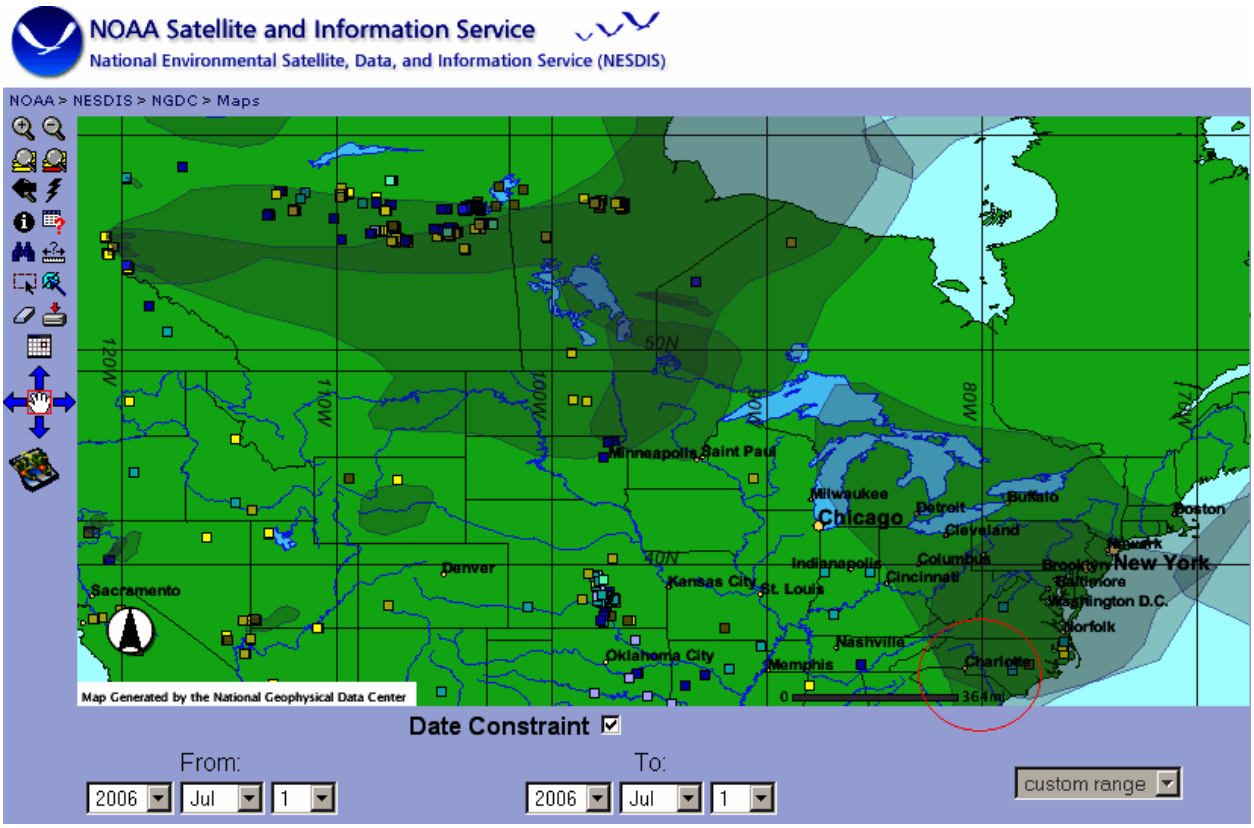


Figure 4. Mecklenburg County PM2.5 Measurements on July 1, 2006-
37-119-0041 $PM_{2.5}$: 35.8 µg/m^3 37-119-0043 $PM_{2.5}$: 35.7 µg/m^3

THROUGH 1530Z **July 1, 2006.**

"...Canada/Northern US:
Large fires in eastern British Columbia, northern Alberta, northern Saskatchewan, and northern Manitoba provinces in Canada are responsible for an extremely large area of smoke which not only covers a good portion of western and central Canada, but has also been transported by winds aloft down into eastern Montana, the Dakotas, and Minnesota. While satellite imagery shows the thickest smoke residing over east central Saskatchewan Province, the northern half of Manitoba Province, and western Hudson Bay, some reduction in visibility reportedly due to haze has been noted across MT, ND, and MN.

Eastern and Southern US:
Visible imagery shows a very large mass of haze across nearly the entire eastern third of the country as well as the south central region covering the middle and lower Mississippi Valley as well as the central and southern Plains. Recent trajectory information shows that it is likely that smoke primarily from the Canadian fires and possibly also to a lesser extent from the recent western US fires is contributing to the hazy appearance noted on satellite imagery across this entire region, though it is certainly difficult to determine a smoke concentration in these areas since the smoke has been around for such a long time mixing with other pollutants present in the region.

3.3 Newspaper article from Saskatoon, Saskatchewan:

Forest fire still raging[5]

Nearly 300 people from three communities have left their homes

Darren Bernhardt, The StarPhoenix

Published: Wednesday, June 28, 2006

A raging forest fire that has forced the evacuation of dozens of people from the northern hamlet of Stony Rapids is licking at the outskirts of the community.

The main fire has consumed more than 30,000 hectares and is looming 900 metres away, on the north side of the Fond du Lac River, while spot fires are flaring up on the south side near the community. The few resources available to fight the blaze are stretched thin under the yellow-orange sky.

The other challenge is the constant shuffling of evacuees to safety, said Julie Orthner, spokesperson with the provincial Department of Corrections and Public Safety.

"The situation is changing so quickly all the time," she said, noting 298 people from three communities have left their homes and more are expected to flee.

"That's the situation we're looking at now," said Orthner. "We've taken out those deemed most vulnerable (elderly people and those suffering from illnesses and respiratory ailments) and the next step is young children and mothers."

But not all mothers are leaving. Julie Duff has slept only a few hours during the past three days and is staying behind as long as possible. She operates Stony Rapids' water treatment plant with her husband, who also runs a general store, and is keeping the reservoir filled in the event any buildings catch fire.

"Hopefully they can get my children out," she said, noting she has three children under the age of 12 and two teenagers.

As much fuel as possible is also being removed from Stony Rapids to avoid a potentially disastrous situation, said Val Nicholson, a spokesperson with Saskatchewan Environment's provincial fire centre in Prince Albert.

Firefighters caught a break Tuesday when the constantly changing winds altered the fire's course away from a beeline into town. The wind has also swept away much of the heavy smoke that was hanging above the region and stretching across the province as far as Regina, Nicholson said.

Those winds, however, can turn again at any moment and push the fire into new territory. The North is extremely dry and any fire that ignites will spread quickly, said Nicholson.

"Nobody can understand a fire to predict it," added Duff.

About 170 Stony Residents were evacuated Sunday to Black Lake, about 20 kilometres southeast. As the air became choked with heavy smoke Monday, the evacuees and several Black Lake residents were shifted to Fond du Lac, 80 kilometres to the west.

More Black Lake residents were moved Monday evening but with tiny Fond du Lac unable to accommodate everyone, the province airlifted 217 people south to hotels in Prince Albert Monday night.

Now, Fond du Lac is packing up as another major blaze, which has devoured 55,000 hectares near the south shore of Lake Athabasca, is within 15 kilometres of that First Nations community. As many as 81 people were to be moved to Prince Albert Tuesday. Once they are settled into a reception centre there, the focus will be on getting out the mothers and children from all three communities.

Saskatchewan Environment has been criticized by some residents in Stony Rapids for not sending water bombers or additional personnel to fight the blaze sooner.

Daryl Jessop, a manager with Saskatchewan Environment's forest protection branch, said water bombers could not have been used because extremely smoky conditions had forced the community's airstrip to close. The community is too far away for firefighting aircraft to use another airport, he said.

3.4 Internet Notice from Global Fire Monitoring Center[2]:

Fires in Central Canada

1 July 2006

In central Canada, wildfires were spreading thick smoke and forcing evacuations on 28 June 2006. Forest fires, many triggered by lightning, were burning in Alberta, Saskatchewan, and Manitoba when the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite passed overhead and captured this image on 27 June. Places where MODIS detected actively burning fire are marked in red.

AQUA
27 June 2006

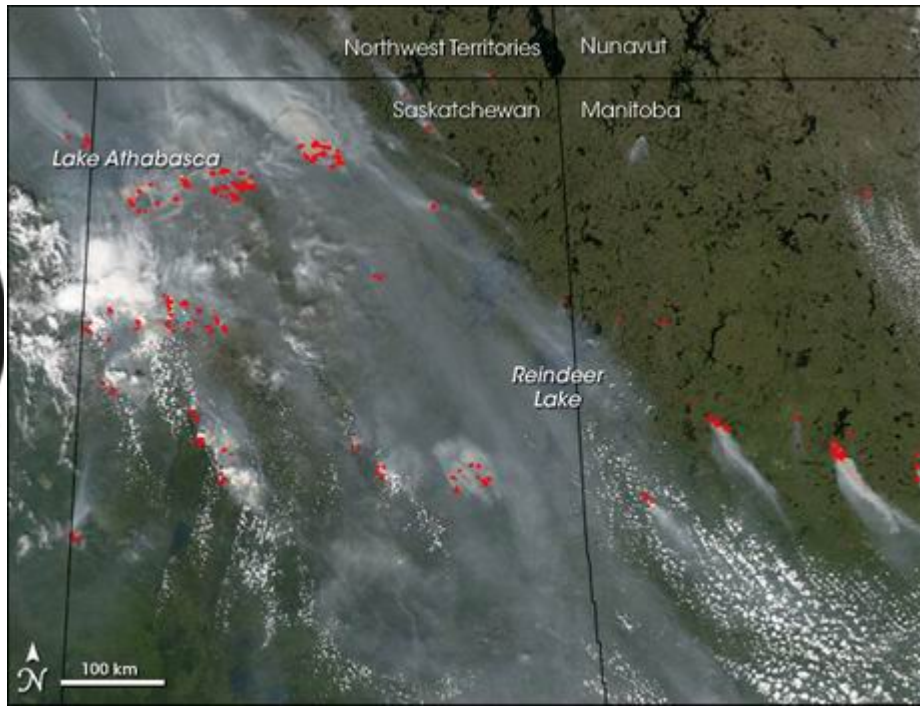


Figure 5. (source: Earth Observatory)

Grayish smoke almost completely hides Lake Athabasca (upper left), which sits at the border of Alberta (far left) and Saskatchewan provinces. A veil of smoke also covers Reindeer Lake, at the Saskatchewan-Manitoba border. According to reports from Reuters news service (see below), the smoke is the primary cause of evacuation orders for communities in Saskatchewan province. On 26 June, MODIS observed smoke from the fires blowing southward several hundred kilometers, beyond Lake Winnipeg. The high-resolution image provided above has a spatial resolution of 250 meters per pixel.

Source: Global Fire Monitoring Center (GFMC), The GFMC is an Activity of the UN International Strategy for Disaster Reduction (ISDR), http://www.fire.uni-freiburg.de/[6]

4.0 Composition and Size of Fires

4.1 Canadian Forest Service Information:

The forested area south of Lake Athabasca is classified as northern boreal forest. The northern boreal forest composition is predominantly boreal spruce, mature jack or lodgepole pine, and immature jack or lodgepole pine.

Between June 3, 2006 and September 29, 2006 more than 2900 square miles had burned in 13 separate fires in the vicinity of Lake Athabasca. All of these fires started before June 24, 2006 and all but 3 of these fires burned throughout the period June 30, 2006 through July 4, 2006. The fires had a fuel consumption range of 3.6 kg/m^2. (Natural Resources Canada, Canadian Forest Service, Fire Management & Forest Protection Branch, Prince Albert, Saskatchewan, e-mail from Edwina Lewis: October 3, 2007)[7].

firenum	firename	year	p_zone	size	startdate	outdate
C65008	06LL-MURZIN	2006	05	208540.00	6/3/06	7/29/06 8:00
L64004	06SR-NOEL	2006	05	63333.00	6/3/06	9/29/06 8:00
L64008	06SR-ROYAL	2006	05	178267.00	6/8/06	9/6/06 8:00
L64009	06SR-SUPPER	2006	05	139867.00	6/8/06	9/6/06 8:00
C62016	06BN-FARAWAY	2006	05	11780.00	6/9/06	7/29/06 8:00
C62018	06BN-RITA	2006	05	3200.00	6/18/06	6/28/06 0:00
C62019	06BN-MCTAGGERT	2006	05	4000.00	6/18/06	6/28/06 8:00
C65011	06LL-CLUFF	2006	05	4000.00	6/18/06	7/1/06 8:00
C62017	06BN-DEBBIE	2006	05	100000.00	6/18/06	7/27/06 8:00
C65012	06LL-DOUG	2006	05	6423.00	6/18/06	7/30/06 8:00
C65013	06LL-WEST	2006	05	1599.00	6/20/06	7/30/06 8:00
C65016	06LL-AGAR	2006	05	43735.00	6/24/06	7/30/06 8:00
			Hectares=	764744.00		
			Sq. Miles=	2953		
			Acres=	1889724		

Table 1. Wildfires near Lake Athabasca, Saskatchewan, Canada.

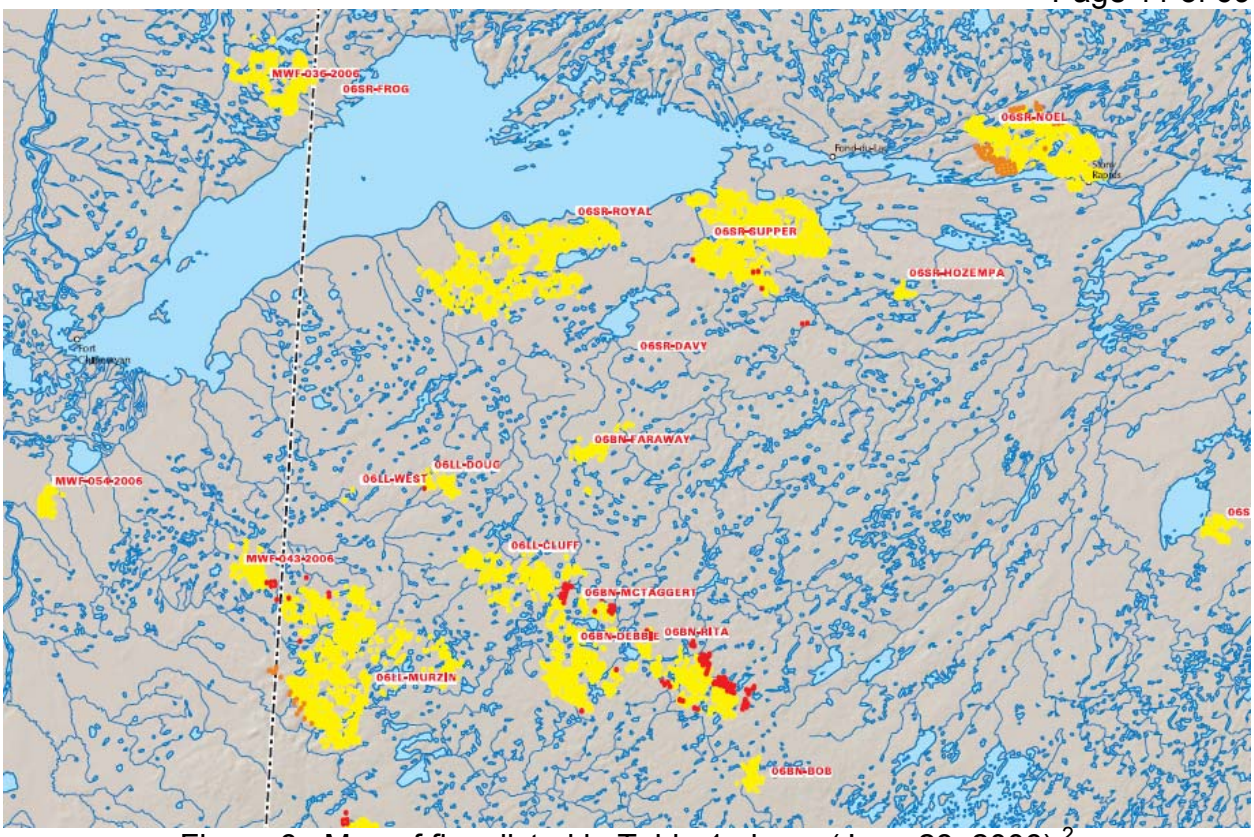


Figure 6. Map of fires listed in Table 1 above (June 28, 2006).[2]

According to the Canadian Forest Service website; as of September 6, 2006 more than 3800 square miles had burned in Saskatchewan, Canada during 2006. The 10 year average is approximately 1200 square miles per year.

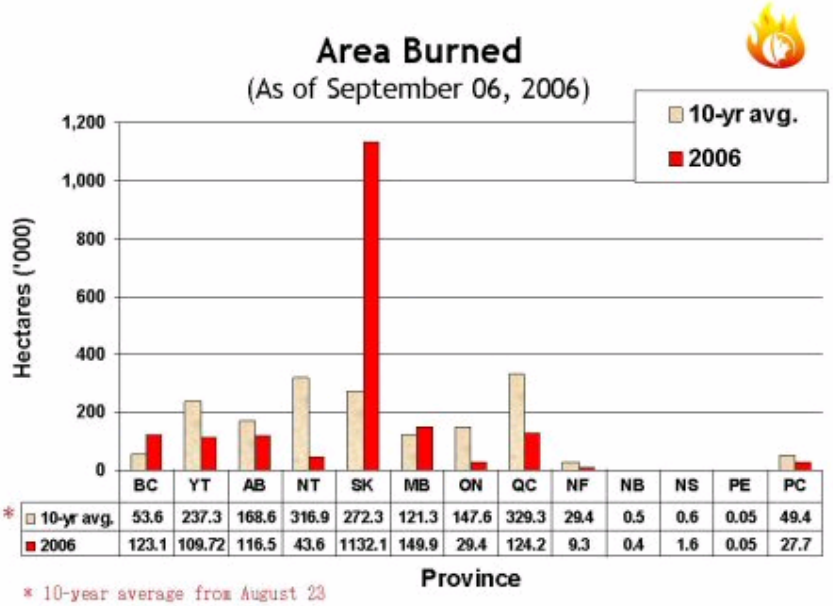


Figure 7. Area burned in Canadian Provinces 2006 versus 10 year average.[8]

4.2 Newspaper Accounts:

Fire North of Fond du Lac river burned 74100 acres (116 square miles) as of June 28, 2006. (Newspaper report – Saskatoon Star Phoenix, June 28, 2006)[5]

Fire South of Lake Athabasca has burned 135850 acres (212 sq. miles) as of June 28, 2006. (Newspaper report – Saskatoon Star Phoenix, June 28, 2006)[5]

5.0 Meteorological Data

26-Jun-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level PressureIn	Visibility	Wind Direction	Wind SpeedMPH	Gust SpeedMPH	PrecipitationIn	Events	Conditions
12:52 AM	72	70	93	29.95	10	SE	8.1	-	0		Overcast
1:52 AM	72	70	93	29.94	3	SSE	6.9	-	N/A		Overcast
2:52 AM	72	70	93	29.93	3	South	6.9	-	0		Overcast
3:52 AM	73	71.1	93	29.93	3	SSE	6.9	-	0		Overcast
4:52 AM	73	70	90	29.93	3	SSE	8.1	-	N/A		Overcast
5:34 AM	73.4	71.6	94	29.96	3	SSE	8.1	-	0	Rain	Light Rain
5:52 AM	73	70	90	29.93	3	SSE	9.2	-	0		Overcast
6:52 AM	73	70	90	29.94	3	SE	9.2	-	N/A		Overcast
8:40 AM	75.2	71.6	89	29.97	10	SSE	9.2	-	N/A		Mostly Cloudy
8:52 AM	75	71.1	87	29.94	10	SSE	9.2	-	N/A		Mostly Cloudy
9:52 AM	75.9	71.1	85	29.95	9	South	6.9	-	N/A		Mostly Cloudy
10:25 AM	75.2	71.6	89	29.97	10	South	6.9	-	0.11		Mostly Cloudy
10:52 AM	78.1	70	76	29.95	10	SSE	10.4	-	0.11		Mostly Cloudy
11:52 AM	82	70	67	29.93	10	SSE	9.2	-	N/A		Mostly Cloudy
12:52 PM	82	69.1	65	29.92	10	South	8.1	-	N/A		Mostly Cloudy
1:52 PM	84.9	68	57	29.89	10	South	12.7	18.4	N/A		Scattered Clouds
2:52 PM	81	69.1	67	29.89	6	SSE	15	-	0	Rain	Heavy Rain
3:52 PM	81	71.1	72	29.89	10	SSE	12.7	-	0.03		Mostly Cloudy
4:52 PM	72	68	87	29.92	6	WNW	6.9	18.4	0.06	Rain	Heavy Rain
5:52 PM	73	69.1	87	29.94	4	Variable	4.6	-	0.09	Thunderstorm	Overcast
6:35 PM	71.6	68	88	29.96	4	SSE	6.9	-	0.07	Rain	Rain
6:52 PM	72	68	87	29.92	5	North	3.5	-	0.1	Rain	Rain
7:52 PM	73	69.1	87	29.93	10	East	4.6	-	0		Mostly Cloudy
8:52 PM	72	69.1	91	29.94	10	East	6.9	-	N/A		Overcast
9:52 PM	72	68	87	29.95	10	ENE	6.9	-	N/A		Mostly Cloudy
10:52 PM	71.1	66.9	87	29.96	10	ESE	8.1	-	N/A		Mostly Cloudy
11:52 PM	71.6	68	88	29.99	10	ESE	4.6	-	N/A		Overcast

27-Jun-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level P	Visibility	Wind Dire	Wind Speed	Gust Speed	PrecipitationIn	Events	Conditions
12:52 AM	71.1	68	90	29.96	10	East	3.5	-	N/A		Overcast
1:35 AM	71.6	68	88	29.97	10	East	5.8	-	N/A		Overcast
1:52 AM	71.1	68	90	29.94	10	East	6.9	-	N/A		Overcast
2:52 AM	71.1	69.1	93	29.95	9	SE	6.9	-	N/A		Overcast
3:52 AM	72	69.1	91	29.94	8	SE	8.1	-	N/A		Overcast
4:52 AM	72	70	93	29.94	7	ESE	6.9	-	N/A		Overcast
5:52 AM	72	70	93	29.94	3	ESE	6.9	-	0		Overcast
6:21 AM	73.4	69.8	88	29.96	3	SE	8.1	-	0	Rain	Light Rain
6:41 AM	73.4	69.8	88	29.96	3	SE	8.1	-	0.02	Rain	Light Rain
6:52 AM	73.4	69.8	88	29.96	3	ESE	9.2	-	N/A	Rain	Light Rain
7:30 AM	73.4	69.8	88	29.96	3	ESE	6.9	-	0.02	Rain	Light Rain
7:52 AM	73	70	90	29.94	8	ESE	8.1	-	0.02		Overcast
8:29 AM	73.4	69.8	88	29.97	2.5	ESE	8.1	-	0.05	Rain	Heavy Rain
8:45 AM	73.4	69.8	88	29.97	1.5	SE	8.1	-	0.13	Rain-Thunderstorm	Heavy Thunderstorms and Rain
8:52 AM	73	70	90	29.95	1.5	SE	6.9	-	0.16	Rain-Thunderstorm	Heavy Thunderstorms and Rain
9:31 AM	71.6	69.8	94	29.97	1	SE	9.2	-	0.19	Rain-Thunderstorm	Heavy Thunderstorms and Rain
9:52 AM	71.1	69.1	93	29.95	1.5	South	4.6	-	0.41	Rain-Thunderstorm	Thunderstorms and Rain
10:41 AM	71.6	69.8	94	29.97	10	WNW	3.5	-	N/A	Rain	Light Rain
10:52 AM	72	70	93	29.95	10	WNW	3.5	-	0.07	Rain	Light Rain
11:52 AM	78.1	72	81	29.96	10	NW	4.6	-	0.01		Mostly Cloudy
12:04 PM	77	71.6	83	29.98	10	WNW	4.6	-	N/A		Mostly Cloudy
12:52 PM	79	70	74	29.95	10	Variable	4.6	-	N/A		Mostly Cloudy
1:52 PM	82	70	67	29.95	10	WNW	8.1	-	N/A		Mostly Cloudy
2:52 PM	82.9	69.1	63	29.94	10	Variable	5.8	-	N/A		Scattered Clouds
3:52 PM	84.9	66.9	55	29.92	10	NW	5.8	-	N/A		Scattered Clouds
4:52 PM	86	68	55	29.93	10	WNW	5.8	-	N/A		Scattered Clouds
5:52 PM	84.9	66	53	29.94	10	NNW	3.5	-	N/A		Scattered Clouds
6:52 PM	84	69.1	61	29.94	10	NW	3.5	-	N/A		Scattered Clouds
7:52 PM	75.9	69.1	79	29.96	10	Calm	Calm	-	N/A		Scattered Clouds
8:52 PM	75.2	66.2	73	29.97	10	Calm	Calm	-	N/A		Scattered Clouds
9:21 PM	77	68	74	30.01	10	Variable	5.8	-	N/A	Thunderstorm	Thunderstorm
9:52 PM	71.1	68	90	30	6	SSW	9.2	-	0.01	Rain-Thunderstorm	Light Thunderstorms and Rain
10:15 PM	71.6	66.2	83	30.01	10	SSW	10.4	-	0	Rain	Light Rain
10:52 PM	72	66	81	30.01	10	Calm	Calm	-	0		Mostly Cloudy
11:52 PM	70	66.9	90	30.02	8	NNW	3.5	-	N/A		Mostly Cloudy

28-Jun-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level PressureIn	Visibility	Wind Direction	Wind SpeedMPH	Gust SpeedMPH	PrecipitationIn	Events	Conditions
12:52 AM	69.1	66.9	93	30.02	5	Calm	Calm	-	N/A		Mostly Cloudy
1:52 AM	68	66	93	30.03	5	Calm	Calm	-	N/A		Scattered Clouds
2:52 AM	69.1	66	90	30.03	5	WNW	4.6	-	N/A		Scattered Clouds
3:52 AM	66.9	64.9	93	30.03	5	Calm	Calm	-	N/A		Scattered Clouds
4:52 AM	66.9	64.9	93	30.03	6	Calm	Calm	-	N/A		Scattered Clouds
5:52 AM	66	64	93	30.05	6	NNW	3.5	-	N/A		Scattered Clouds
6:52 AM	64.9	64	97	30.07	5	Calm	Calm	-	N/A		Partly Cloudy
7:52 AM	71.1	66.9	87	30.09	7	NW	3.5	-	N/A		Partly Cloudy
8:52 AM	73.9	68	82	30.11	9	WNW	4.6	-	N/A		Partly Cloudy
9:52 AM	77	69.1	76	30.12	10	NW	4.6	-	N/A		Partly Cloudy
10:52 AM	82	66.9	60	30.11	10	North	3.5	-	N/A		Partly Cloudy
11:52 AM	86	63	46	30.11	10	NNW	3.5	-	N/A		Partly Cloudy
12:52 PM	86	64	48	30.11	10	Variable	5.8	-	N/A		Scattered Clouds
1:52 PM	84.9	61	44	30.09	10	Variable	5.8	-	N/A		Mostly Cloudy
2:52 PM	86	61	43	30.08	10	Variable	6.9	-	N/A		Overcast
3:52 PM	84.9	64.9	51	30.07	10	SSW	8.1	-	N/A		Mostly Cloudy
4:52 PM	84.9	64	49	30.06	10	SSW	8.1	-	N/A		Scattered Clouds
5:52 PM	84.9	64	49	30.06	10	South	9.2	-	N/A		Scattered Clouds
6:52 PM	82.9	64	53	30.06	9	South	6.9	-	N/A		Scattered Clouds
7:52 PM	80.1	66	62	30.06	8	South	4.6	-	N/A		Scattered Clouds
8:52 PM	77	66	69	30.08	7	South	6.9	-	N/A		Scattered Clouds
9:52 PM	77	66	69	30.08	8	SSW	4.6	-	N/A		Partly Cloudy
10:52 PM	75	66	73	30.09	7	SSW	3.5	-	N/A		Clear
11:52 PM	73.9	66	76	30.08	7	Calm	Calm	-	N/A		Clear

29-Jun-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level PressureIn	Visibility	Wind Direction	Wind SpeedMPH	Gust SpeedMPH	PrecipitationIn	Events	Conditions
12:52 AM	72	66	81	30.1	7	Calm	Calm	-	N/A		Clear
1:52 AM	66.9	64.9	93	30.11	7	Calm	Calm	-	N/A		Clear
2:52 AM	68	64.9	90	30.1	6	Calm	Calm	-	N/A		Clear
3:52 AM	66.2	64.4	94	30.12	5	Calm	Calm	-	N/A		Clear
4:52 AM	68	66	93	30.08	5	Calm	Calm	-	N/A		Clear
5:52 AM	66.9	64.9	93	30.09	5	NW	3.5	-	N/A		Partly Cloudy
6:52 AM	66.9	64.9	93	30.1	3	NW	3.5	-	N/A		Scattered Clouds
7:52 AM	70	66.9	90	30.11	4	NNW	4.6	-	N/A		Scattered Clouds
8:52 AM	73	66.9	81	30.11	5	Variable	4.6	-	N/A		Haze
9:52 AM	79	64	60	30.11	9	NNW	8.1	-	N/A		Clear
10:52 AM	82	62.1	51	30.11	10	NNE	8.1	-	N/A		Clear
11:52 AM	82.9	61	47	30.12	10	NNW	6.9	-	N/A		Clear
12:52 PM	84	60.1	44	30.11	9	NW	6.9	-	N/A		Partly Cloudy
1:52 PM	86	60.1	41	30.09	10	Calm	Calm	-	N/A		Partly Cloudy
2:52 PM	86	57.9	38	30.07	10	Variable	4.6	-	N/A		Scattered Clouds
3:52 PM	87.1	57	36	30.06	10	East	4.6	-	N/A		Scattered Clouds
4:52 PM	86	55	35	30.04	10	Calm	Calm	-	N/A		Partly Cloudy
5:52 PM	82.4	60.8	48	30.06	10	Calm	Calm	-	N/A		Partly Cloudy
6:52 PM	82.9	61	47	30.03	10	SW	3.5	-	N/A		Partly Cloudy
7:52 PM	78.1	63	60	30.03	10	SSW	3.5	-	N/A		Partly Cloudy
8:52 PM	75.9	62.1	62	30.03	10	SSW	5.8	-	N/A		Scattered Clouds
9:52 PM	73.9	62.1	66	30.04	10	Calm	Calm	-	N/A		Partly Cloudy
10:52 PM	75	62.1	64	30.06	10	SSW	3.5	-	N/A		Partly Cloudy
11:52 PM	73.9	63	68	30.06	10	WNW	4.6	-	N/A		Mostly Cloudy

30-Jun-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level PressureIn	Visibility	Wind Direction	Wind SpeedMPH	Gust SpeedMPH	PrecipitationIn	Events	Conditions
12:52 AM	71.1	64	78	30.05	8	Calm	Calm	-	N/A		Clear
1:52 AM	68	63	84	30.04	7	WNW	3.5	-	N/A		Clear
2:52 AM	68	62.1	81	30.04	8	NW	6.9	-	N/A		Clear
3:52 AM	69.1	61	75	30.05	8	NNW	6.9	-	N/A		Clear
4:52 AM	66	61	84	30.06	8	NW	5.8	-	N/A		Partly Cloudy
5:52 AM	66	61	84	30.07	7	NNW	4.6	-	N/A		Partly Cloudy
6:52 AM	66.9	62.1	84	30.09	7	North	5.8	-	N/A		Partly Cloudy
7:52 AM	71.1	62.1	73	30.1	8	North	6.9	-	N/A		Clear
8:52 AM	73.9	62.1	66	30.12	9	North	8.1	-	N/A		Partly Cloudy
9:52 AM	77	60.1	56	30.13	10	NNE	8.1	-	N/A		Clear
10:52 AM	80.1	61	52	30.12	8	Variable	4.6	-	N/A		Clear
11:52 AM	80.6	57.2	45	30.14	10	North	6.9	-	N/A		Partly Cloudy
12:52 PM	82	59	45	30.1	10	NW	5.8	-	N/A		Partly Cloudy
1:52 PM	82.9	60.1	46	30.09	10	Variable	6.9	-	N/A		Partly Cloudy
2:52 PM	84	60.1	44	30.08	9	Calm	Calm	-	N/A		Scattered Clouds
3:52 PM	84	57	40	30.08	9	Variable	5.8	-	N/A		Scattered Clouds
4:52 PM	82.9	57.9	42	30.07	8	Variable	4.6	-	N/A		Partly Cloudy
5:52 PM	82.9	57.9	42	30.07	9	Variable	4.6	-	N/A		Partly Cloudy
6:52 PM	82.9	60.1	46	30.07	9	Calm	Calm	-	N/A		Partly Cloudy
7:52 PM	77	61	58	30.09	8	Calm	Calm	-	N/A		Clear
8:52 PM	71.1	62.1	73	30.09	6	Calm	Calm	-	N/A		Haze
9:52 PM	73	60.1	64	30.1	8	Calm	Calm	-	0		Clear
10:52 PM	71.1	60.1	68	30.12	7	Calm	Calm	-	N/A		Clear
11:52 PM	73	60.1	64	30.12	7	Calm	Calm	-	N/A		Clear

1-Jul-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level PressureIn	Visibility	Wind Direction	Wind SpeedMPH	Gust SpeedMPH	PrecipitationIn	Events	Conditions
12:52 AM	72	61	68	30.13	7	Variable	3.5	-	N/A		Clear
1:52 AM	71.1	60.1	68	30.14	6	SE	4.6	-	N/A		Haze
2:52 AM	69.1	61	75	30.14	6	Calm	Calm	-	N/A		Haze
3:52 AM	69.1	61	75	30.14	6	SE	3.5	-	N/A		Haze
4:52 AM	66	61	84	30.15	6	WNW	5.8	-	N/A		Haze
5:52 AM	64.9	61	87	30.16	5	WNW	5.8	-	N/A		Clear
6:52 AM	64	61	90	30.18	5	NNW	4.6	-	N/A		Partly Cloudy
7:52 AM	69.1	63	81	30.2	5	NW	4.6	-	N/A		Haze
8:52 AM	75	64	69	30.22	5	North	4.6	-	N/A		Haze
9:52 AM	78.1	64	62	30.22	5	Calm	Calm	-	N/A		Haze
10:52 AM	80.1	64.9	60	30.22	6	SW	3.5	-	N/A		Haze
11:52 AM	82	64	54	30.23	6	Variable	4.6	-	N/A		Haze
12:52 PM	84	63	49	30.22	7	SW	5.8	-	N/A		Partly Cloudy
1:52 PM	86	63	46	30.21	7	Calm	Calm	-	N/A		Partly Cloudy
2:52 PM	86	63	46	30.19	8	Variable	5.8	-	N/A		Partly Cloudy
3:52 PM	86	64	48	30.19	8	NE	4.6	-	N/A		Partly Cloudy
4:52 PM	86	64	48	30.18	7	Calm	Calm	-	N/A		Partly Cloudy
5:52 PM	84.9	64	49	30.17	8	WSW	4.6	-	N/A		Partly Cloudy
6:52 PM	84.9	66	53	30.16	8	Calm	Calm	-	N/A		Scattered Clouds
7:52 PM	82	64.9	56	30.16	8	SSW	4.6	-	N/A		Scattered Clouds
8:52 PM	78.1	64.9	64	30.17	7	SSW	4.6	-	N/A		Scattered Clouds
9:52 PM	75.9	64.9	69	30.17	8	South	3.5	-	N/A		Scattered Clouds
10:52 PM	75.9	66	71	30.19	8	SSW	4.6	-	N/A		Partly Cloudy
11:52 PM	72	66	81	30.19	7	SSW	4.6	-	N/A		Partly Cloudy

2-Jul-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level PressureIn	Visibility	Wind Direction	Wind SpeedMPH	Gust SpeedMPH	PrecipitationIn	Events	Conditions
12:52 AM	72	64.9	78	30.2	7	South	3.5	-	N/A		Partly Cloudy
1:52 AM	72	64.9	78	30.2	7	Calm	Calm	-	N/A		Clear
2:52 AM	71.1	64	78	30.2	7	Calm	Calm	-	N/A		Clear
3:52 AM	71.1	64.9	81	30.21	7	Calm	Calm	-	N/A		Clear
4:52 AM	70	64.9	84	30.21	6	Calm	Calm	-	N/A		Haze
5:52 AM	69.1	64.9	87	30.22	6	Calm	Calm	-	N/A		Clear
6:52 AM	69.1	64.9	87	30.24	6	Calm	Calm	-	N/A		Clear
7:52 AM	73.4	66.2	78	30.26	5	Variable	3.5	-	N/A		Haze
8:52 AM	78.1	68	71	30.24	6	Variable	4.6	-	N/A		Haze
9:52 AM	80.1	68	67	30.24	6	SW	5.8	-	N/A		Haze
10:52 AM	84	69.1	61	30.23	7	Variable	3.5	-	N/A		Clear
11:52 AM	86	68	55	30.23	7	Variable	5.8	-	N/A		Clear
12:52 PM	89.1	70	53	30.22	7	Variable	4.6	-	N/A		Partly Cloudy
1:52 PM	90	66	45	30.19	9	Variable	4.6	-	N/A		Partly Cloudy
2:52 PM	90	68	48	30.18	10	Variable	5.8	-	N/A		Partly Cloudy
3:52 PM	91	66.9	45	30.16	10	South	5.8	-	N/A		Scattered Clouds
4:52 PM	90	66.9	46	30.14	10	SSW	5.8	-	N/A		Scattered Clouds
5:52 PM	88	68	51	30.13	9	SSW	3.5	-	N/A		Scattered Clouds
6:20 PM	84.2	69.8	62	30.15	9	SW	3.5	-	N/A	Thunder	Thunderstorm
6:52 PM	84.9	66.9	55	30.14	8	Variable	3.5	-	N/A	Thunder	Thunderstorm
7:08 PM	80.6	64.4	58	30.17	9	WNW	10.4	-	N/A		Mostly Cloudy
7:52 PM	82.9	64.9	54	30.15	10	Calm	Calm	-	N/A		Mostly Cloudy
8:52 PM	80.1	64.9	60	30.16	9	South	4.6	-	N/A		Scattered Clouds
9:52 PM	78.1	66	66	30.18	10	South	5.8	-	0		Partly Cloudy
10:52 PM	79	68	69	30.19	10	South	3.5	-	N/A		Clear
11:52 PM	77	68	74	30.19	7	SSW	3.5	-	N/A		Clear

3-Jul-06											
TimeEDT	TemperatureF	Dew PointF	Humidity	Sea Level PressureIn	Visibility	Wind Direction	Wind SpeedMPH	Gust SpeedMPH	PrecipitationIn	Events	Conditions
12:52 AM	75.9	66.9	74	30.19	8	SSW	4.6	-	N/A		Clear
1:52 AM	75	66.9	76	30.18	7	Calm	Calm	-	N/A		Clear
2:52 AM	73.9	66.9	79	30.17	7	South	3.5	-	N/A		Clear
3:52 AM	73.9	66.9	79	30.17	7	South	4.6	-	N/A		Clear
4:52 AM	73	66.9	81	30.15	7	Calm	Calm	-	N/A		Clear
5:52 AM	73.9	66.9	79	30.17	7	Calm	Calm	-	N/A		Clear
6:52 AM	73	66.9	81	30.18	7	Variable	3.5	-	N/A		Scattered Clouds
7:52 AM	75.2	68	78	30.21	7	Variable	3.5	-	N/A		Scattered Clouds
8:52 AM	79	69.1	72	30.19	7	Calm	Calm	-	N/A		Partly Cloudy
9:52 AM	82	70	67	30.19	7	Variable	3.5	-	N/A		Partly Cloudy
10:52 AM	84.9	70	61	30.19	7	Variable	3.5	-	N/A		Partly Cloudy
11:52 AM	87.8	69.8	55	30.21	7	Calm	Calm	-	N/A		Mostly Cloudy
12:52 PM	89.1	69.1	52	30.17	8	Variable	3.5	-	N/A		Mostly Cloudy
1:52 PM	90	69.1	50	30.15	8	South	4.6	-	N/A		Scattered Clouds
2:52 PM	91	69.1	48	30.12	8	SSW	5.8	-	N/A		Scattered Clouds
3:52 PM	91.9	66.9	44	30.12	8	Variable	3.5	-	N/A		Scattered Clouds
4:52 PM	91.9	69.1	47	30.1	7	Variable	4.6	-	N/A		Scattered Clouds
5:52 PM	91	70	50	30.09	8	SSW	4.6	-	N/A		Scattered Clouds
6:52 PM	88	71.1	57	30.09	7	SSW	3.5	-	N/A		Scattered Clouds
7:52 PM	84	70	63	30.08	7	SSW	4.6	-	N/A		Partly Cloudy
8:52 PM	82.9	69.1	63	30.09	6	South	5.8	-	N/A		Haze
9:52 PM	81	69.1	67	30.12	7	SSW	3.5	-	N/A		Partly Cloudy
10:52 PM	78.8	69.8	74	30.12	8	SSW	3.5	-	N/A		Clear
11:52 PM	80.1	69.1	69	30.12	7	Variable	3.5	-	N/A		Clear

6.0 Ozone Data from Regional Sites

8 Hour Averages, ppm			27-Jun-06	28-Jun-06	29-Jun-06	30-Jun-06	1-Jul-06	2-Jul-06	3-Jul-06
Site Name	**County**	**AIRS Code**	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday
MonroeMS	Union	37-179-0003	0.047	0.075	0.072	0.065	0.07	0.058	0.063
Enochville	Rowan*	37-159-0022	0.039	0.075	0.066	0.073	0.084	0.075	0.083
Crouse	Lincoln	37-109-0004	0.04	0.067	0.06	0.063	0.068	0.055	0.059
Rockwell	Rowan*	37-159-0021	0.036	0.078	0.065	0.074	0.08	0.074	0.08
Arrowood	Meck. Co	37-119-1005	0.036	0.061	0.065	0.074	0.076	0.057	0.064
County Line (U)	Meck. Co	37-119-1009	0.043	0.08	0.073	0.076	0.092	0.072	0.078
Garinger	Meck. Co.	37-119-0041	0.04	0.072	0.074	0.079	0.094	0.073	0.086
1 Hour Averages, ppm									
MonroeMS	Union	37-179-0003	0.054	0.084	0.087	0.072	0.074	0.061	0.069
Enochville	Rowan*	37-159-0022	0.045	0.08	0.071	0.084	0.088	0.084	0.099
Crouse	Lincoln	37-109-0004	0.045	0.072	0.063	0.067	0.072	0.06	0.071
Rockwell	Rowan*	37-159-0021	0.042	0.091	0.068	0.085	0.085	0.082	0.088
Arrowood	Meck. Co	37-119-1005	0.041	0.067	0.074	0.082	0.084	0.061	0.072
County Line (U)	Meck. Co	37-119-1009	0.051	0.085	0.08	0.081	0.101	0.078	0.084
Garinger	Meck. Co.	37-119-0041	0.046	0.076	0.077	0.087	0.105	0.082	0.094

7.0 Trajectories and Mixing Heights

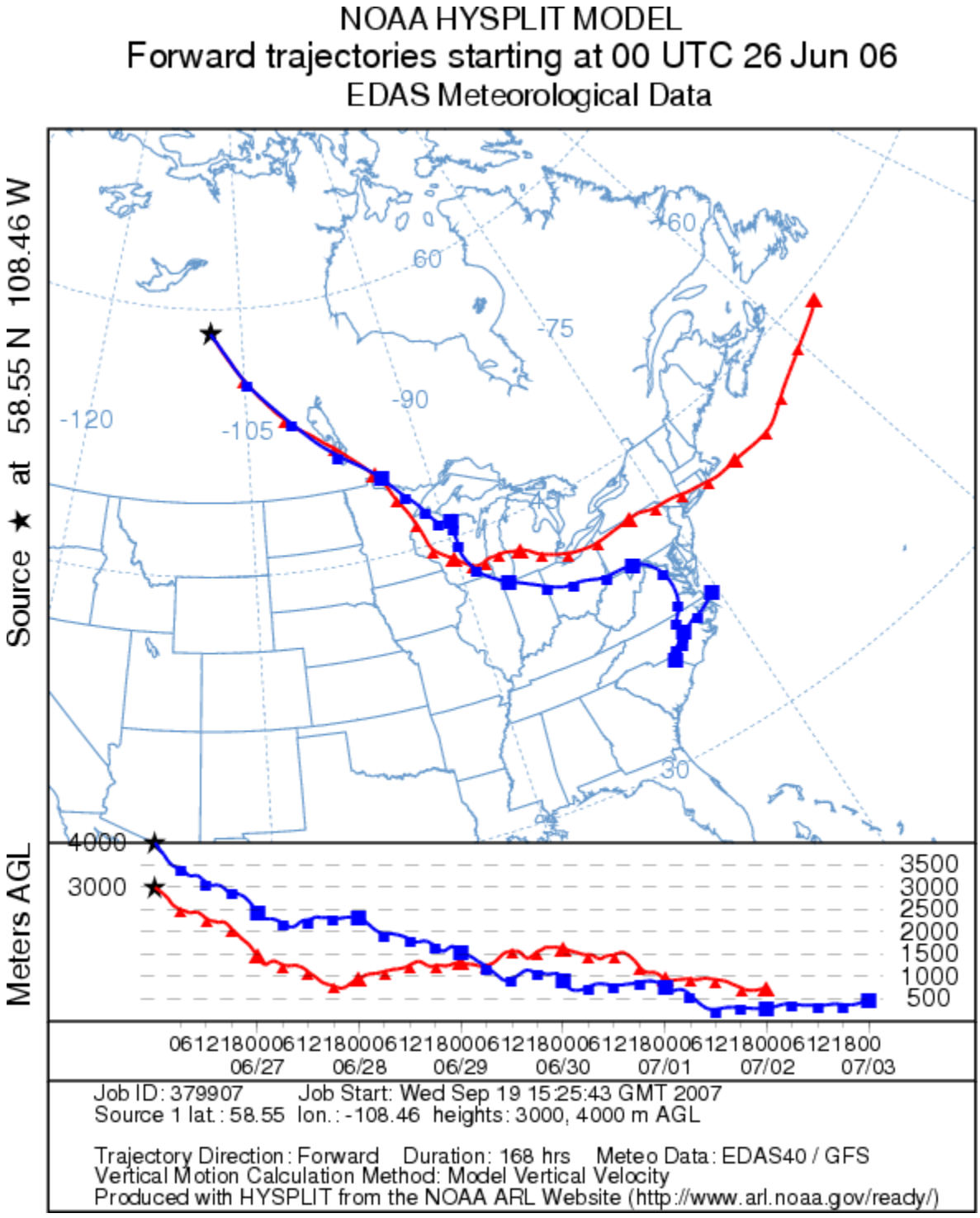


Figure 8.

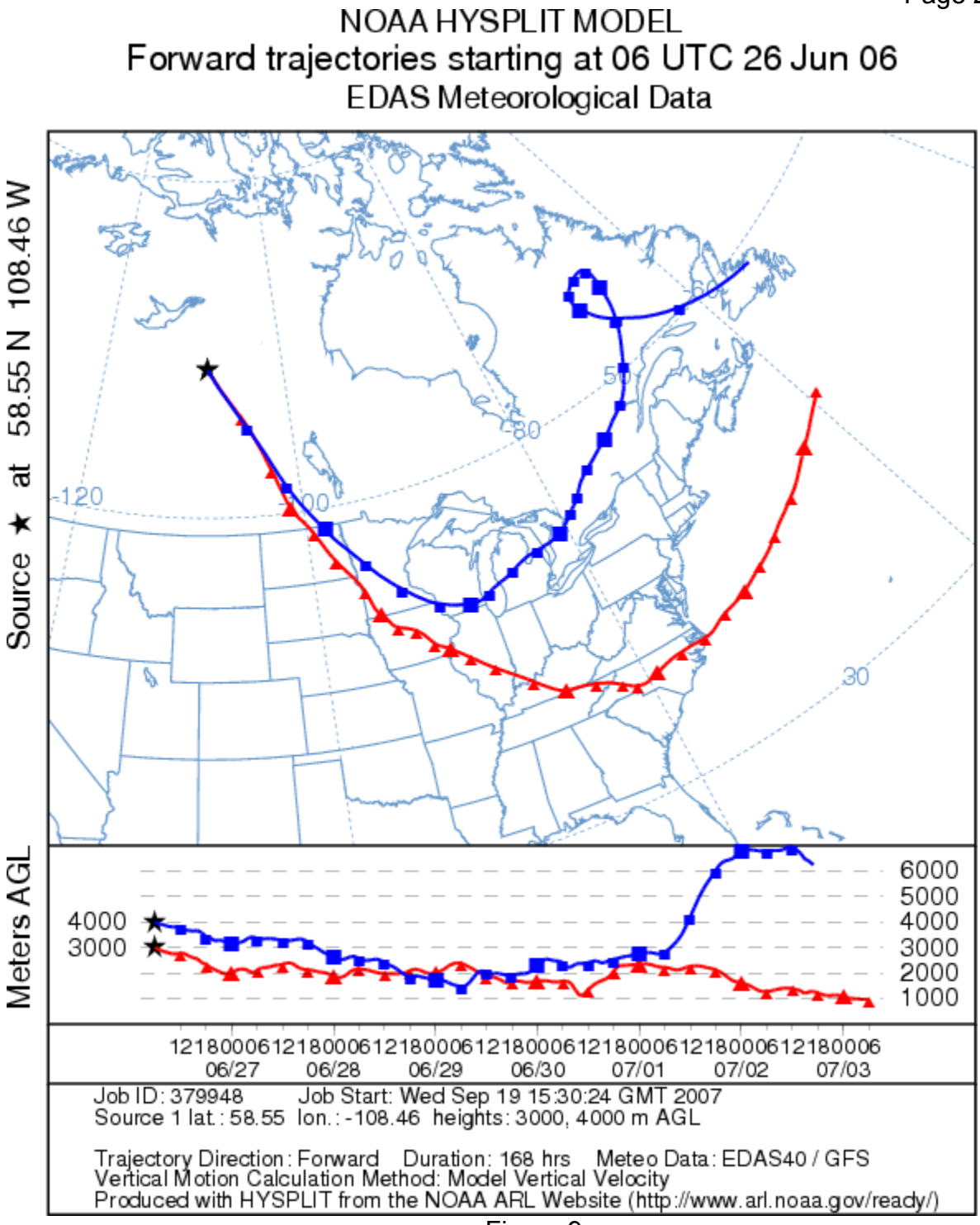
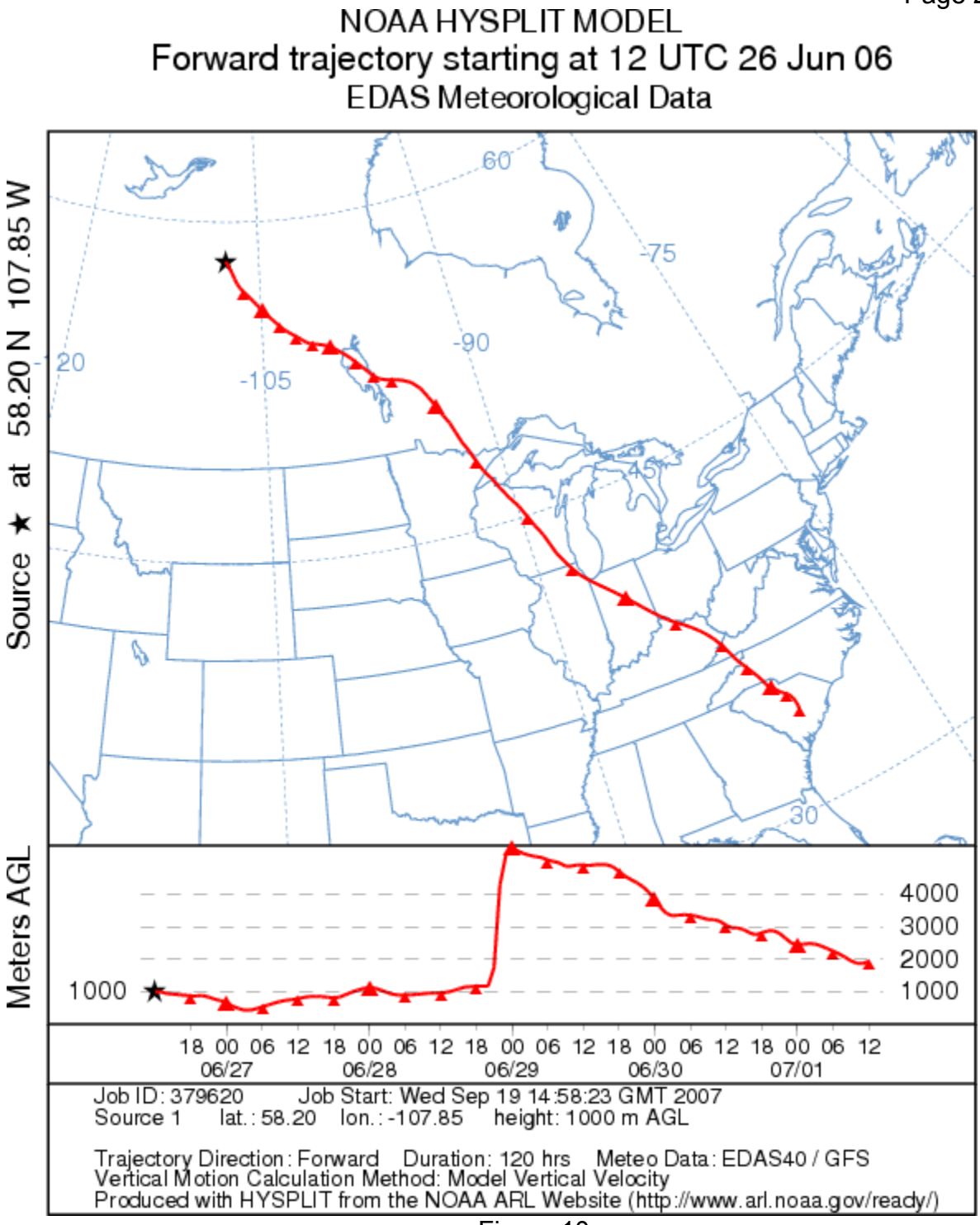

NOAA HYSPLIT MODEL
Forward trajectories starting at 06 UTC 26 Jun 06
EDAS Meteorological Data
Source ★ at 58.55 N 108.46 W
Meters AGL
6000
5000
4000
3000
2000
1000
4000
3000
06/27
06/28
06/29
06/30
07/01
07/02
07/03
Job ID: 379948 Job Start: Wed Sep 19 15:30:24 GMT 2007
Source 1 lat.: 58.55 lon.: -108.46 heights: 3000, 4000 m AGL
Trajectory Direction: Forward Duration: 168 hrs Meteo Data: EDAS40 / GFS
Vertical Motion Calculation Method: Model Vertical Velocity
Produced with HYSPLIT from the NOAA ARL Website (http://www.arl.noaa.gov/ready/)

Figure 9.


NOAA HYSPLIT MODEL
Forward trajectory starting at 12 UTC 26 Jun 06
EDAS Meteorological Data
Source ★ at 58.20 N 107.85 W
60
-75
-90
-105
20
45
30
Meters AGL
4000
3000
2000
1000
1000
18 00 06 12 18 00 06 12 18 00 06 12 18 00 06 12 18 00 06 12
06/27 06/28 06/29 06/30 07/01
Job ID: 379620 Job Start: Wed Sep 19 14:58:23 GMT 2007
Source 1 lat.: 58.20 lon.: -107.85 height: 1000 m AGL
Trajectory Direction: Forward Duration: 120 hrs Meteo Data: EDAS40 / GFS
Vertical Motion Calculation Method: Model Vertical Velocity
Produced with HYSPLIT from the NOAA ARL Website (http://www.arl.noaa.gov/ready/)
Figure 10.

Figures 11 and 12 below document the mixing height in Charlotte, NC on July 1, 2006. The mixing height was approximately 1500 to 1700 meters.

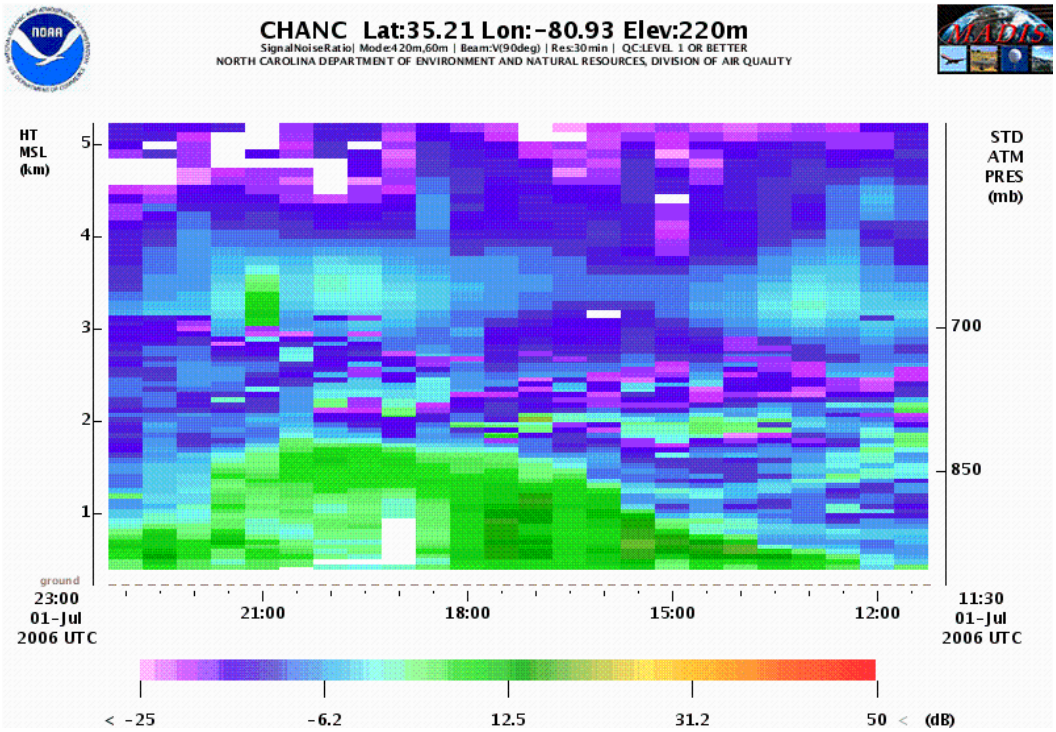


Figure 11.

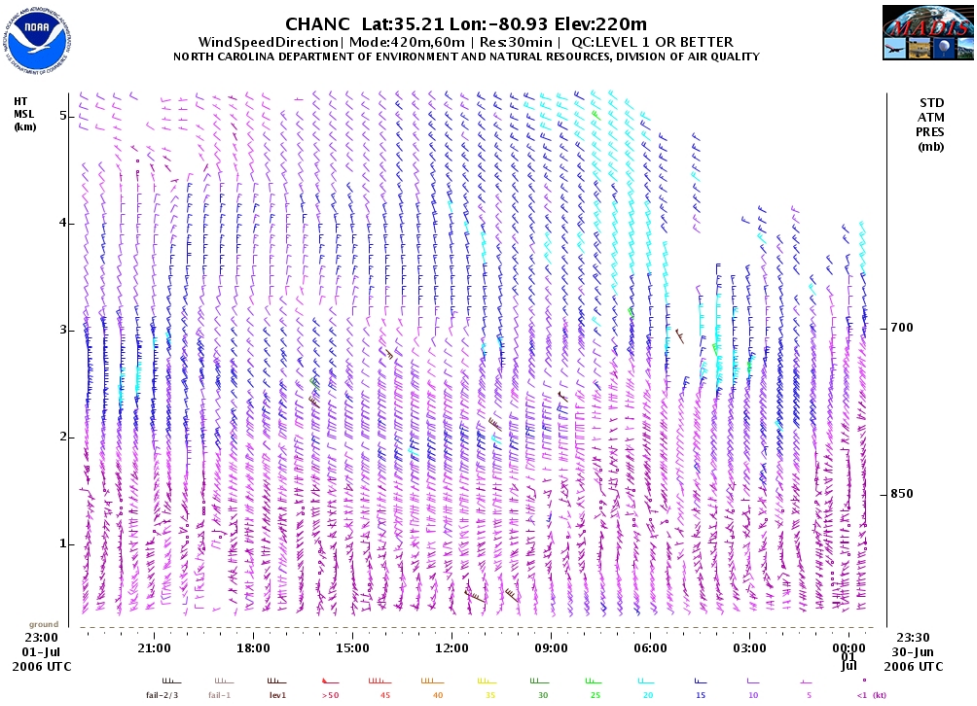


Figure 12.

8.0 Selected $PM_{2.5}$ Speciation Data

The following charts were compiled from data collected from the Speciation Trends Network site 37-119-0041:

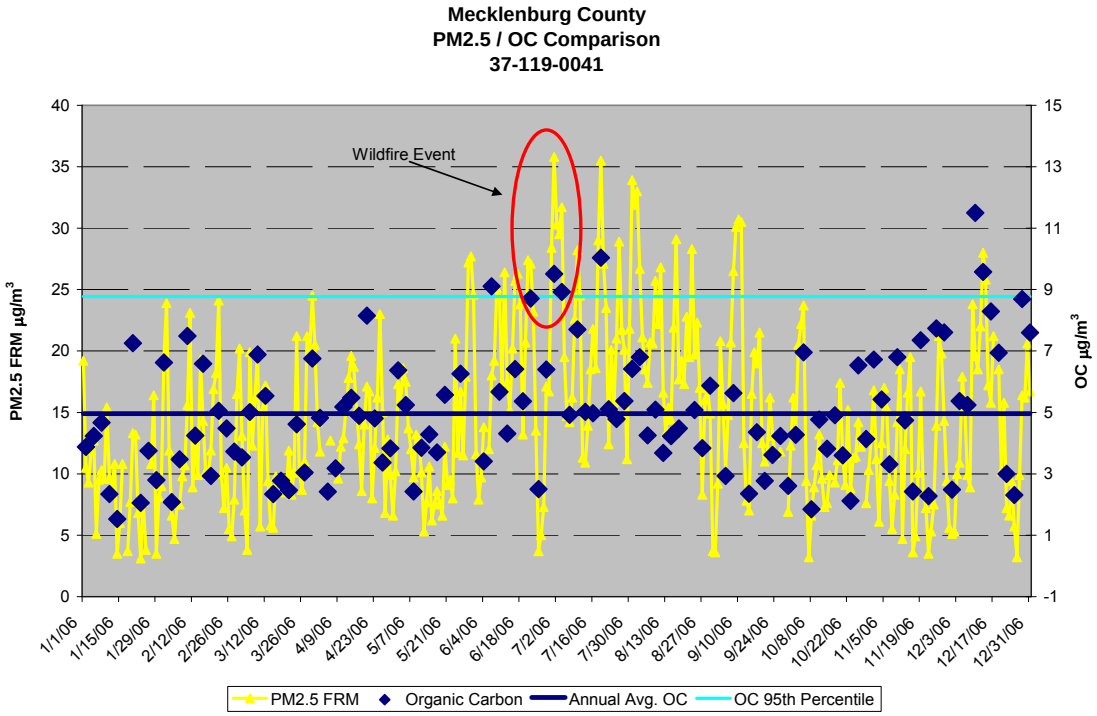


Figure 13. Organic Carbon Data

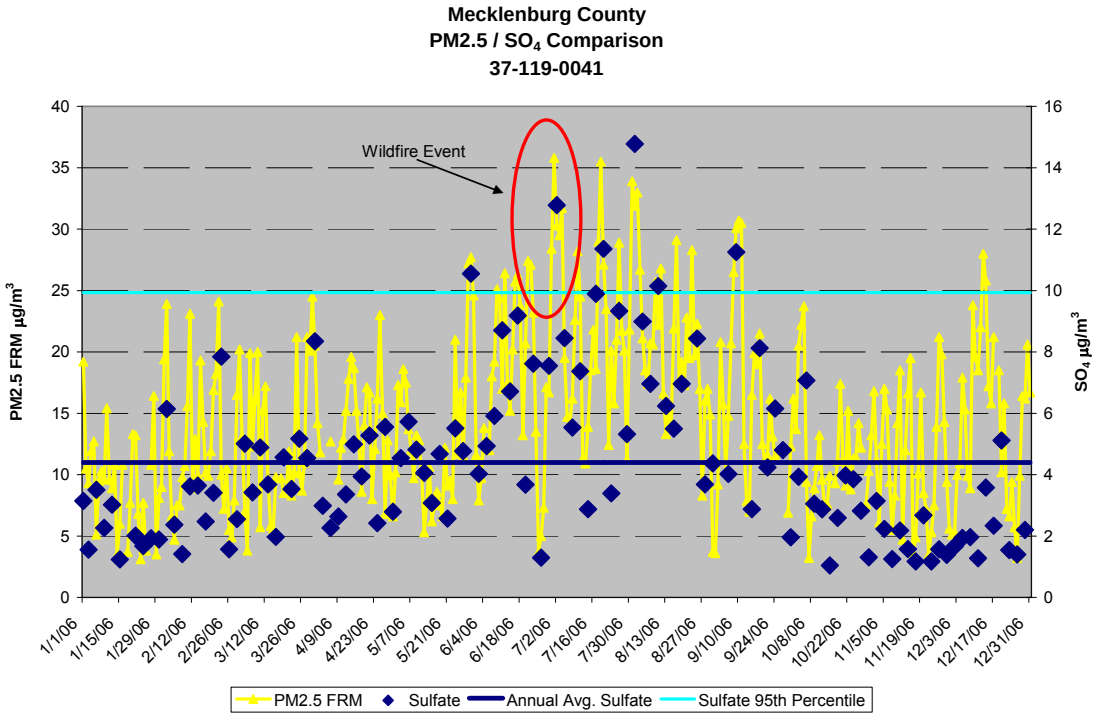


Figure 14. Sulfate Data

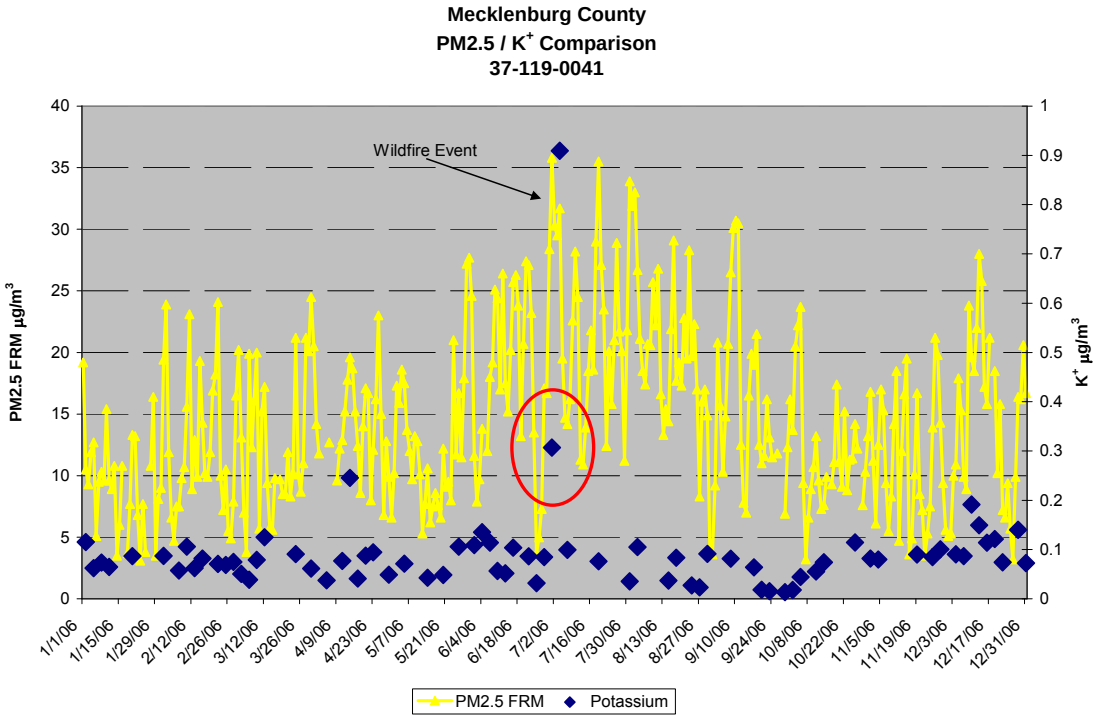


Figure 15.- Potassium Ion Measurements from STN. "Organic carbon is often highly correlated with water-soluble potassium suggesting smoke."

9.0 Continuous and FRM $PM_{2.5}$ Monitoring Data

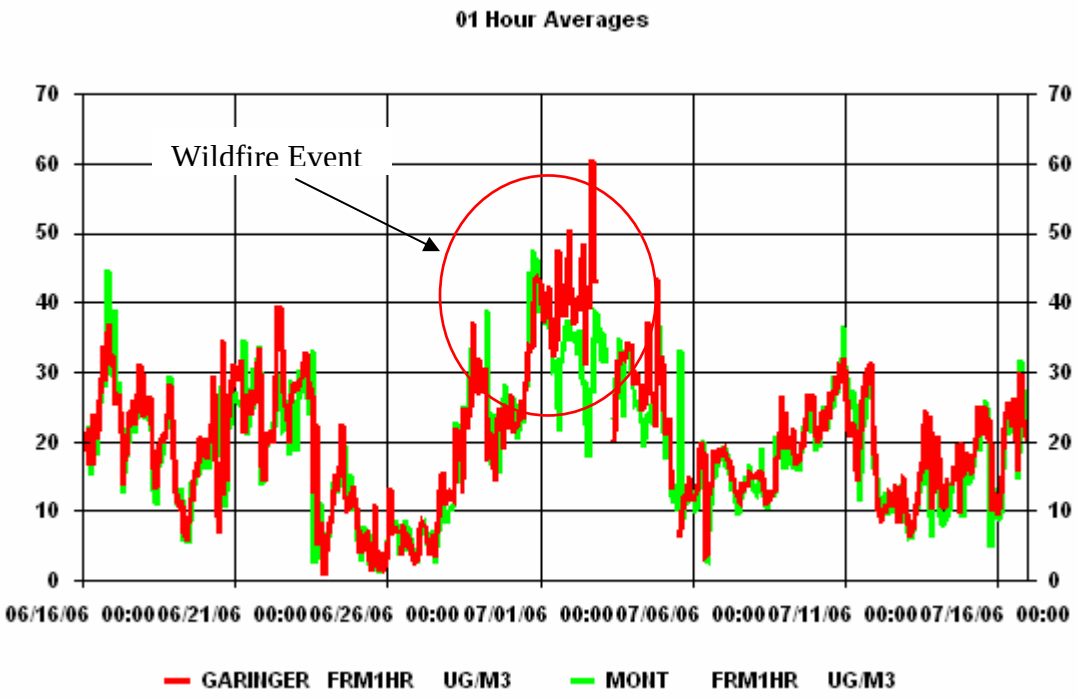


Figure 16. TEOM Data

Data displayed in the chart above was recorded at sites 37-119-0041 and 37-119-0042. The measurements were made using an R&P TEOM continuous PM2.5 instrument operating at 50ºC. Data from site 37-119-0041 stops on July 2, 2006 at 1900 because the sample filter loading exceeded the allowable limit. The instrument was restarted with a new filter on July 3, 2006 at 1000.

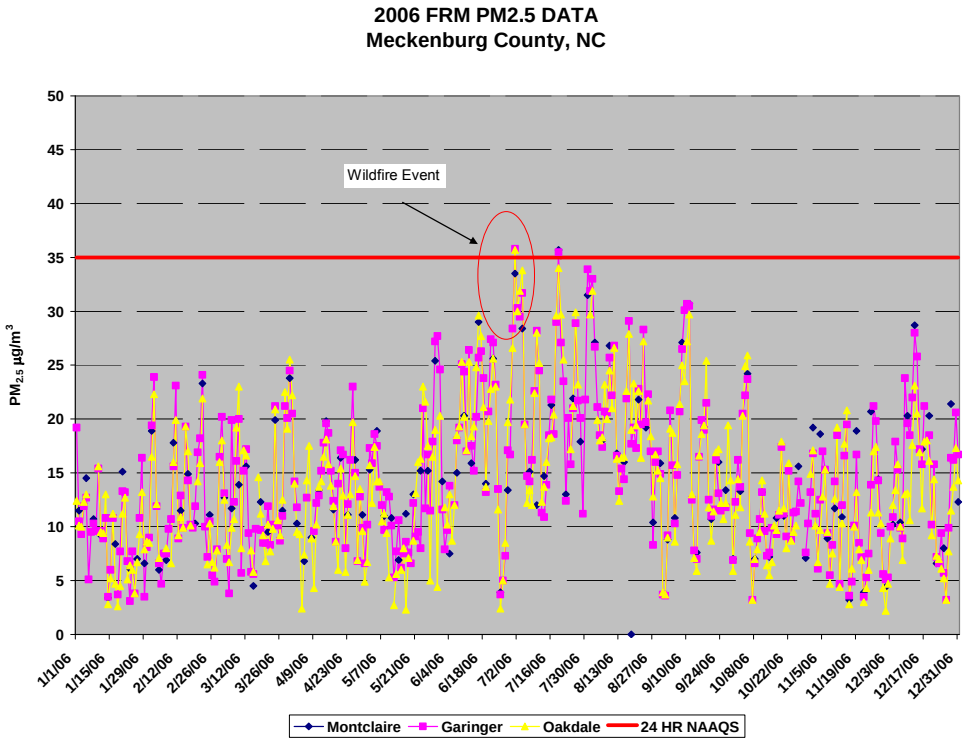


Figure 17. 2006 FRM $PM_{2.5}$ Data for Mecklenburg County

Data displayed in the chart above was recorded at sites 37-119-0041, 37-119-0042, and 37-119-0043.

10.0 Comparison to Typical Data

Below is the box and whisker plot for PM2.5 data measured at all sites operating in Mecklenburg County during the summer months from 2003 to 2005:

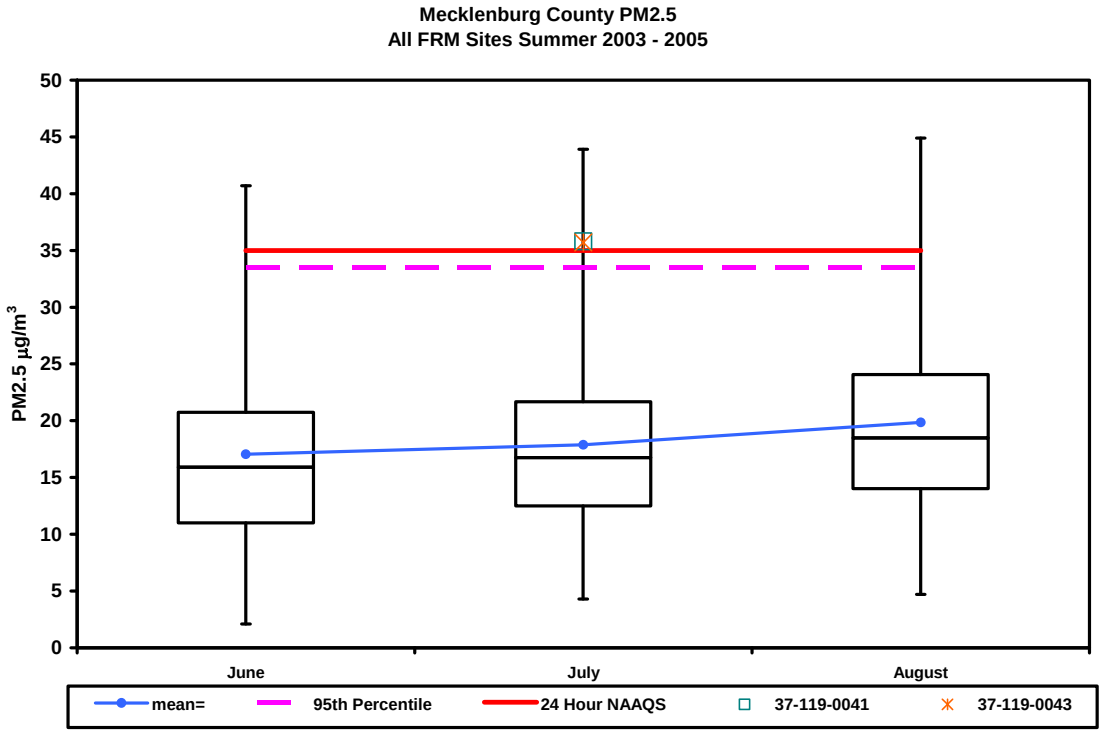


Figure 18.

Since the data being analyzed was measured on July 1st, the summer months were chosen for the analysis rather than the 3rd calendar quarter. Historically, the highest concentrations recorded in the MCAQ network have been measured in June, July, and August.

The data from July 1, 2006 is plotted for both 37-119-0041 (teal box) and 37-119-0043 (orange ×). The values are 35.8 µg/m^3 and 35.7 µg/m^3, respectively. The 95th percentile for the summer season is 33.5 µg/m^3. The 24-hour NAAQS is 35 µg/m^3.

	June	July	August
n	202	202	202
# Values > 95th %	11	7	14
# Values > NAAQS	8	4	13

Table 2.

During the 3 year summer period listed above, 32 of 606 measurements are greater than the 95th percentile and 4% of the measurements (25/606) are greater than the NAAQS.

The seasonal evidence indicates data for the date of concern (July 1, 2006) is greater than the 95th percentile at each site of concern (37-119-0041, 37-119-0043). The data is also well above the 75th percentile:

	37-119-0041	37-119-0043
Data for July 1, 2006	35.8 μg/m^3	35.7 μg/m^3
95th Percentile (Seasonal)	33.5 μg/m^3	
75th Percentile (Seasonal)	22.2 μg/m^3	

Table 3.

For comparison, the annual data for all sites operating during the period 2003 – 2005 is displayed below:

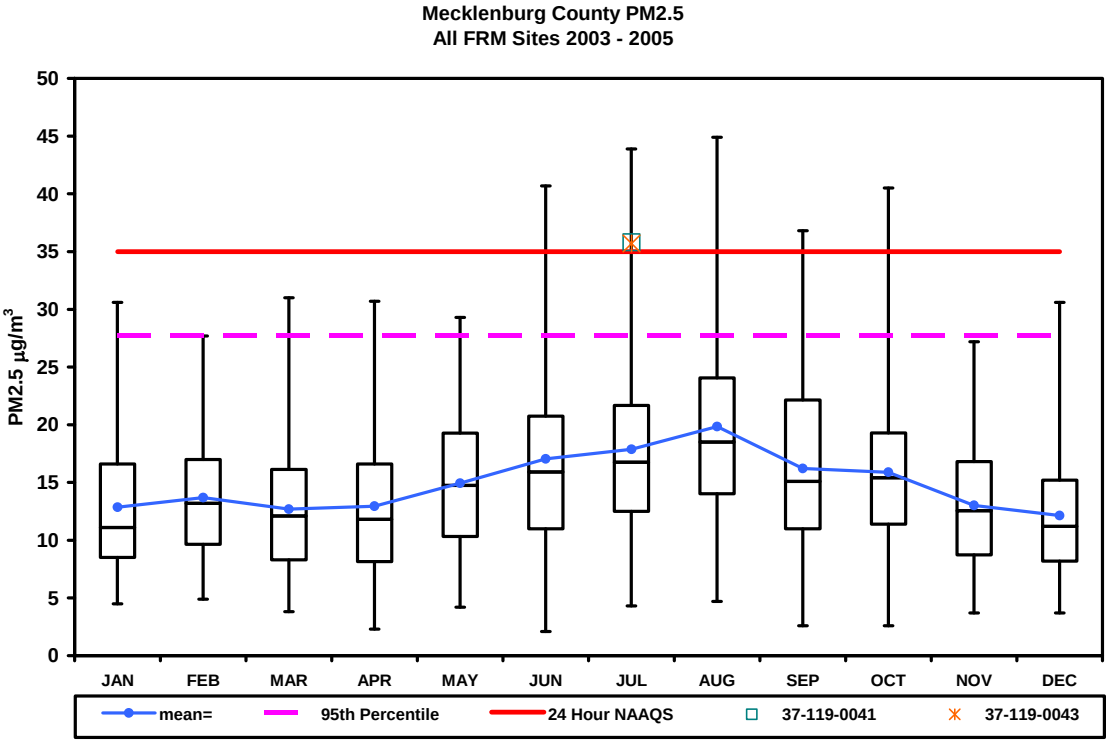


Figure 19.

During the 3 year period listed above 121 of 2396 measurements are greater than the 95th percentile (27.7 μg/m^3) and 1% of the measurements (30/2396) are greater than the NAAQS (35 μg/m^3).

Based on the qualifications of 40 CFR Part 50 § 50.14 (Federal Register / Vol. 72, No. 55 / Thursday, March 22, 2007 / Rules and Regulations Page-13569) and taking into consideration the evidence of the occurrence of the event, the event may be associated with an unusual measured concentration beyond typical fluctuations including background.

11.0 "But For" Analysis

The 13 fires examined as part of the documented event in the vicinity of Lake Athabasca, Saskatchewan, Canada are estimated (assuming 100% consumption) to have consumed 27.5 billion kilograms (30.4 million tons) of fuel materials. Using an emission factor from the "First Order Fire Effects Model" (FOFEM)[14] under normal conditions (9 grams per kilogram) yields estimated total $PM_{2.5}$ emissions of 245 million kilograms (270,000 tons) within a 95 day period (total fire period). If an even distribution of material is assumed for the purposes of estimation; an estimated 72,089,668 kg (79,436 tons) of $PM_{2.5}$ was emitted in the 28 days prior to the measurement date (July 1, 2006).

The National Environmental Satellite, Data, and Information Service (NESDIS) documents the path of the smoke plume across the continent. The NESDIS data on June 20, 2006 state:

"…The cluster of fires surrounding Lake Athabasca in northern Saskatchewan continue to produce vast amounts of dense smoke that are affecting northeast Alberta, as well as moving southeast across Saskatchewan and into central Manitoba. Several fires in northern Manitoba are producing locally dense plumes of smoke that are moving southeast..."

Notices on the NESDIS continue through the date of interest on July 1, 2006:

" … Visible imagery shows a very large mass of haze across nearly the entire eastern third of the country as well as the south central region covering the middle and lower Mississippi Valley as well as the central and southern Plains. Recent trajectory information shows that it is likely that smoke primarily from the Canadian fires and possibly also to a lesser extent from the recent western US fires is contributing to the hazy appearance noted on satellite imagery across this entire region, though it is certainly difficult to determine a smoke concentration in these areas since the smoke has been around for such a long time mixing with other pollutants present in the region."

Modeled forward trajectories (Figures 8 – 10.) from the wildfire area in the days preceding July 1st indicate trajectories that intersect the monitoring area in Mecklenburg County, NC. Mixing height in Charlotte, NC is estimated to have been 1700 meters on July 1, 2006. Modeled forward trajectories starting at 00z on June 26, 2006 from a height of 4000 meters place the projected air parcel below the 1700 m mixing height on July 1, 2006. Modeled forward trajectories starting at 06z on June 26, 2006 from a height of 3000 meters place the projected air parcel just at or below the 1700 m mixing height on July 1, 2006. Modeled forward trajectories starting at 12z on June 26, 2006 from a height of 1000 meters place the projected air parcel just above the 1700 m mixing height on July 1, 2006; however, mixing height measured in Greensboro, NC (approximately 90 miles NE of Charlotte) indicated a slightly higher afternoon mixing height on July 1st of 2032 m. This places the 1000 m trajectory just at the mixing height. The modeled trajectories may

indicate the potential for smoke to become mixed into the lower atmosphere where it may have impacted measurements made at breathing height (2 m).

Information compiled in this analysis indicates the organic carbon (OC) fraction of the STN sample collected on July 1, 2006 at site 37-119-0041 contained 9.5 $\mu g/m^3$ of organic carbon (See Figure 13.) The average concentration of organic carbon measured at 37-119-0041 from 2003 - 2006 during the summer months was 5.1 $\mu g/m^3$. OC levels were 4.4 $\mu g/m^3$ above the summer average on the date of the event. Elevated organic carbon concentrations may be associated with wood smoke emissions[10].

EPA has estimated that approximately 30% of primary carbon in $PM_{2.5}$ carbon emission aerosol is attributable to wildland fire sources[11]. Primary carbon in the total organic carbon speciation sample collected on July 1, 2006 at site 37-119-0041 was estimated using the minimum OC/EC ratio method. Primary carbon in the total organic carbon sample was estimated to be 3.9 $\mu g/m^3$. Thirty percent (30%) of the estimated primary carbon concentration yields an estimated 1.17 $\mu g/m^3$ of primary carbon attributable to wildland fire based on the emissions estimate.

The $PM_{2.5}$ concentrations (FRM) measured at the monitoring sites in Mecklenburg County were 35.8 $\mu g/m^3$ and 35.7 $\mu g/m^3$. A relatively small increase in organic carbon content (estimated to be at least 1.17 $\mu g/m^3$) due to the presence of wood smoke from wildland fires may have contributed to the total $PM_{2.5}$ measurements being in excess of the NAAQS.

Given:

1. Estimated $PM_{2.5}$ emissions from the described event were in excess of 72,089,668 kilograms (79,436 tons) leading up to the date under review.

2. The 75th and 95th percentile of summer $PM_{2.5}$ data for all sites operating in the MCAQ network from 2003 – 2005 was 22.2 $\mu g/m^3$ and 33.5 $\mu g/m^3$, respectively. The values measured on July 1, 2006 were greater than the 95th percentile (35.8 $\mu g/m^3$ and 35.7 $\mu g/m^3$.)

3. Modeled forward trajectories from the location of the described event intersect with the area where $PM_{2.5}$ was measured.

4. Elevated organic carbon concentrations (9.5 $\mu g/m^3$ versus the summer average of 5.1 $\mu g/m^3$); which may be associated with wildfire emissions (See Figure 15 - Potassium Ion Measurements from STN.), were measured at site 37-119-0041 on the date of the described event.

5. A multi-variable regression of seasonal (June to August) data for 2006 was performed using meteorological data obtained from Charlotte-Douglas International

Airport. Daily wind speed, wind direction, temperature, dew point, precipitation, and previous day precipitation data were plotted versus the FRM $PM_{2.5}$ data for each site.

The estimated 99% upper-bound of a normal approximation (using estimation of missing observations by covariance with 2006 seasonal data) for July 1, 2006 at site 37-119-0041 was 33.7 $\mu g/m^3$ (r^2 = 0.39) versus the measured value of 35.8 $\mu g/m^3$. Using seasonal data for 37-119-0041 for multiple years from 2003 – 2006 yields a 99% upper-bound of 35.5 $\mu g/m^3$ versus 35.8 $\mu g/m^3$; however, the r^2 for this regression is lower (r^2 = 0.29) than the r^2 for the single year analysis.

The estimated 99% upper-bound of a normal approximation for the data for July 1, 2006 at site 37-119-0043 was 33.7 $\mu g/m^3$ (r^2 = 0.42) versus the measured value of 35.7 $\mu g/m^3$. Only one year of $PM_{2.5}$ data is available for 37-119-0043, therefore a multi-year analysis at this site could not be performed.

Based on the 2006 seasonal estimations of missing observations by covariance, less than 1% of measured values would be expected to be greater than 33.7 $\mu g/m^3$ at these sites on July 1, 2006.

But for the contribution of $PM_{2.5}$ from this event, the $PM_{2.5}$ NAAQS may not have been exceeded on July 1, 2006 at sites 37-119-0041 and 37-119-0043.

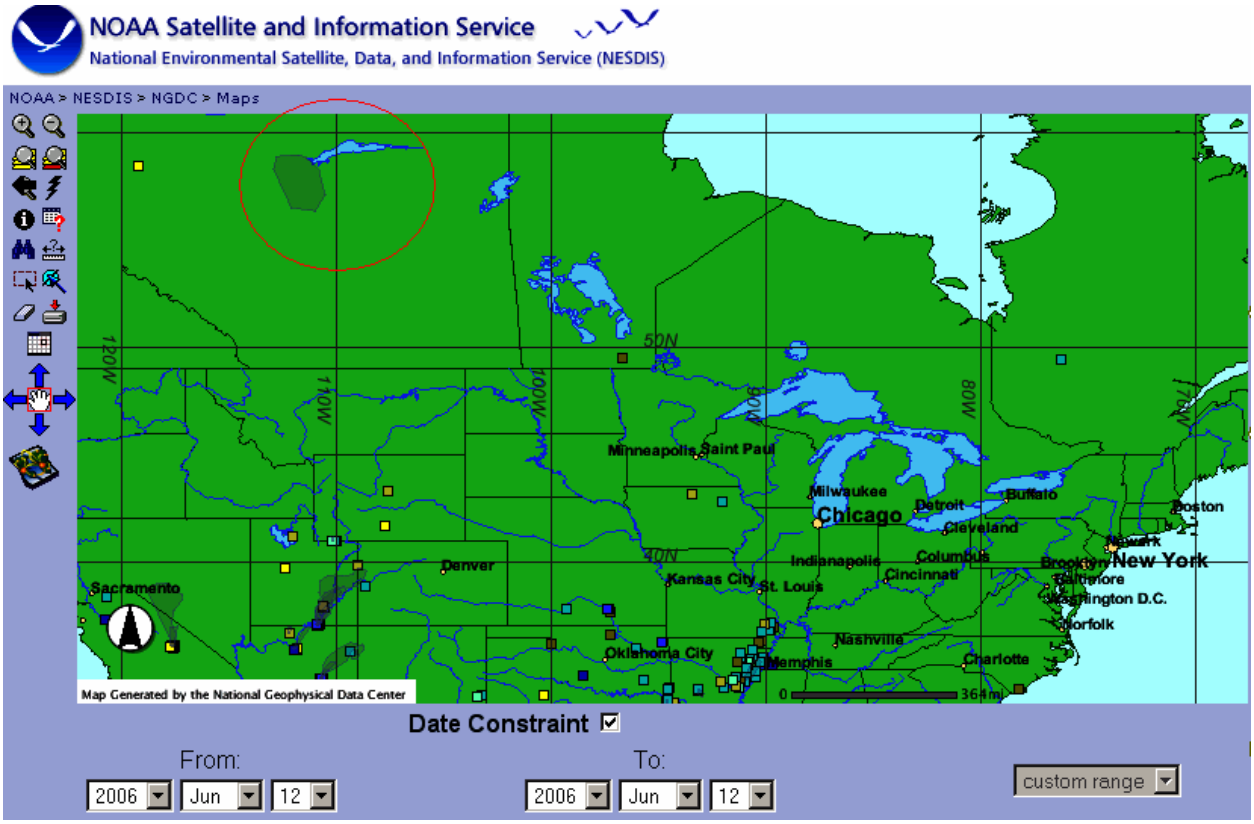
Appendix A

Reports beginning on June 12, 2006 are listed to provide background on the development of the event:

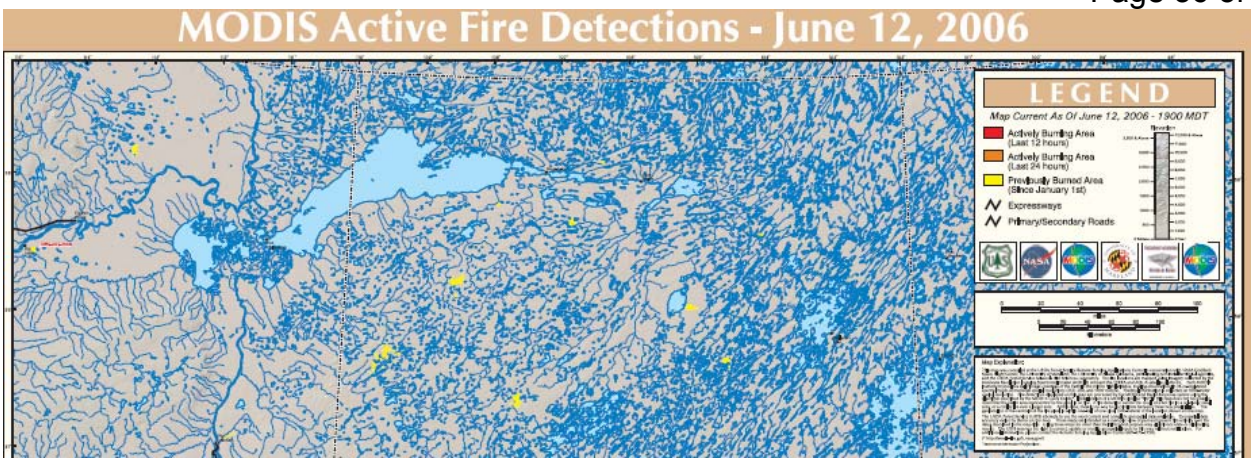
Monday, **June 12, 2006**

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1630Z **June 12, 2006.**

"...Canada:
A few fires over northeast Alberta and northwest Saskatchewan were producing active moderately dense smoke plumes south and west of Lake Athabasca..."



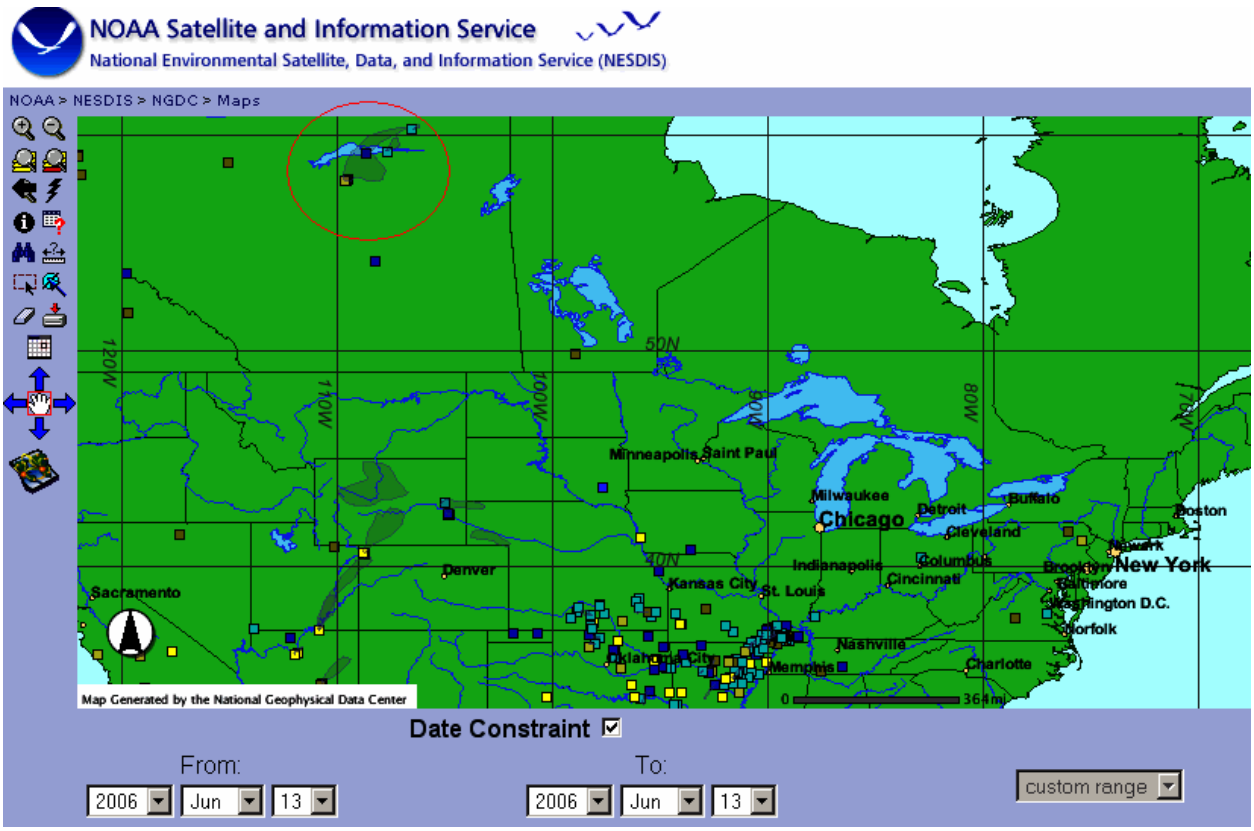
Mecklenburg County PM2.5 Measurements on June 12, 2006-
37-119-0041 $PM_{2.5}$: 26.4 µg/m^3 37-119-0043 $PM_{2.5}$: 25.3 µg/m^3



Fire Detections on MODIS on June 12, 2006.[2]

THROUGH 0000Z **June 13, 2006.**

"...Canada:
Earlier today a few fires over northeast Alberta and northwest Saskatchewan were producing moderate smoke plumes but the area is now too cloud covered to observe..."



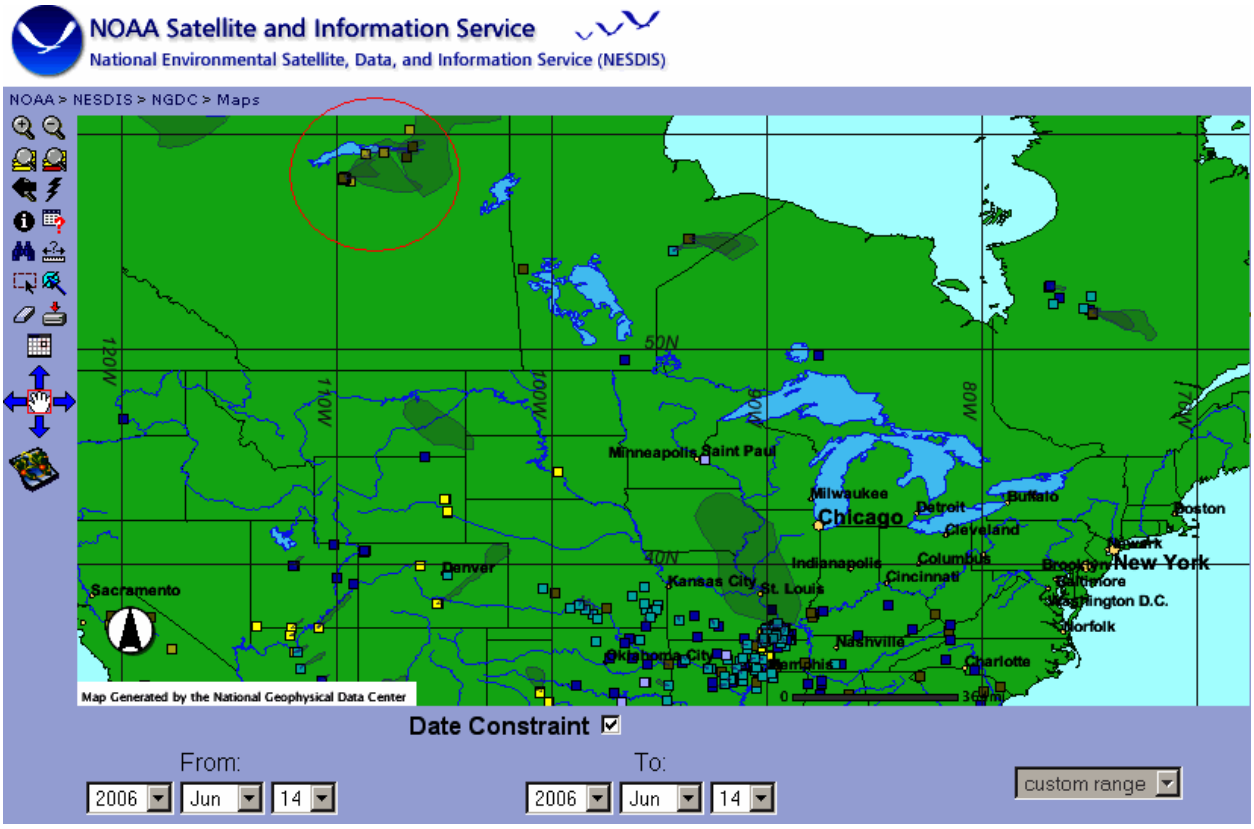
Mecklenburg County PM2.5 Measurements on June 13, 2006-
37-119-0041 $PM_{2.5}$: 17.5µg/m^3 37-119-0043 $PM_{2.5}$: 18.4 µg/m^3

THROUGH 1600Z **June 13, 2006.**

"...Canada:
A patch of moderately dense smoke from fire last evening is seen over Lake Athabasca and along the Saskatchewan/Northern Territory border..."

THROUGH 0200Z **June 14, 2006.**

"...Saskatchewan, Canada:
A large wild fire about 70 miles south of Lake Athabasca was producing a large and dense smoke plume that was fanning out between a north and easterly direction. The densest portion of the smoke plume was generally heading east and extended about 100 miles from it's point source..."



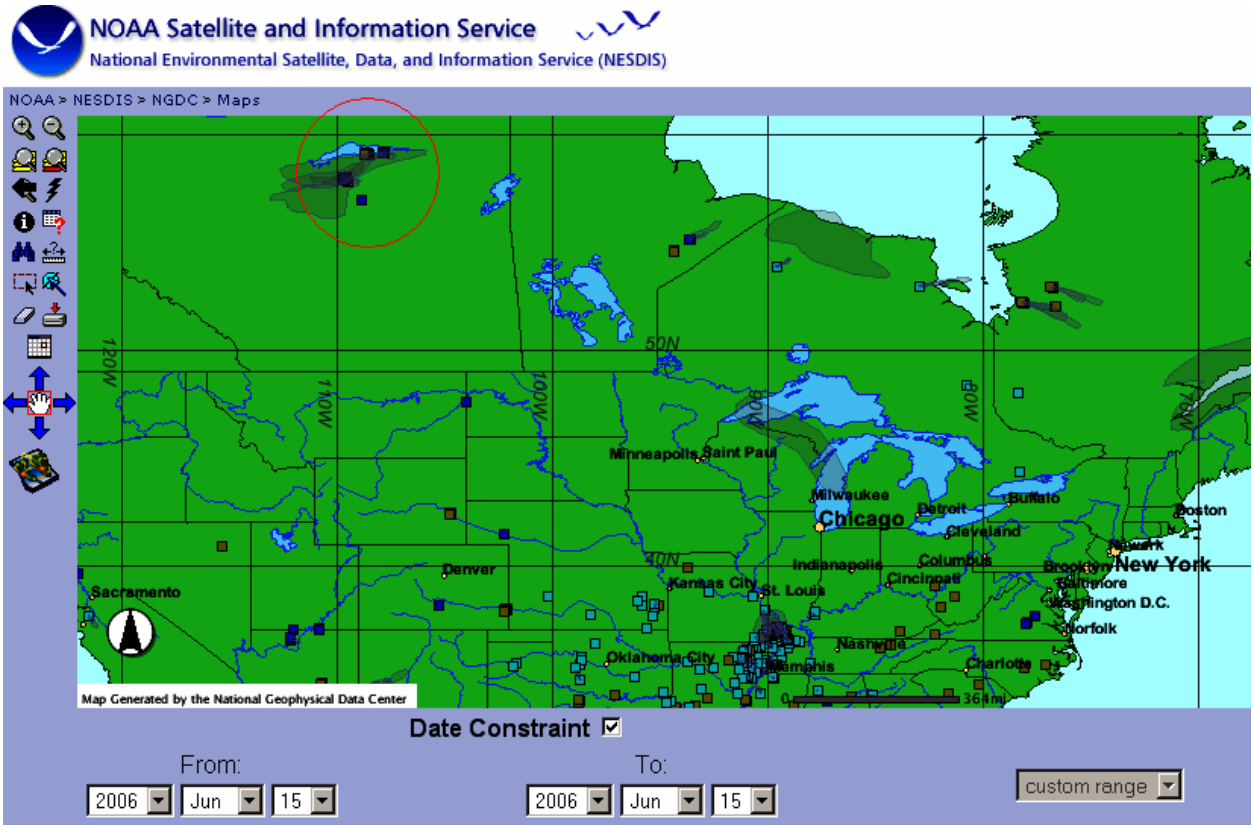
Mecklenburg County PM2.5 Measurements on June 14, 2006-
37-119-0041 $PM_{2.5}$: 15.2µg/m^3 37-119-0043 $PM_{2.5}$: 19.3 µg/m^3

THROUGH 1800Z **June 14, 2006.**

"...Saskatchewan, Canada:
A large area of moderately to at times locally dense smoke was observed over northern Saskatchewan near Lake Athabasca and over the southeast portions of the Northwest Territories. The smoke appeared to originate from a large wildfire south of Lake Athabasca last night..."

THROUGH 0232Z **June 15, 2006.**

"...Saskatchewan, Canada:
A large area of mostly dense smoke was observed over northern Saskatchewan near Lake Athabasca. The smoke originated from a large wildfire 70 miles south of Lake Athabasca and also from smaller but still noteworthy fire activity along the southern shore of Lake Athabasca..."



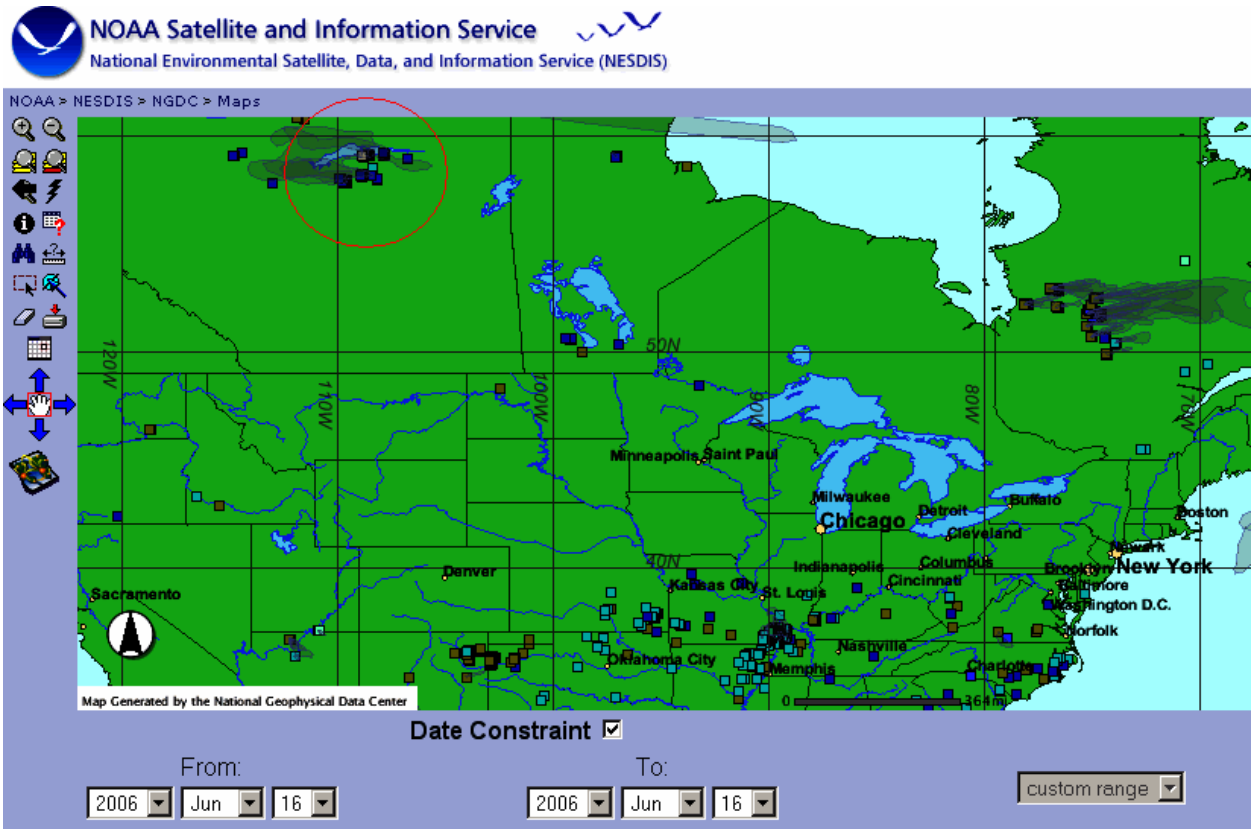
Mecklenburg County PM2.5 Measurements on June 15, 2006-
37-119-0041 $PM_{2.5}$: 20.2 µg/m^3 37-119-0043 $PM_{2.5}$: 24.8 µg/m^3

THROUGH 1915Z **June 15, 2006.**

"...N Saskatchewan:
A large area of dense smoke can be seen in the middle levels of the atmosphere below high level cirrus. The smoke is from a large fire burning south of Lk Athabasca. The smoke appears to be directly under the High Pressure as the entire plume appears to be rotating anticyclonicly with a narrow extension N of the fire turning from N to NE..."

THROUGH 0115Z **June 16, 2006.**

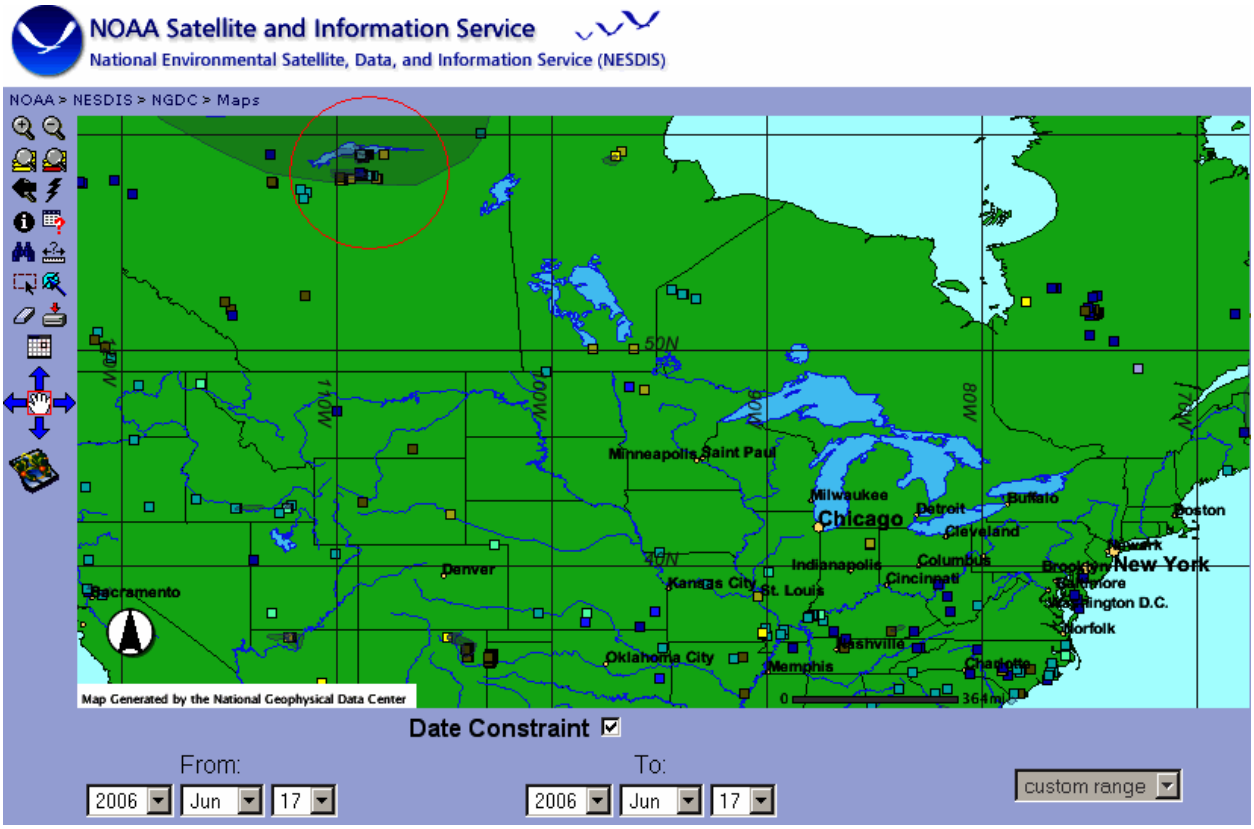
"...Saskatchewan:
Pyrocumulonimbus are developing over the fire about 100-125km South of Lake Athabasca, this is in response to a rapid intensification of the fire in the last hour. Otherwise a thinner plume of smoke (with moderate density) from earlier burning of this and two fires along the S shore of Lake Athabasca have being circling over Northern Alberta and Saskatchewan under the influence of a high pressure area that has been getting the squeeze (W to E) between a strong Low over S Alberta and a strong W/NW arctic jet..."



Mecklenburg County PM2.5 Measurements on June 16, 2006-
37-119-0041 $PM_{2.5}$: 25.7 µg/m^3 37-119-0043 $PM_{2.5}$: 29.6 µg/m^3

THROUGH 1530Z **June 17, 2006**.

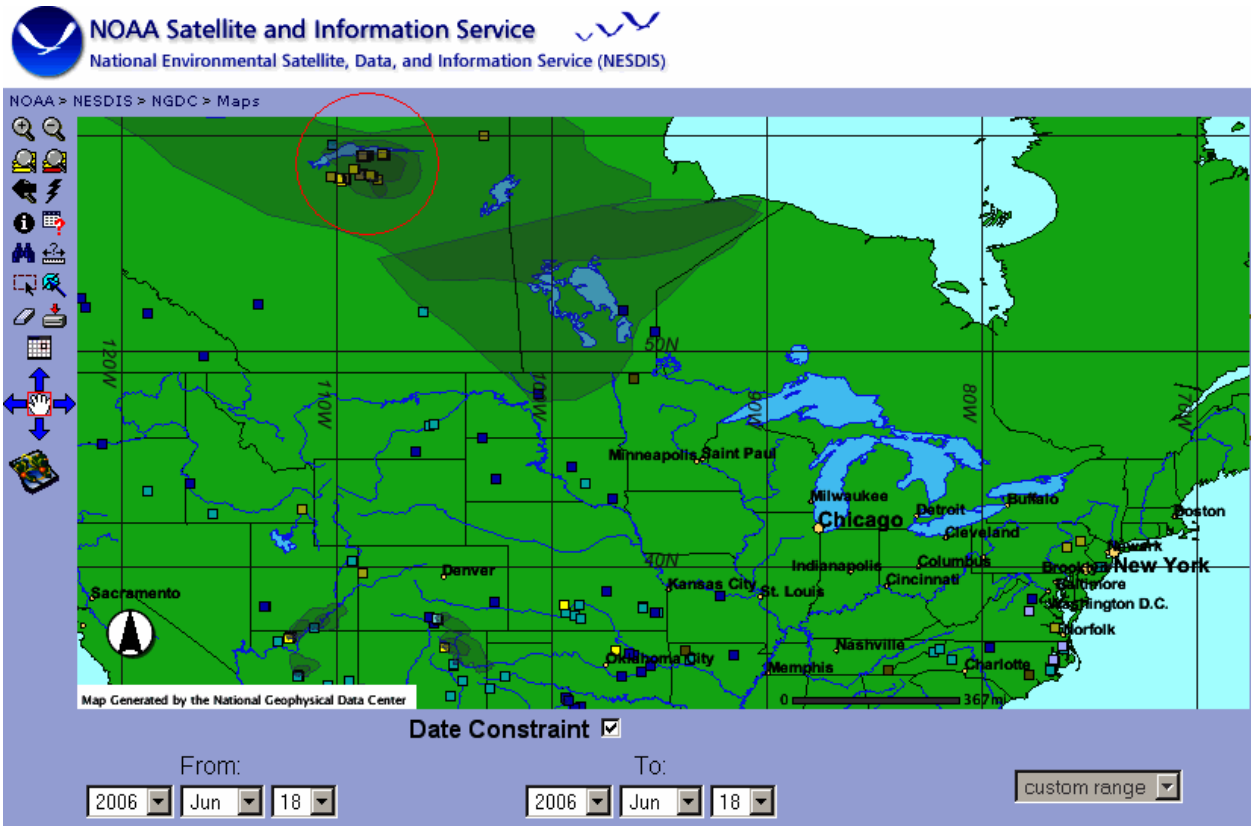
"...Canada:
A broad area of smoke could be seen from the eastern Beaufort Sea north of Tuktut Nogait National Park south across Big Bear Lake and then southeast across Great Slave Lake to Northern Alberta and norrthwestern (sic) Saskatchewan and Lake Athabasca..."



Mecklenburg County PM2.5 Measurements on June 17, 2006-
37-119-0041 $PM_{2.5}$: 26.3 µg/m^3 37-119-0043 $PM_{2.5}$: 27.7 µg/m^3

THROUGH 0130Z **June 18, 2006.**

"...Western/Central Canada:
A thin line of smoke is stretching from the western Northwest Territories southeast to northern Saskatchewan and Alberta. The source of the southern edge smoke is coming from the numerous fires burning near and around Lake Athabasca in northwest Saskatchewan and northeast Alberta. The northern edge smoke source cannot be confirmed..."



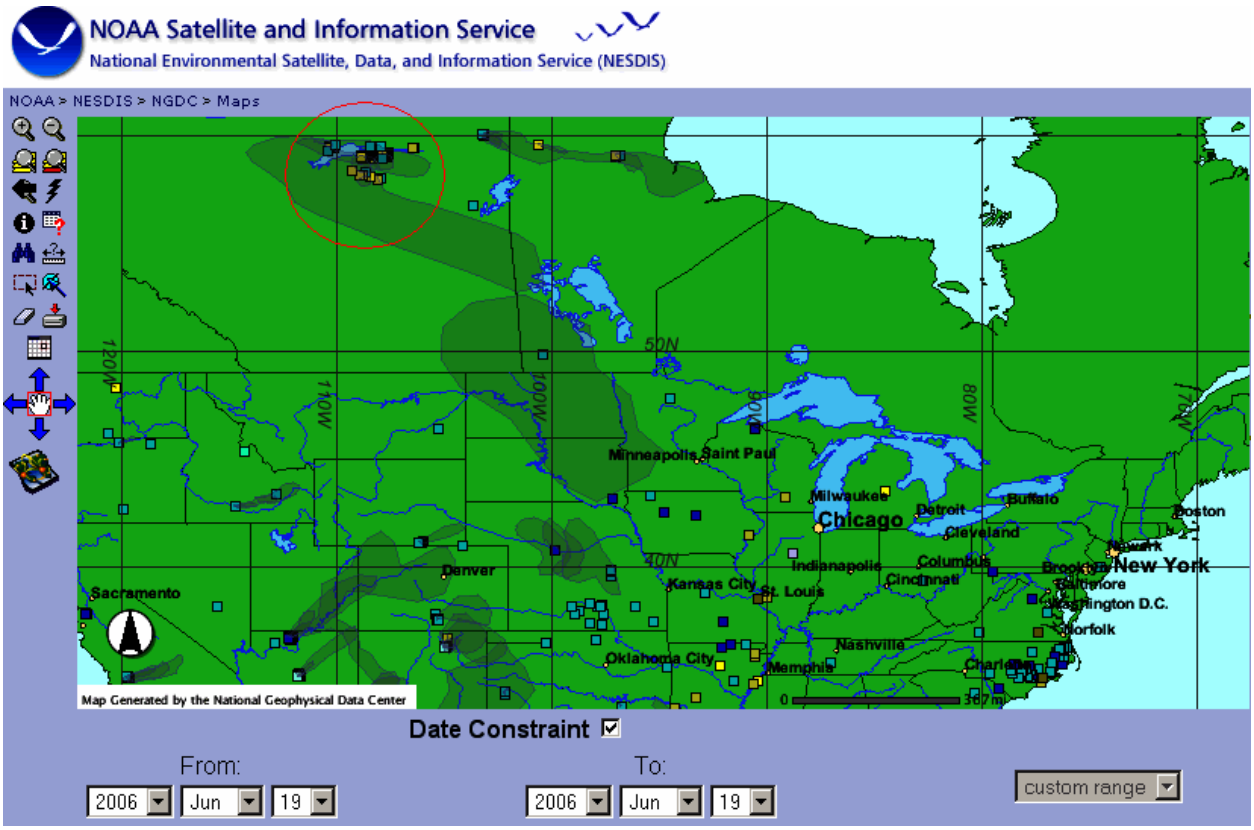
Mecklenburg County PM2.5 Measurements on June 18, 2006-
37-119-0041 $PM_{2.5}$: 23.8 µg/m^3 37-119-0043 $PM_{2.5}$: 21.1 µg/m^3

THROUGH 1400Z **June 18, 2006.**

"...Canada:
Early morning visible imagery showed a large swath of mostly thin smoke which stretched all the way from around Great Slave Lake of the Northwest Territories to central Manitoba Province just north of Lake Winnipeg. Clouds were also present along this axis which prevented additional smoke detection. Within the area of smoke, a relatively thicker and more moderately dense area of smoke was present over northeastern Alberta and northwestern Saskatchewan Provinces, just south of Lake Athabasca. The source of the smoke was believed to be the fires over northern Alberta and northern Saskatchewan Provinces as well as some possible contribution from recent fires over Alaska..."

THROUGH 0215Z **June 19, 2006.**

"...Canada:
A cluster of fires surrounding Lake Athabasca of norther Saskatchewan are producing a very dense area of smoke that seems to moving predominately to the southeast, but cloud cover limits the visibility..."



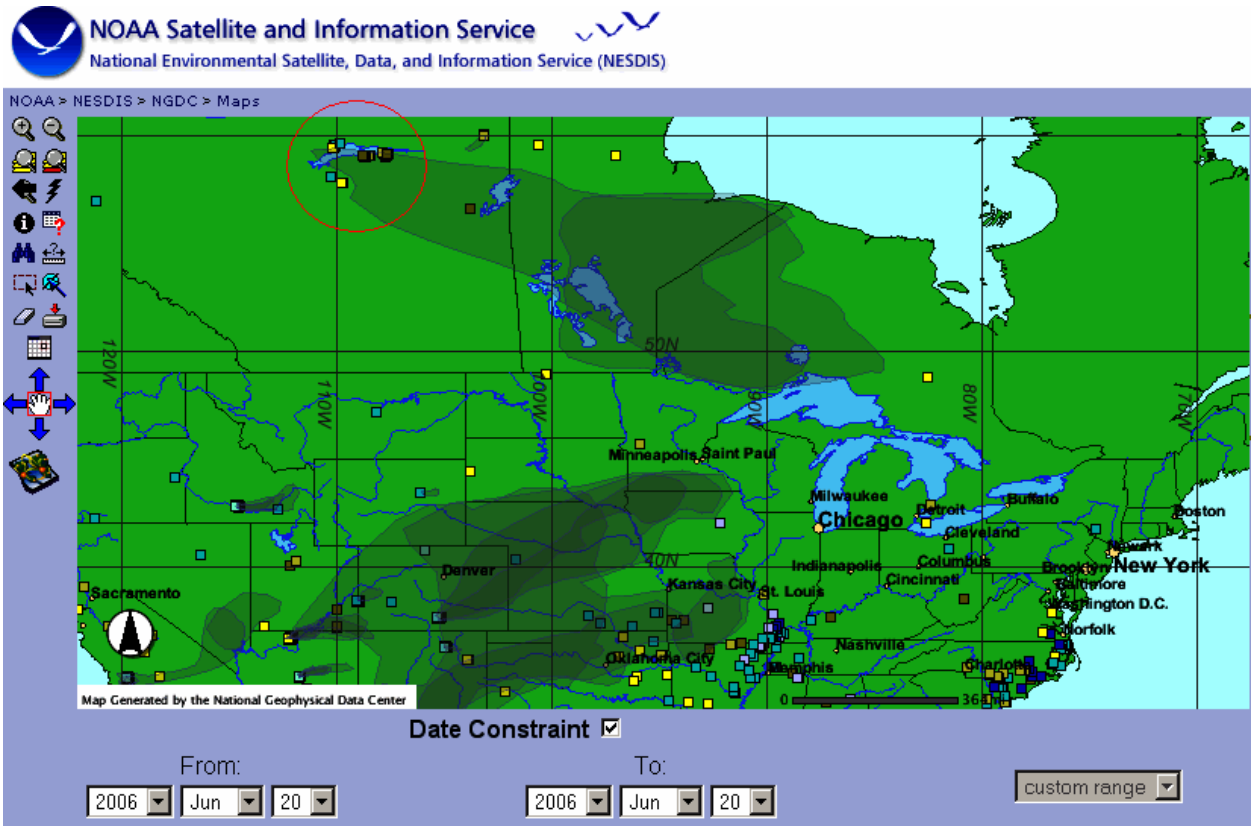
Mecklenburg County PM2.5 Measurements on June 19, 2006-
37-119-0041 $PM_{2.5}$: 13.2 µg/m^3 37-119-0043 $PM_{2.5}$: 13.7 µg/m^3

THROUGH 1600Z **June 19, 2006.**

"...Canada:
A cluster of fires surrounding Lake Athabasca in northern Saskatchewan that have been burning for many days have produced several patches of residual smoke that can be seen over areas of northern Saskatchewan and northern Manitoba and parts of the Northwest Territory between Great Bear Lake and Great Slave Lake. The areas reaches western Hudson Bay and northeast Manitoba..."

THROUGH 0215Z **June 20, 2006.**

"...Canada:
The cluster of fires surrounding Lake Athabasca in northern Saskatchewan continue to produce vast amounts of dense smoke that are affecting northeast Alberta, as well as moving southeast across Saskatchewan and into central Manitoba. Several fires in northern Manitoba are producing locally dense plumes of smoke that are moving southeast..."



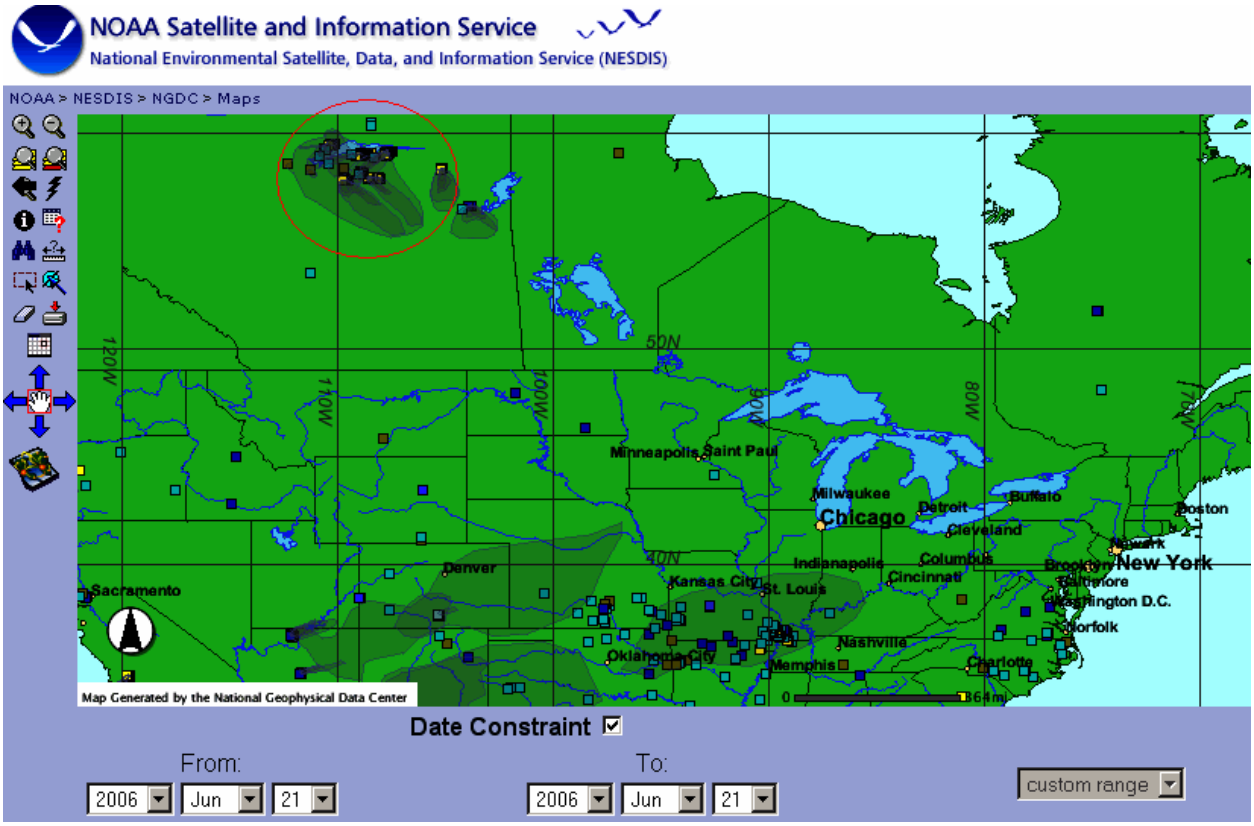
Mecklenburg County PM2.5 Measurements on June 20, 2006-
37-119-0041 $PM_{2.5}$: 20.7 µg/m^3 37-119-0043 $PM_{2.5}$: 19.8 µg/m^3

THROUGH 1700Z **June 20, 2006.**

"...Alaska/Canada:
A very long but relatively narrow swath of thin to moderately dense smoke extended from near Lake Athabasca close to the Alberta-Saskatchewan Province border southeastward almost to northern Minnesota and Lake Superior. This smoke was believed to have originated primarily from fires over northern Alberta and northern Saskatchewan Provinces in western Canada..."

THROUGH 1600Z **June 21, 2006.**

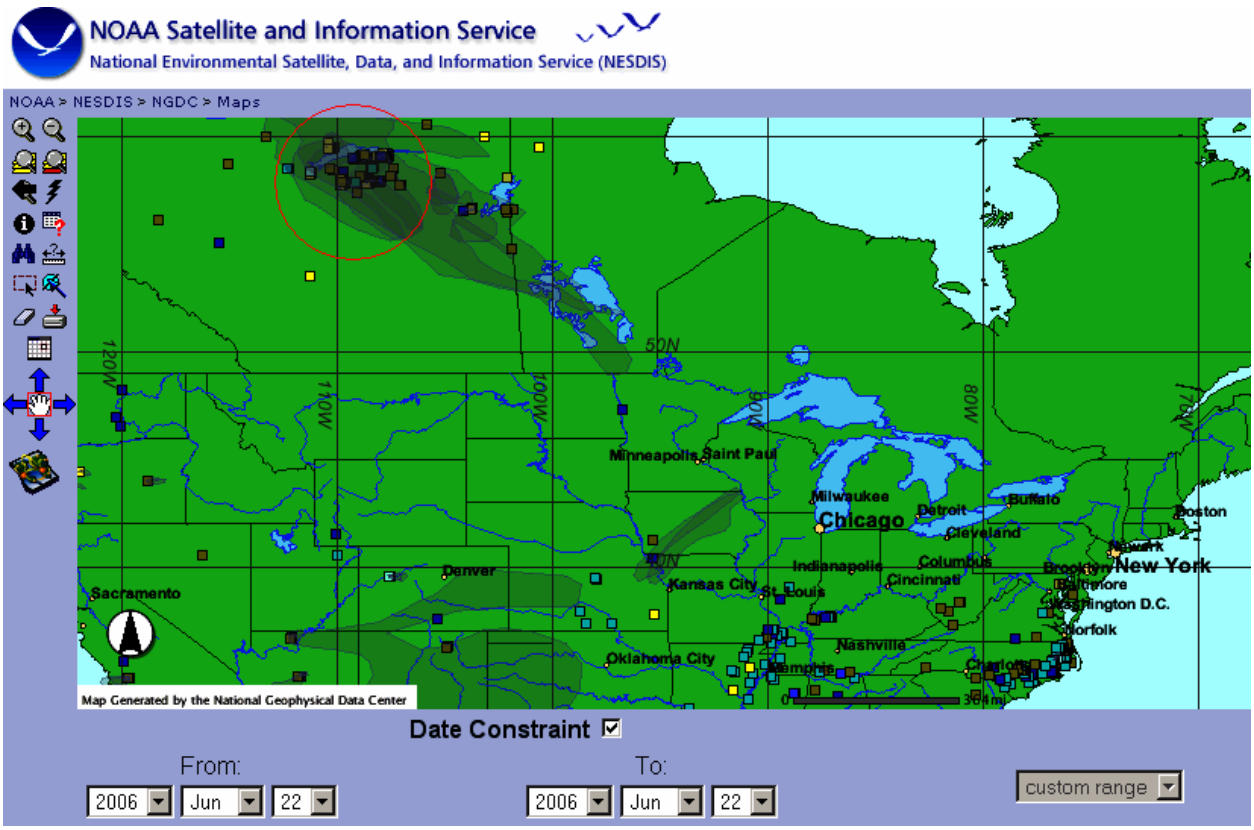
"...Canada:
An area of thin to moderate smoke is seen from northwest Saskatchewan across northern Alberta and into southwest Northwest Territory over Great Slave Lake. The smoke was generated from fires that have been burning around Lake Athabasca for several days..."



Mecklenburg County PM2.5 Measurements on June 21, 2006-
37-119-0041 $PM_{2.5}$: 27.4 $\mu g/m^3$ 37-119-0043 $PM_{2.5}$: 22.8 $\mu g/m^3$

THROUGH 0130Z **June 22, 2006.**

"...Canada:
Numerous fires around and southeast of Lake Athabasca resulted in a large number of moderately dense smoke plumes that were moving towards the south and southeast..."



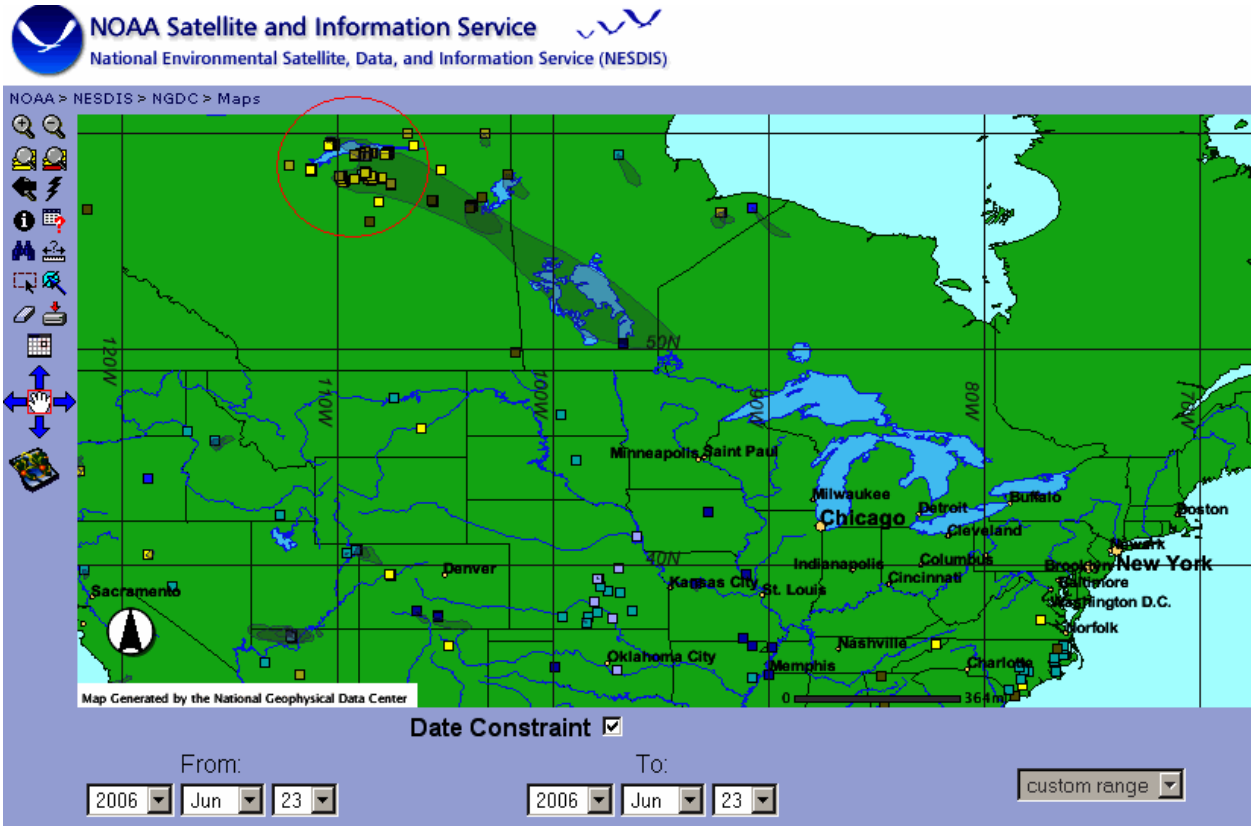
Mecklenburg County PM2.5 Measurements on June 22, 2006-
37-119-0041 $PM_{2.5}$: 27.1 µg/m^3 37-119-0043 $PM_{2.5}$: 25.6 µg/m^3

THROUGH 1530Z **June 22, 2006**.

"...In Canada a large pool of smoke can be seen in the area south of Lake Athabasca in northern Saskatchewan. Bands of smoke are moving away from this pool, northwest to Western Great Slave Lake and southeast across the Lac La Ronge region to just west of Lake Winnipeg in Central Manitoba..."

THROUGH 0130Z **June 23, 2006.**

"...Canada:
Numerous large fires around Lake Athabasca in northern Saskatchewan and notheast Alberta are producing a large area of moderately dense to locally very dense smoke near the source of the fires. The smoke extends from around Great Slave Lake in the southern Northwest Territory southeastward across northeast Alberta, much of northern Saskatchewan and into southwest Manitoba near Lake Winnipeg. The smoke reaches to the US border in northwest Minnesota..."



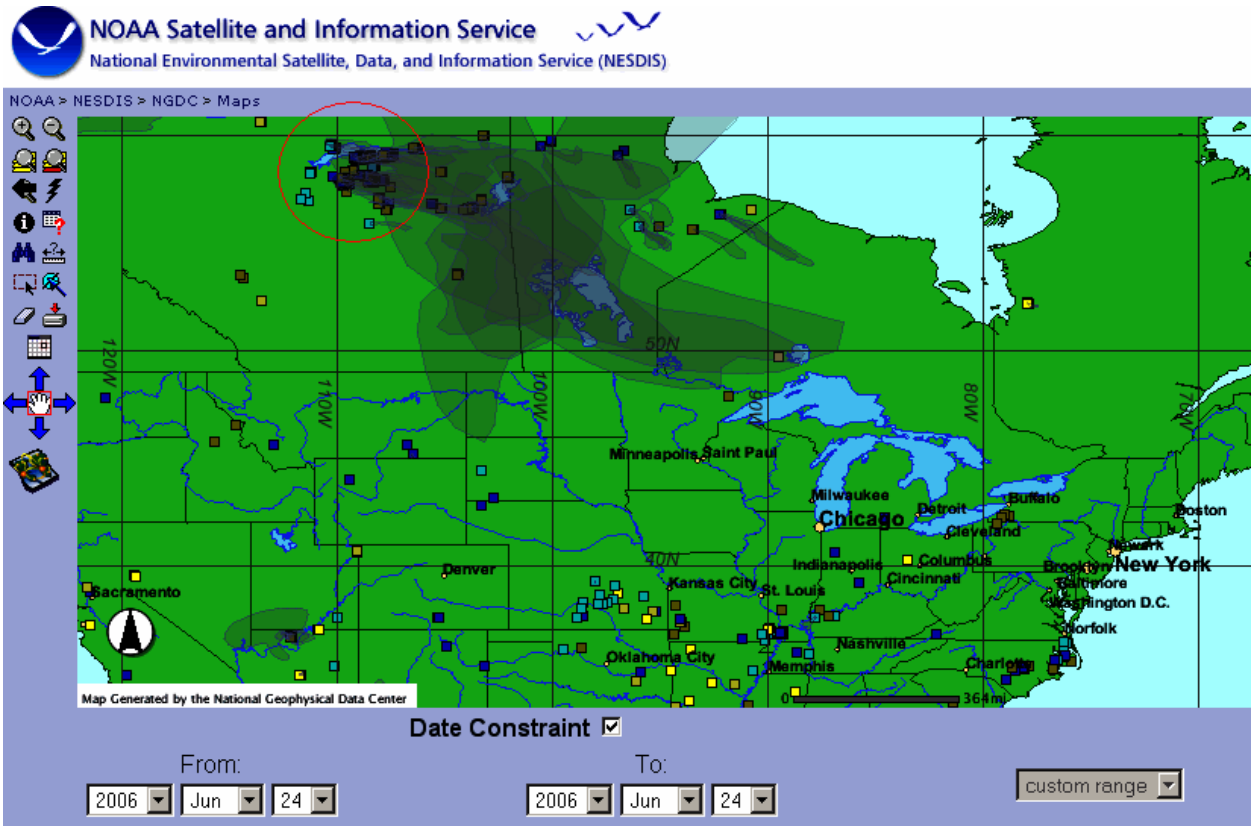
Mecklenburg County PM2.5 Measurements on June 23, 2006-
37-119-0041 $PM_{2.5}$: 23.2 µg/m^3 37-119-0043 $PM_{2.5}$: 23.0 µg/m^3

THROUGH 1600Z **June 23, 2006**.

"...Canada:
In Canada a large pool of smoke continues in the area south of Lake Athabasca in northern Saskatchewan. Bands of smoke are moving away from this pool, northwest to Eastern Great Slave Lake and southeast across the Lac La Ronge region to northern portions of Lake Winnipeg in Central Manitoba..."

THROUGH 0235Z **June 24, 2006.**

"...Canada:
The wildfires surrounding Lake Athabasca in northern Saskatchewan continue to produce massive amounts of dense smoke that are moving across most of Saskatchewan in a southeast direction. A large portion of this smoke is coming from a wildfire on the east-central border of Saskatchewan..."



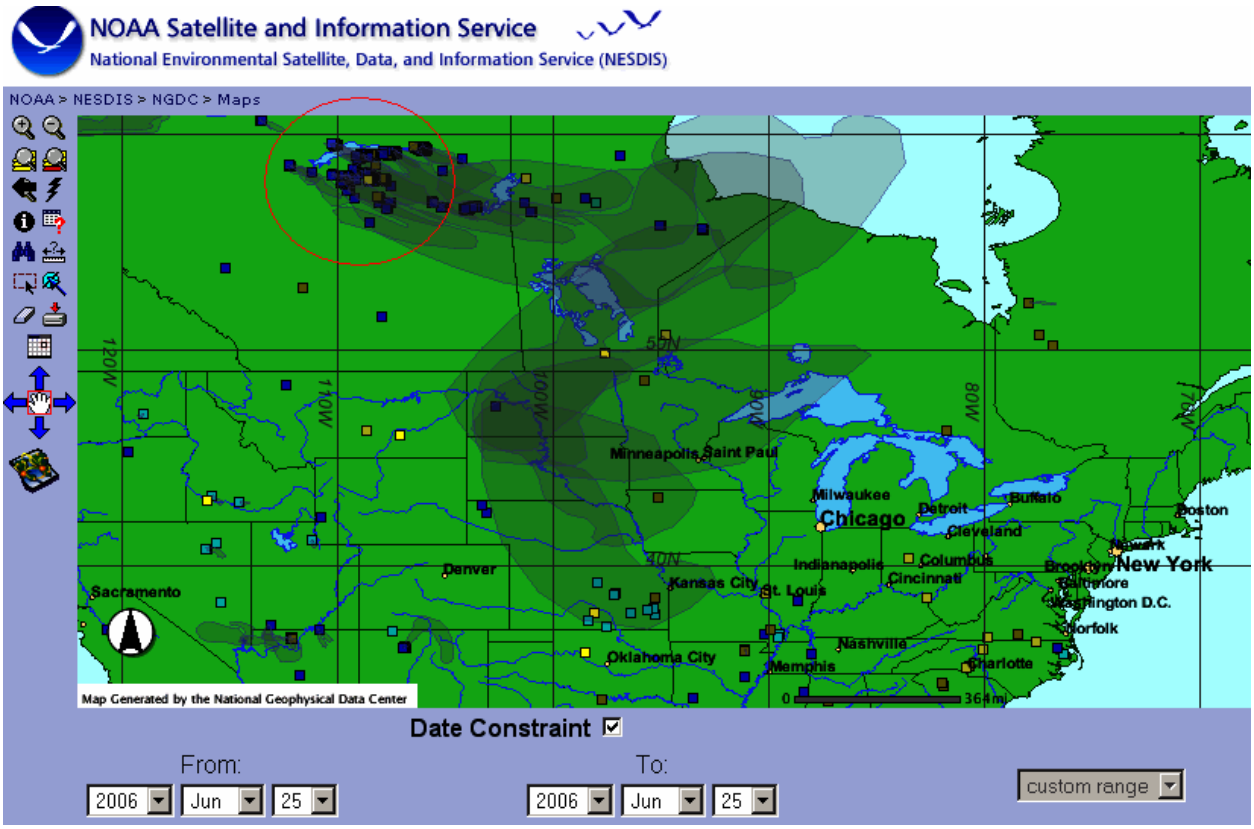
Mecklenburg County PM2.5 Measurements on June 24, 2006-
37-119-0041 $PM_{2.5}$: 13.5 µg/m^3 37-119-0043 $PM_{2.5}$: 11.6 µg/m^3

THROUGH 1600Z **June 24, 2006.**

"...Canada:
The fires continue south of Lake Athabasca in Northern Saskatchewan, however the large pool of thick smoke has shifted southeast to the Lac La Ronge region and area south of Reindeer Lake. The smoke then continues into South Central Manitoba over the Lake Winnipeg Region..."

THROUGH 0232Z **June 25, 2006.**

"...Canada:
A tremendous outbreak of wildfires continues this evening near Lake Athabasca in northern Saskatchewan and northeast Alberta. An extremely large and dense smoke plume was seen stretching from the fire activity over the southern Lake Athabasca region towards Reindeer Lake. The plume then oriented itself in a north/south orientation towards Lake Winnipeg/Lake Winnipegosis and further extending towards the United States/Canadian border..."



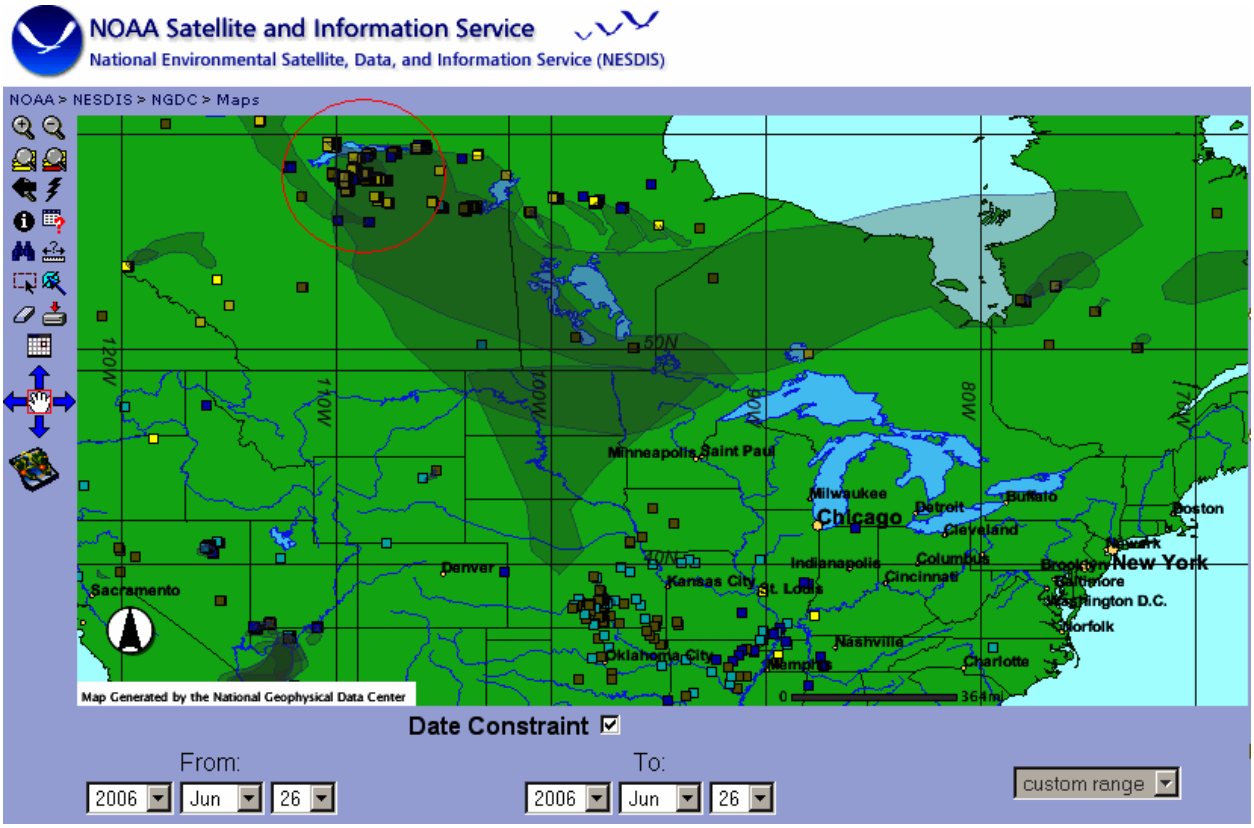
Mecklenburg County PM2.5 Measurements on June 25, 2006-
37-119-0041 $PM_{2.5}$: 3.7 µg/m^3 37-119-0043 $PM_{2.5}$: 2.4 µg/m^3

THROUGH 1600Z **June 25, 2006.**

"...South central Canada and north central U.S.:
The numerous and persistent fires near (and just south of) Lake Athabasca in northern Saskatchewan and northeastern Alberta continue to produce a very large area of moderate to thick smoke. The smoke moves toward the east southeast and then moves southward. Currently the densest smoke is in northern Saskatchewan, almost all of Manitoba, North Dakota, western Minnesota, South Dakota, eastern Nebraska, and western Iowa..."

THROUGH 0232Z **June 26, 2006.**

"...South central Canada and north central U.S.: The numerous and persistent fires near (and just south of) Lake Athabasca in northern Saskatchewan and northeastern Alberta continue to produce a very large area of moderate to dense smoke that is generally drifting towards the southeast. The smoke plume covers most of northern Saskatchewan, Manitoba, the western third of Ontario and Hudson Bay. The plume also covered a good portion of the north central United States from North Dakota/Minnesota south to Kansas and Missouri..."



Mecklenburg County PM2.5 Measurements on June 26, 2006-
37-119-0041 $PM_{2.5}$: 5.0 µg/m^3 37-119-0043 $PM_{2.5}$: 5.0 µg/m^3

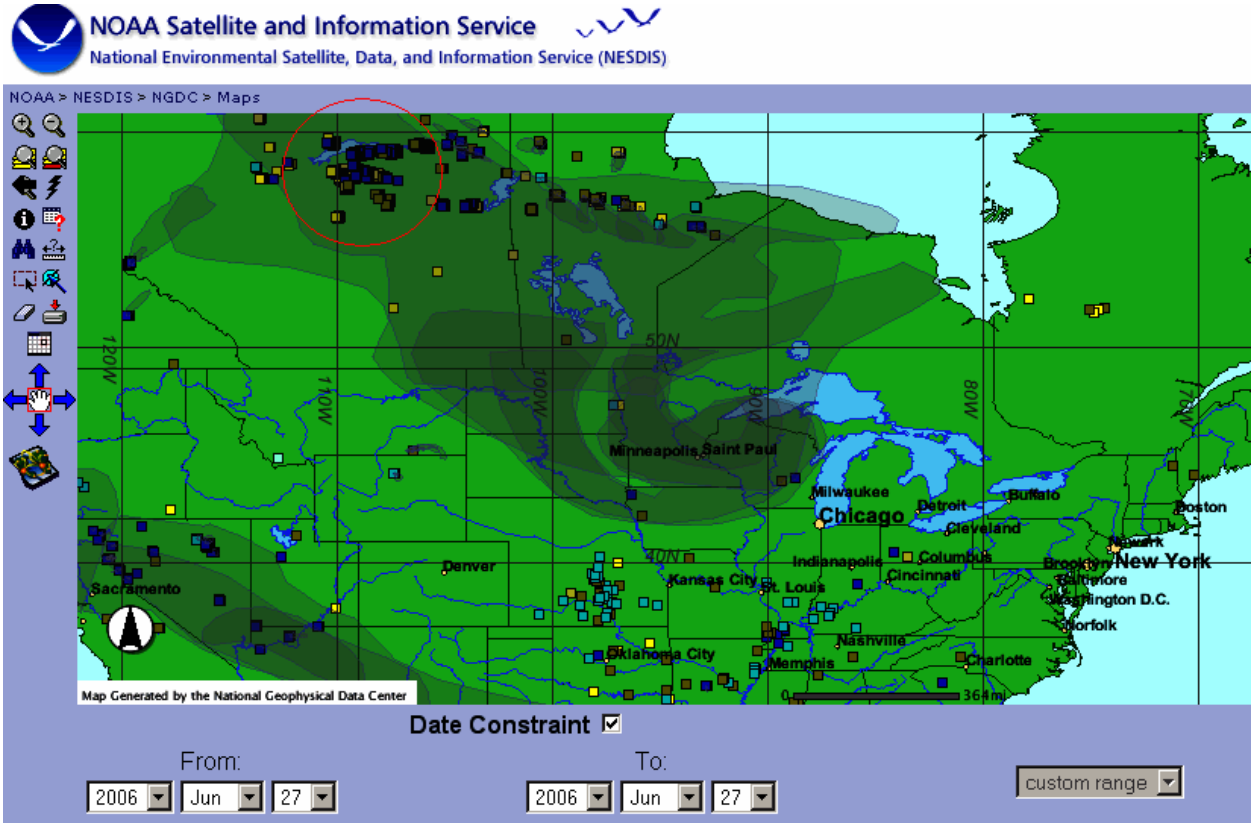
THROUGH 1600Z **June 26, 2006.**

"...Central Canada:
Numerous and persistent fires around Lake Athabasca in northern Saskatchewan and northeastern Alberta continue to produce a very large area of moderate to mainly very dense smoke that is generally moving towards the southeast. The most smoke is being produced this morning from a large fire on the northeast shore of the lake. The smoke plume extends from Lake Athabasca across central Saskatchewan (crossing the southwest tip of Reindeer Lake) into most of southern Manitoba, covering
all of Lake Winnipeg, and into western Ontario..."

THROUGH 0100Z **June 27, 2006.**

"...Canada:
There are numerous fires around Lake Athabasca and Reindeer Lake and they are producing a moderately dense to locally very dense area of smoke. The smoke is moving south across the whole of Saskatchewan and also covers sourthern (sic) Manitoba, North Dakota and northwest Minnesota. Numerous new fires in northern Manitoba north of Lake Winnipeg and east of Reindeer Lake are producing very dense plumes of smoke, which are moving sourtheast (sic) to northern Lake Winnipeg.

There is thin smoke in Quebec from previous day's fires on Lake Athabasca and Reindeer Lake, which is moving east across east central Quebec and into Labrador. Two big fires in western Quebec are producing locally dense plumes of smoke, wich are moving northeast. There is also a fire producing moderately dense smoke moving north in central Quebec near Chibougamau. A fire in eastern Quebec north of Sept Iles is producing a narrow plume of dense smoke that is moving to the east..."



Mecklenburg County PM2.5 Measurements on June 27, 2006-
37-119-0041 $PM_{2.5}$: 7.3 $\mu g/m^3$ 37-119-0043 $PM_{2.5}$: 8.5 $\mu g/m^3$

THROUGH 1600Z **June 27, 2006.**

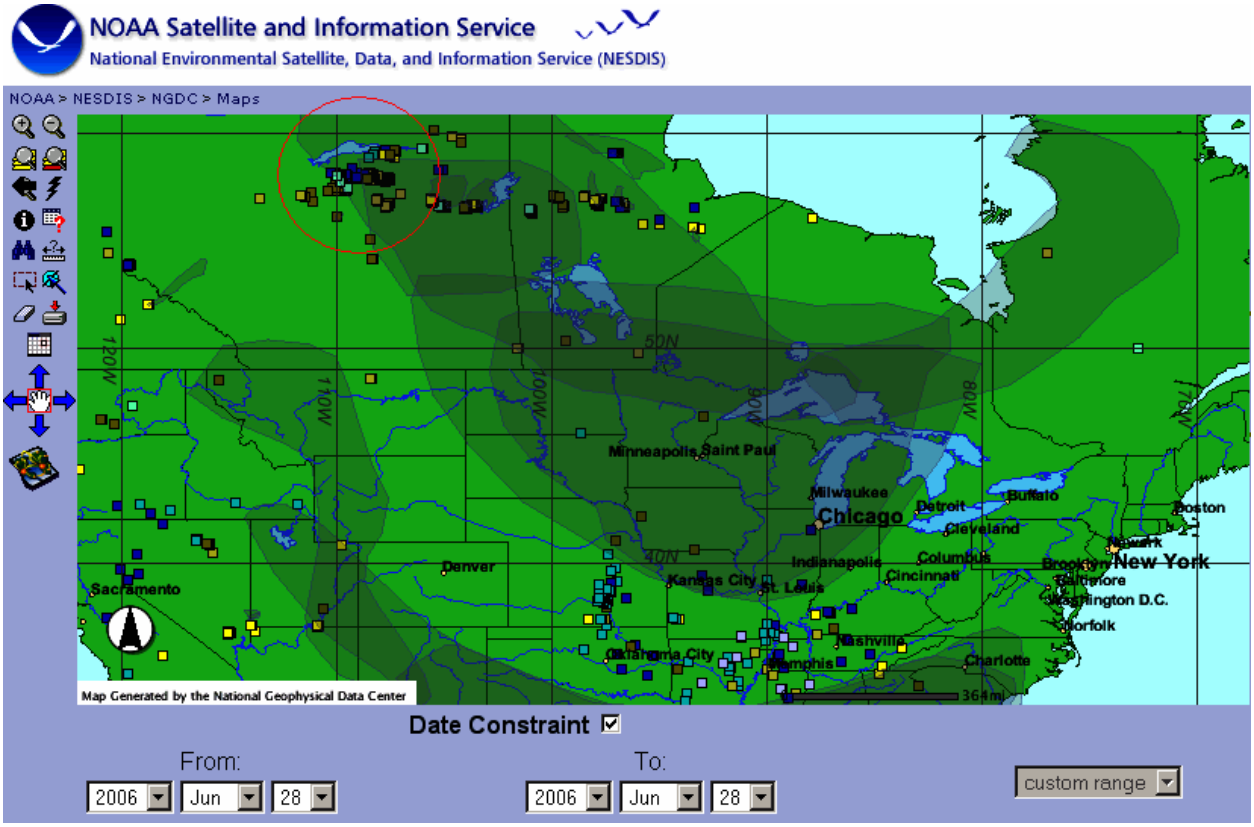
"...Canada:
Fires continue south of Lake Athabasca in Northern Saskatchewan and in central Alberta that are producing a thick plume of smoke that extends southeast across eastern Saskatchewan and west central and southwest Manitoba.

North central US:

Thick smoke from southeast Saskatchewan and southwest Manitoba flows into North Dakota then into north central and northeast South Dakota where it then curves into southwest and central Minnesota..."

THROUGH 0015Z **June 28, 2006.**

"...Northern Plains, Upper Midwest:
Moderately dense smoke covers virtually all of the Northern Plains and Upper Midwest and was moving southeast into Nebraska and Iowa. This area of smoke was the result of multitudinous fires in northeastern Alberta, northern Saskatchewan and northern Manitoba..."



Mecklenburg County PM2.5 Measurements on June 28, 2006-
37-119-0041 $PM_{2.5}$: 17.1 µg/m^3 37-119-0043 $PM_{2.5}$: 19.7 µg/m^3

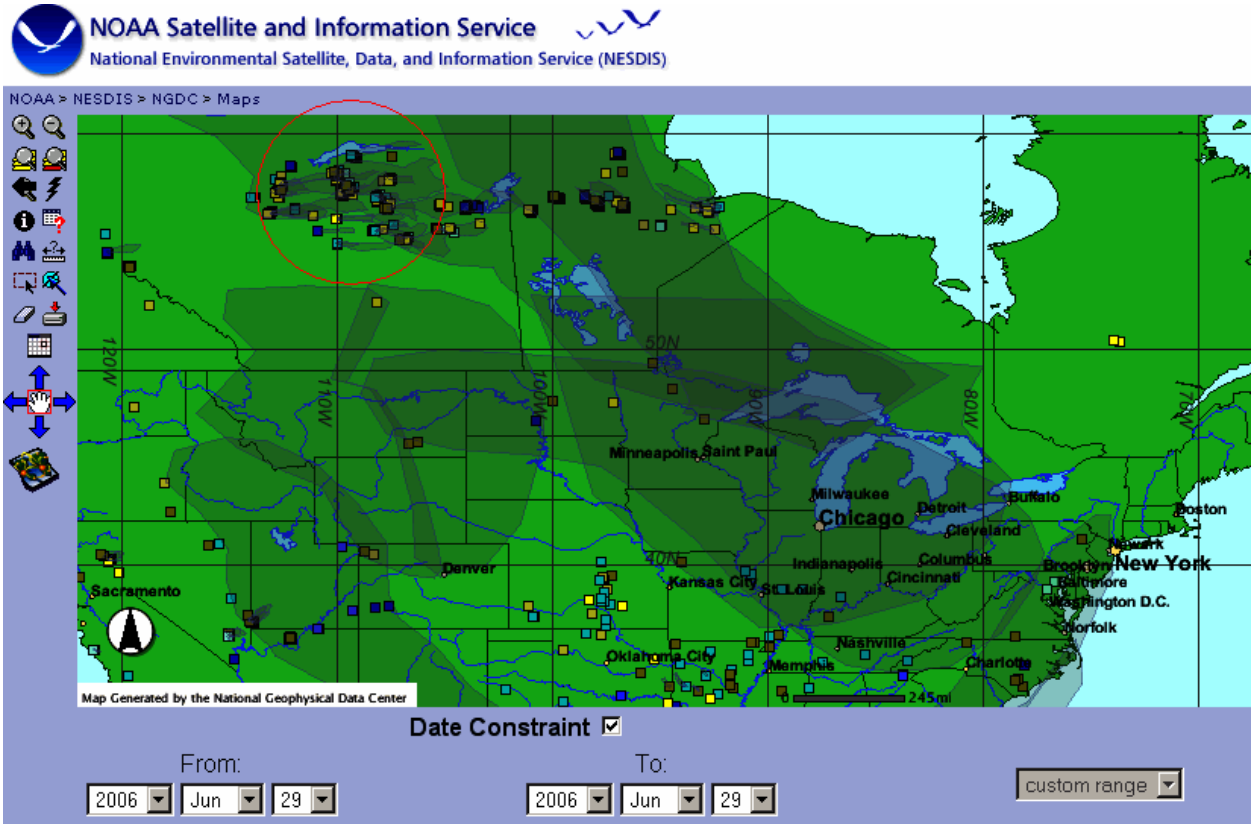
THROUGH 1630Z **June 28, 2006.**

"...Central Canada/Northern Plains/Upper Midwest/Upper and Middle Mississippi Valley/Upper Great Lakes/Ohio Valley: A large area of moderately dense smoke is pushing southeast from Saskatchewan/Manitoba/Ontario into north and south Dakota across Minnesota/Iowa and into Wisconsin/Michigan and as far south as Illinois, Indiana and northern Missouri. The area of thickest smoke is wrapping up with an upper level low in eastern Wisconsin and western Michigan and stretching from Manitoba across eastern North Dakota, western Michigan into northern Iowa/Illinois and across Wisconsin/Michigan as mentioned above.

Great Basin/Southwest/Southern Plains/Lower Mississippi Valley/Southeast: Several large wildfires in northern Arizona, southern Utah, northern California and northern Nevada has generated an extensive plume of smoke that stretches from the southern Idaho-northern Utah border southeastward across northwest Arizona-southwest Colorado and most of New Mexico, then eastward across central Texas-northern Louisiana-southern Mississippi/Alabama and east northeast into Georgia and South Carolina. The smoke is moderately dense through Texas and thins out across Louisiana to Alabama and very thin across Georgia/South Carolina..."

THROUGH 0200Z **June 29, 2006.**

"...Northern/Central US:
The large area of moderately dense smoke continues to push southeast from the numerous wildfires in northern and central Saskatchewan, northeastern Alberta, and northwestern Manitoba Provinces. The smoke covers the Northern Plains, Upper Mississippi Valley, Great Lakes region and stretches down through northern Missouri, southern Illinois and Indiana, and as far east as Ohio.



Mecklenburg County PM2.5 Measurements on June 29, 2006-
37-119-0041 $PM_{2.5}$: 16.7 µg/m^3 37-119-0043 $PM_{2.5}$: 21.8 µg/m^3

June 29, 2006 continued:

Western/Southern/Eastern US:
An extremely long swath of thin to moderately dense smoke stretches all the way from Idaho/Montana southward through Texas, then eastward along the entire Gulf Coast region. The band of smoke then turns northeastward across Georgia and the Carolinas to Virginia and also just offshore over the Atlantic ocean. The northern portion of the smoke over Idaho/Montana has been moving northeastward and eastward while the smoke across the southern US is generally moving eastward, except northeastward along the Southeast Atlantic states and the Middle Atlantic region. This smoke is the result of the large number of wildfires spread throughout the West and Southwest over the last week. The largest concentrations of fires have mainly been observed across Arizona, Nevada and Utah. A significant
amount of cloudiness across the western US is present this afternoon and evening which is likely hindering additional fire and smoke detection..."

THROUGH 1618Z **June 29, 2006.**

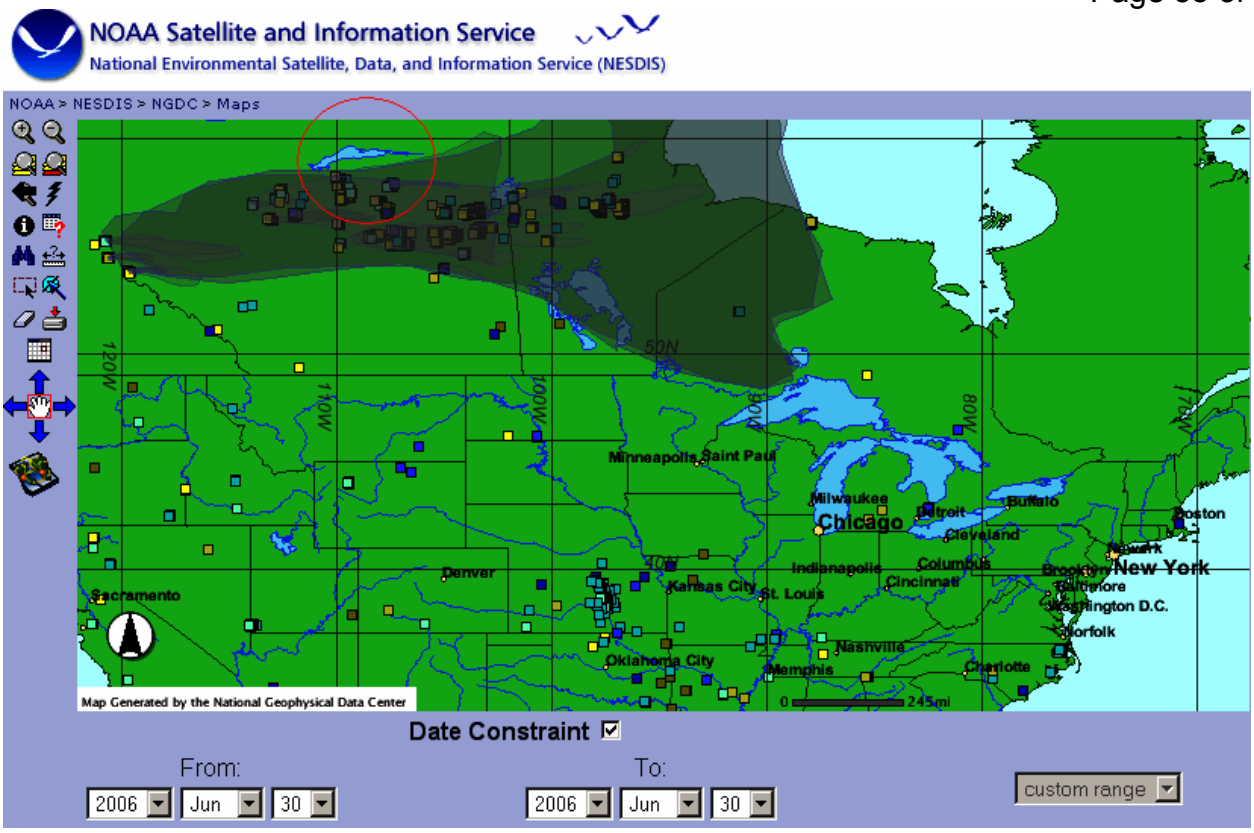
"...Central Canada/N Plains/N Mississippi Valley/Mid-West/Ohio Valley:
A large area of moderately dense smoke extended southward from fires in Central Canada through the N Plains/Upper Mississippi Valley to the Mid-West and into the Ohio Valley. The Most (sic) dense smoke occurred from SW Ontario across Minnesota and Wisconsin to Illinois and Indiana.

Southern Tier Of States:
An extensive area of thin and moderately dense smoke stretched from New Mexico through the Gulf States to the Carolinas and SE Virginia. The thickest smoke occurred mostly from S Alabama to the Carolinas..."

THROUGH 0100Z **June 30, 2006.**

"...Southeast/Lower Mississippi Valley:
A smoke plume has persisted for over 12 hours, extending to the Gulf of Mexico, from a fire in Escambia County, Alabama. A finger of smoke...the result of fires burning in Arizona, Utah and Nevada...stretched from offshore of the Carolinas southwestward across the Florida Panhandle and west along the Gulf Coast to Louisiana.

Canada and North Central U.S.:
Numerous fires in the Canadian provinces of Alberta, Saskatchewan and Manitoba have produced a massive pall of smoke that extended southeast across Ontario, the northern Plains, the Upper and Mid Mississippi Valleys, the Tennessee and Ohio Valleys and the Great Lakes..."



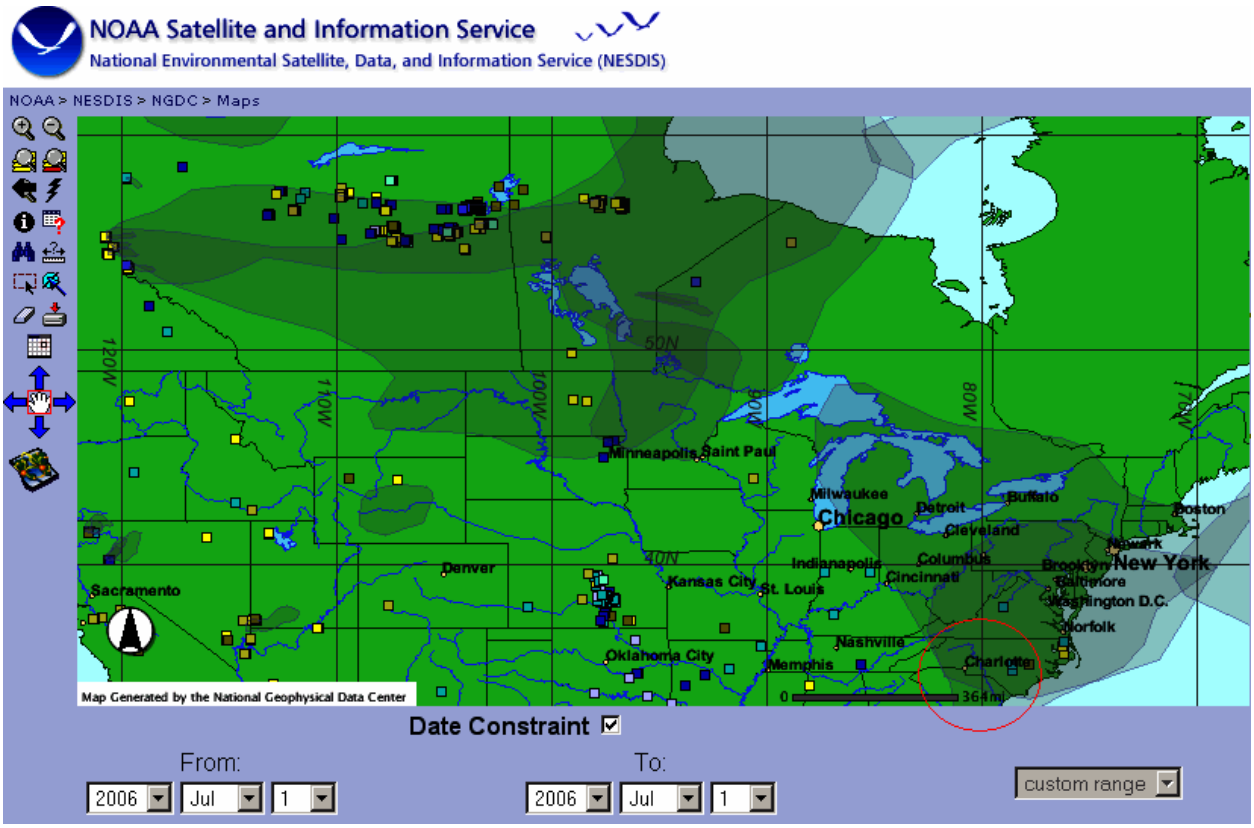
Mecklenburg County PM2.5 Measurements on June 30, 2006-
37-119-0041 $PM_{2.5}$: 28.4 µg/m^3 37-119-0043 $PM_{2.5}$: 26.6 µg/m^3

THROUGH 1610Z **June 30, 2006.**

"...Canada and North Central U.S.:
The numerous fires in Alberta, Saskatchewan and Manitoba have produced a massive area of moderately dense to dense smoke that is traveling east to southeast and reaching parts of the Northern Plains/Upper Mississippi Valley. The majority of the fires as well as the most dense portion of the smoke is located in central Saskatchewan..."

THROUGH 0132Z **July 1, 2006.**

"...Canada and Eastern U.S. :
Numerous fires in the Canadian Provinces of Alberta, Saskatchewan and Manitoba produced an extensive plume of dense to moderately dense smoke that extended southeastward across Ontario through the Great Lakes to the Ohio Valley and the Middle Atlantic states. Thin smoke extended from NE Texas across the N Gulf of Mexico to Florida..."



Mecklenburg County PM2.5 Measurements on July 1, 2006-
37-119-0041 $PM_{2.5}$: 35.8 µg/m^3 37-119-0043 $PM_{2.5}$: 35.7 µg/m^3

THROUGH 1530Z **July 1, 2006.**

"...Canada/Northern US:
Large fires in eastern British Columbia, northern Alberta, northern Saskatchewan, and northern Manitoba provinces in Canada are responsible for an extremely large area of smoke which not only covers a good portion of western and central Canada, but has also been transported by winds aloft down into eastern Montana, the Dakotas, and Minnesota. While satellite imagery shows the thickest smoke residing over east central Saskatchewan Province, the northern half of Manitoba Province, and western Hudson Bay, some reduction in visibility reportedly due to haze has been noted across MT, ND, and MN.

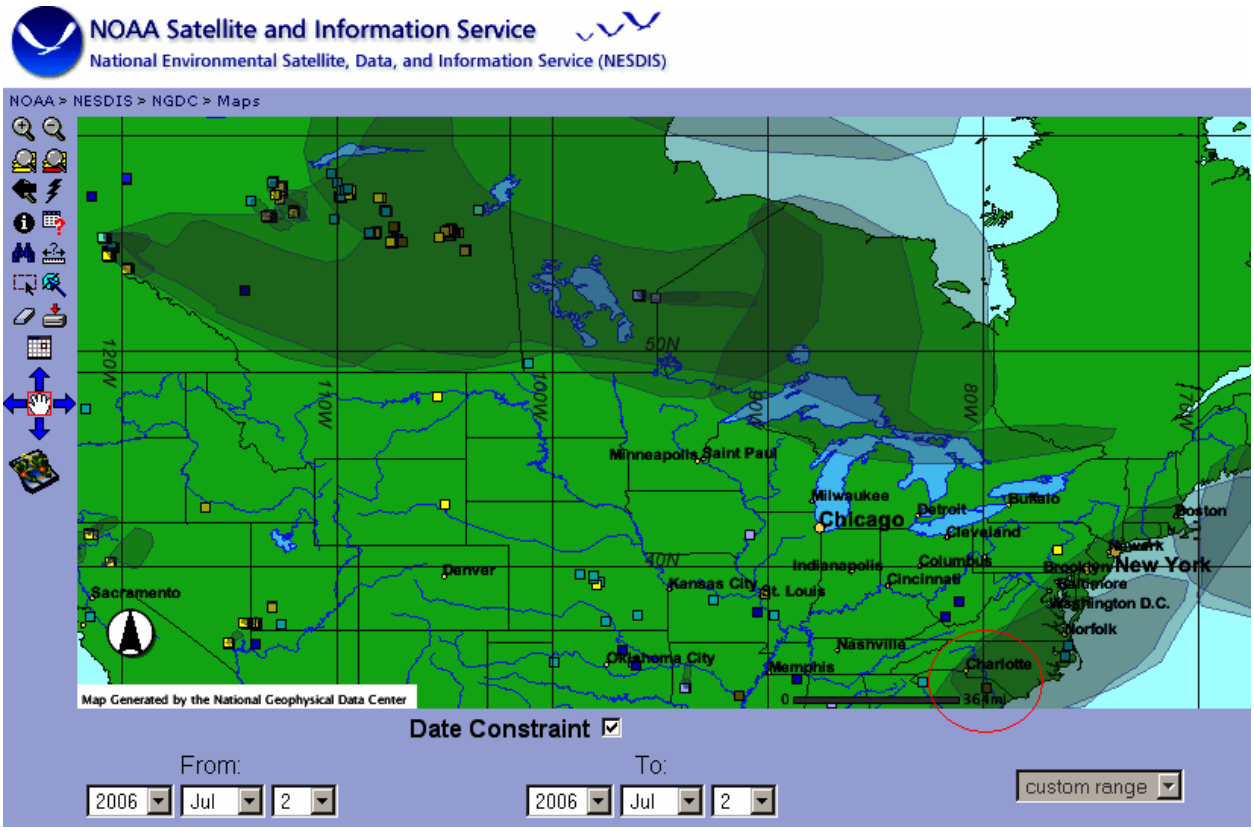
Eastern and Southern US:

Visible imagery shows a very large mass of haze across nearly the entire eastern third of the country as well as the south central region covering the middle and lower Mississippi Valley as well as the central and southern Plains. Recent trajectory information shows that it is likely that smoke primarily from the Canadian fires and possibly also to a lesser extent from the recent western US fires is contributing to the hazy appearance noted on satellite imagery across this entire region, though it is certainly difficult to determine a smoke concentration in these areas since the smoke has been around for such a long time mixing with other pollutants present in the region.

THROUGH 0225Z July 2, 2006.

"...Canada/Northern US:
In eastern British Columbia, northern Alberta, Saskatchewan, and northern Manitoba provinces the wildfires continue to produce massive amounts of smoke that are covering a good portion of western/central Canada. The wildfires in eastern British Columbia are currently producing the most dense portions of smoke. The massive area of smoke has also moved south and is affecting portions of North Dakota, South Dakota, Minnesota and Wisconsin.

Eastern:
This evenings visible imagery shows smoke/haze over the eastern part of the US and out into the Atlantic Ocean. This enormous area of smoke has been carried by winds moving in a southeast direction from the Canadian fires mentioned above..."



Mecklenburg County PM2.5 Measurements on July 2, 2006-
37-119-0041 $PM_{2.5}$: 30.3 µg/m^3 37-119-0043 $PM_{2.5}$: 30.0 µg/m^3

THROUGH 1645Z **July 2, 2006.**

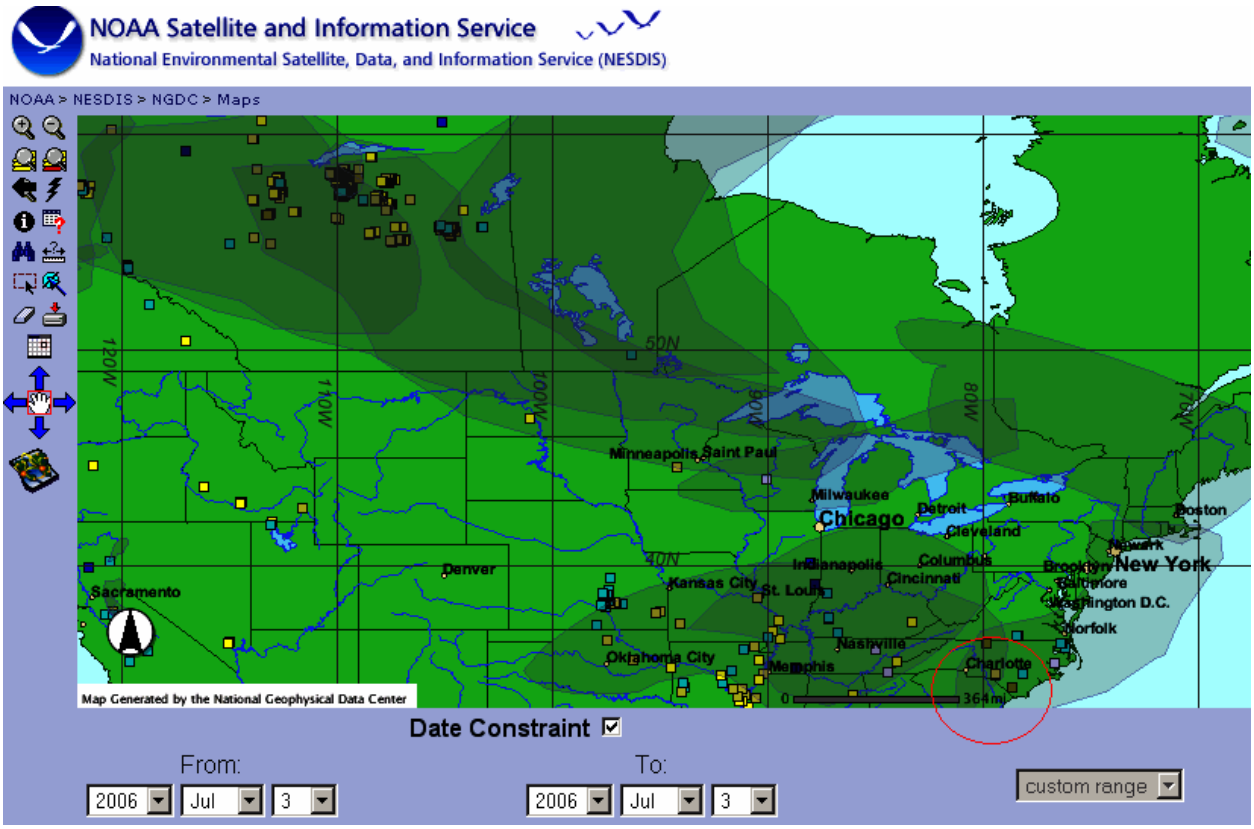
"...Eastern US:
A mixture of smoke/haze extends northeast from Georgia nearly 900 MI affecting states all the way up the east coast. This area is the result of wildfires throughout the Canadian Provinces of British Columbia, Alberta, Saskatchewan and Manitoba..."

Canada/Northern US:
The massive amount of wildfires throughout British Columbia, Alberta, Saskatchewan and Manitoba continue to produce an area of light to moderately dense smoke. This area of smoke extends from eastern British Columbia, affecting the northern parts of North Dakota, Minnesota, Wisconsin and Michigan, and as far east as Ontario. The wildfires in eastern British Columbia are producing the densest portion of the smoke..."

THROUGH 0223Z **July 3, 2006.**

"...Eastern US:
The large area of smoke/haze continues to linger over the east coast, but is slowly fading away.

Canada/Northern US:
The massive amount of wildfires across British Columbia, Alberta, Saskatchewan and Manitoba continue to produce massive amounts of moderately dense to dense smoke that is traveling east to southeast and covering most of Ontario as well as northern parts of North Dakota, Minnesota, Wisconsin and Michigan. The majority of this smoke is being produced by large wildfires in eastern British Columbia. In southeast Manitoba there is a wildfire that continues to produce a very dense plume of smoke that is moving directly east into central Ontario..."



Mecklenburg County PM2.5 Measurements on July 3, 2006-
37-119-0041 $PM_{2.5}$: 29.5 $\mu g/m^3$ 37-119-0043 $PM_{2.5}$: 31.9 $\mu g/m^3$

THROUGH 1645Z **July 3, 2006.**

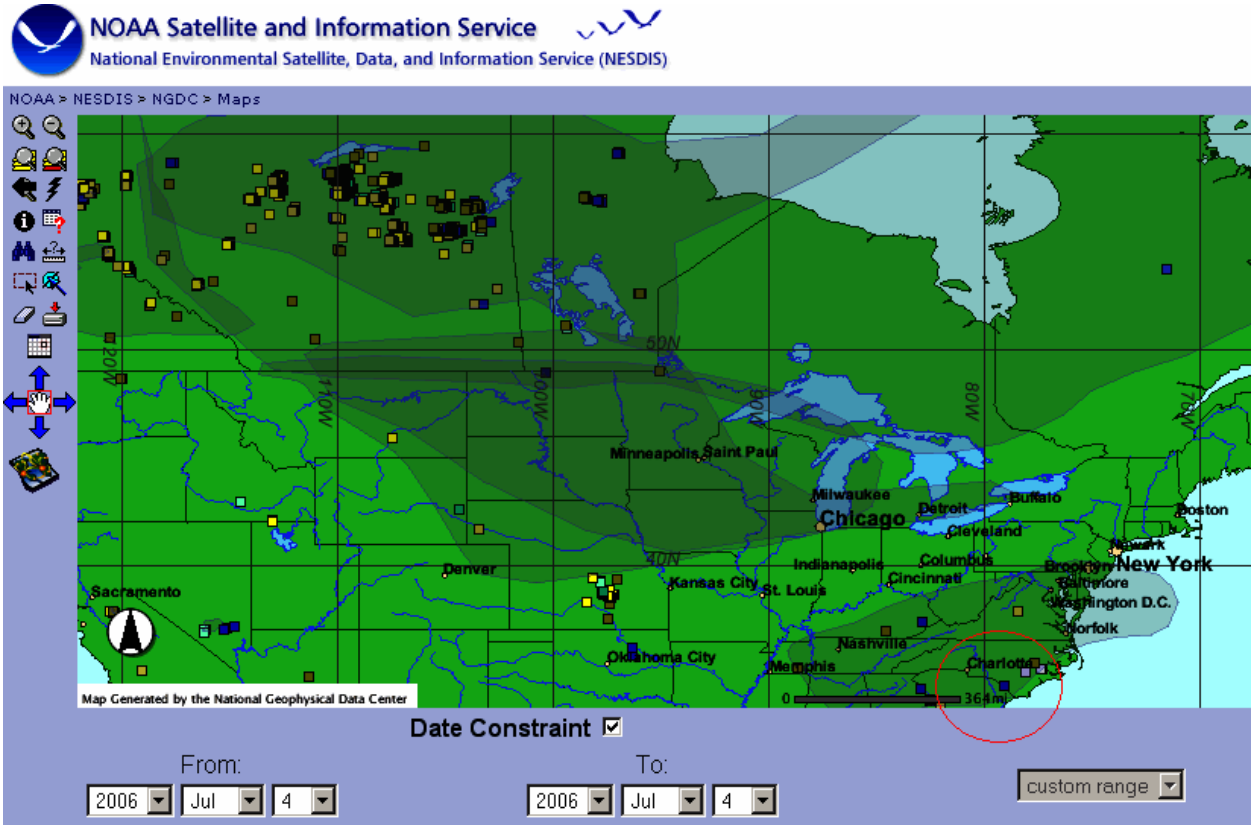
"...Canada/Northern US:
The massive amount of wildfires across British Columbia, Alberta, Saskatchewan and Manitoba continue to produce large amounts of moderately dense to dense smoke moving southeast across British Columbia, Saskatchewan and Manitoba and into the northern Plains, Upper Mississippi Valley and Upper Great Lakes and continuing to move east southeast across the U.S.

Central/Southern Plains/Lower Mississippi and Tennessee Valley/Southeast:
Smoke from the Canadian fires has moved south overnight into the central US. The smoke is mainly light to moderately dense and continues to move south to southeast moving into Georgia and the Carolinas..."

THROUGH 0215Z July 4, 2006.

"...Northern US/Western-Central Canada:
The massive amount of wildfires in British Columbia, Alberta, Saskatchewan and Manitoba continue to produce prodigious amounts of smoke across all of western and central Canada, as well as affecting the northern US. The most dense portions of smoke can be found in central/eastern British Columbia (sic) and northeast Alberta/northwest Saskatchewan. The smoke is moving in a eastward direction, with some moving south into the US, mainly affecting North Dakota, Minnesota, Wisconsin and Michigan.

Central/Eastern US:
The smoke from the enormous amounts of Canadian wildfires has moved its way down into the central and eastern parts of the United States. The area of smoke ranges from as far west as Kansas/Nebraska, as far south as the northern tip of Florida and all the way up the east coast into central Maine..."

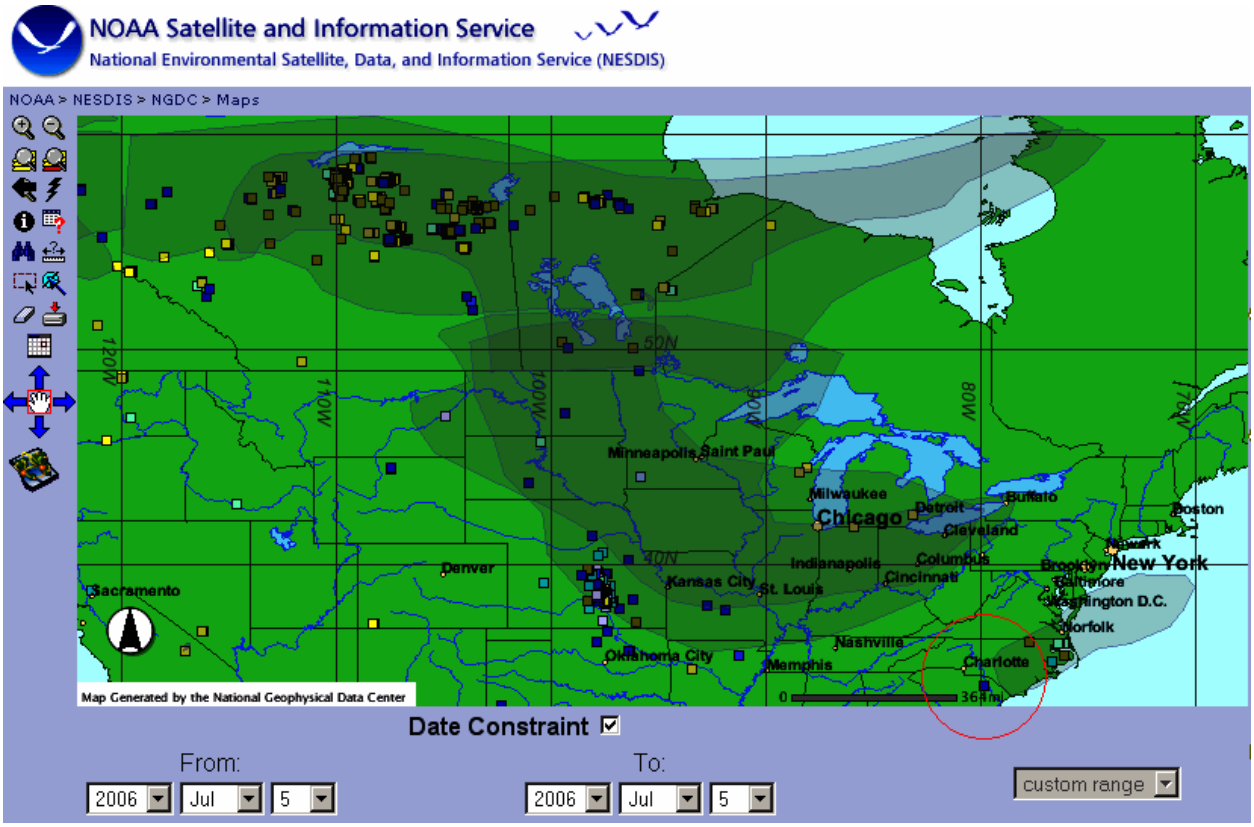


Mecklenburg County PM2.5 Measurements on July 3, 2006-
37-119-0041 $PM_{2.5}$: 31.7 µg/m^3 37-119-0043 $PM_{2.5}$: 33.8 µg/m^3

THROUGH 0100Z **July 5, 2006.**

"...North central U.S and most of Canada:
The very numerous and bright fires in British Columbia, Alberta and Saskatchewan are continuing to produce a huge area of moderate to dense smoke covering the eastern two thirds of British Colombia, and almost all of Alberta, Saskatchewan, and Manitoba. Less dense smoke extends into Ontario, Quebec, the Hudson

Bay, northeastern Montana, all of North Dakota, northern South Dakota, all of Minnesota and possibly Iowa and Michigan.



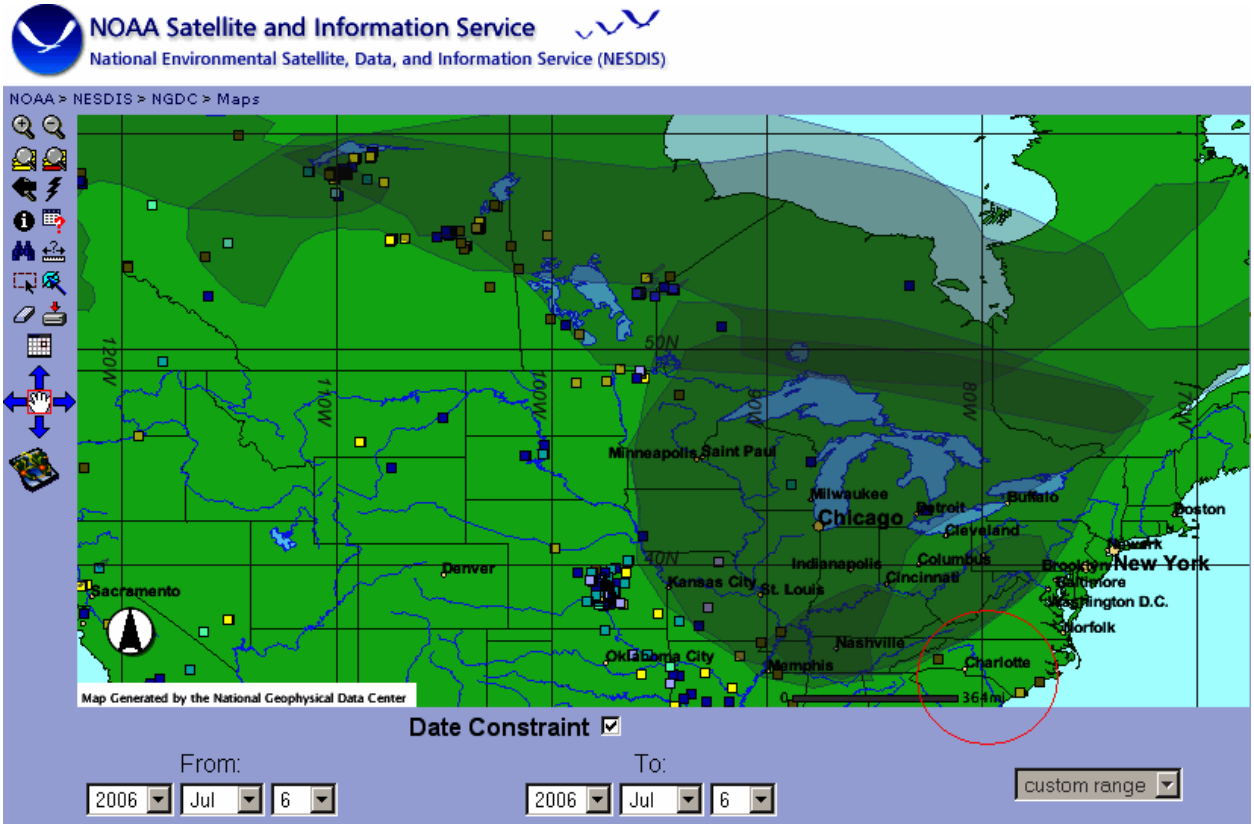
Mecklenburg County PM2.5 Measurements on July 5, 2006-
37-119-0041 $PM_{2.5}$: 19.5 µg/m^3 37-119-0043 $PM_{2.5}$: 19.5 µg/m^3

Mid Atlantic to Tennessee Valley:
A mixture of light smoke and haze seen this afternoon in this area seems to have diminished before nightfall. The smoke is believed to be "leftover" smoke originally coming from the fires in western and central Canada..."

THROUGH 0200Z **July 6, 2006.**

"...Southeastern U.S:
A large area of thin smoke from the residual of fires from the past several days are continuing to move northeast to the Atlantic Ocean from eastern North Carolina. There is one fire in Florida in southern Lafayette county producing moderately dense plume of smoke, which is moving mainly west to the Gulf Mexico. A fire in Georgia in Jeff Davis county is producing a thin plume of smoke moving northwest...

...Central/Eastern U.S and West/Central Canada:
The massive wildfires across northern British Columbia, Alberta, Saskatchewan and Manitoba continue to produce moderately dense to locally very dense areas of smoke that cover nearly all four provinces.
The enormous area of smoke has also moved southeast into the U.S. with the most dense portions affecting the northern and central Plains, including the Dakotas, Minnesota, and western Iowa. The smoke becomes a little thinner further south and east as it extends as far south as northern Arkansas and east through the Ohio Valley into northwest Pennsylvania.



Mecklenburg County PM2.5 Measurements on July 6, 2006-
37-119-0041 $PM_{2.5}$: 14.7 µg/m^3 37-119-0043 $PM_{2.5}$: 12.2 µg/m^3

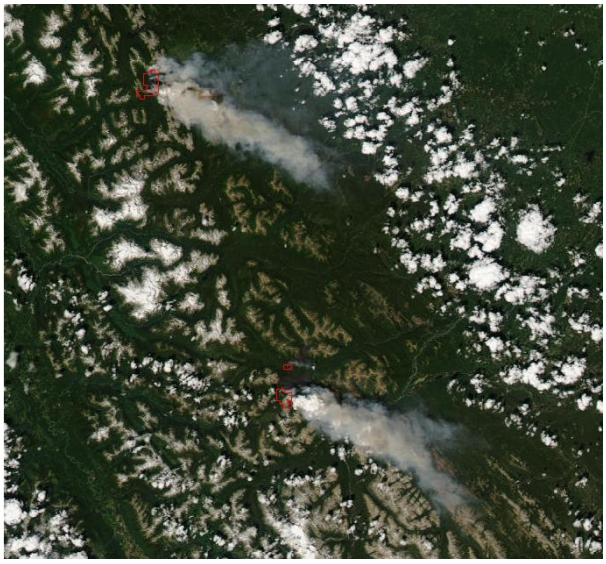
Appendix B

From the Website – U.S. Air Quality, The Smog Blog,
Http://alg.umbc.edu/usaq/archives/2006_07.html

July 1, 2006

In honor of Canada Day

Some of the smoke we are seeing is not only coming from fires in Saskatchewan and Manitoba, but two fires in Alberta. In the images below (left MODIS 500 RGB) and right (GoogleEarth), you can see two large fires in BC/Alberta border just about where the border turns north (west of Edmonton). The large white peaked mountain is Mount Sir Alexander (named for Sir Alexander Mackenzie). The nearest towns are Cache Creek, Alta., Dome Creek, BC and McBride, BC. The river valley running NW is the Fraser Valley, named after Simon Fraser....curious since Hoff went to Simon Fraser University. Happy Canada Day!

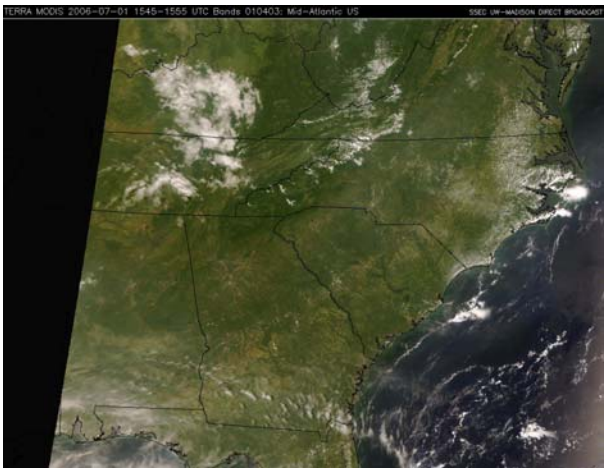


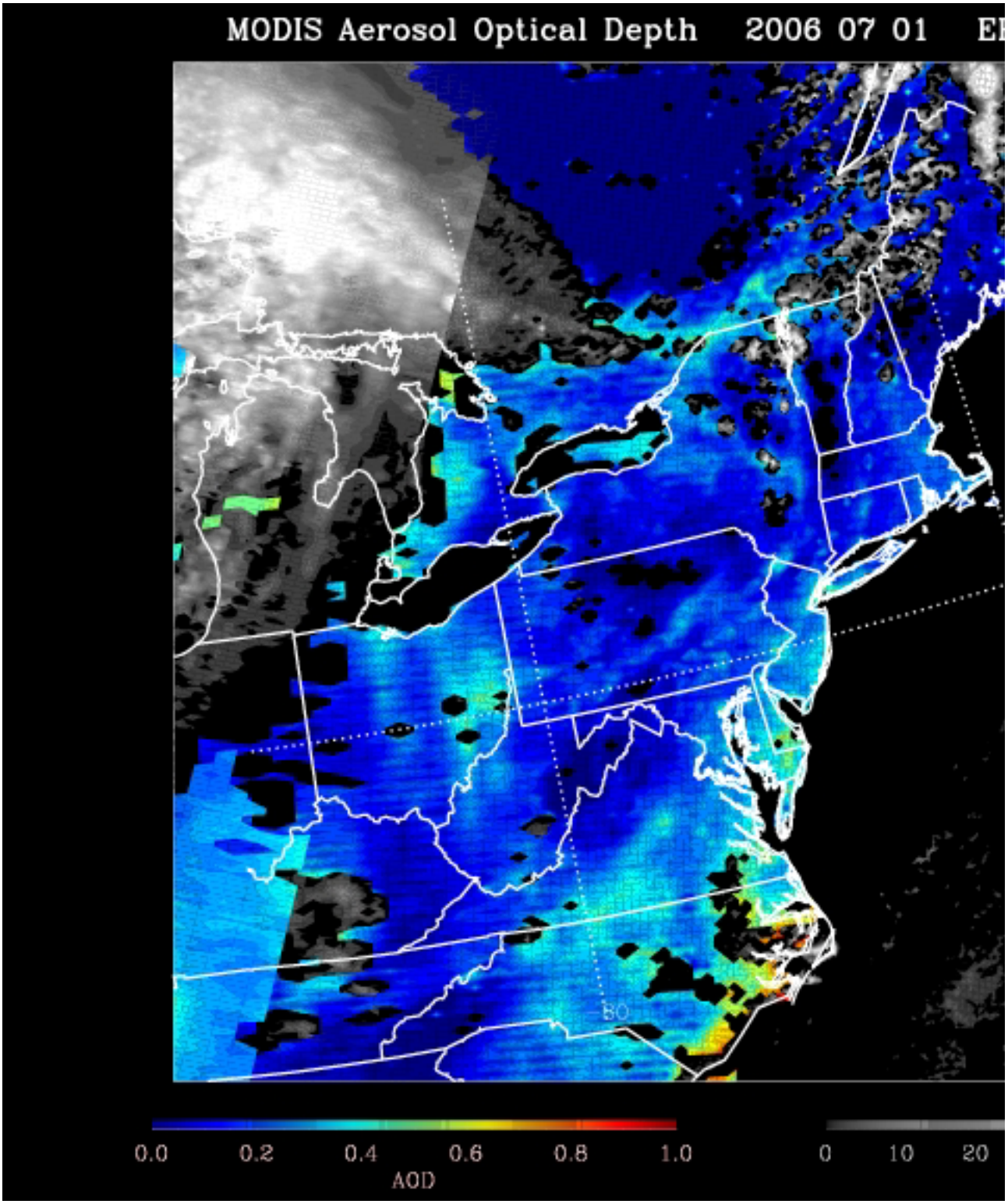
Posted by Ray Hoff at 11:54 PM

Eastern USA experiencing moderate Air quality

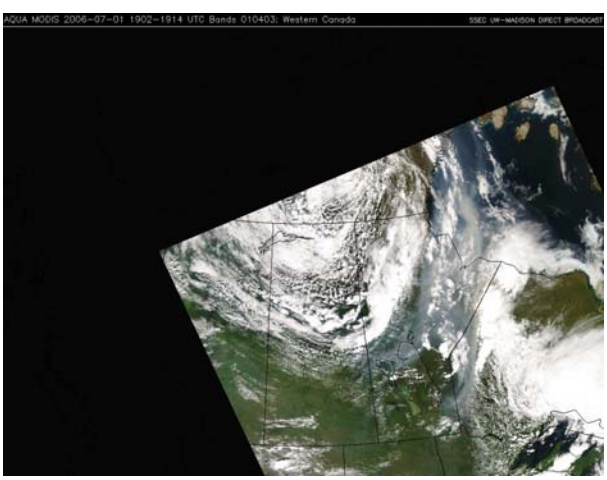
The entire eastern portion of the United States experienced moderate PM2.5 levels today according to EPA AIRNow.

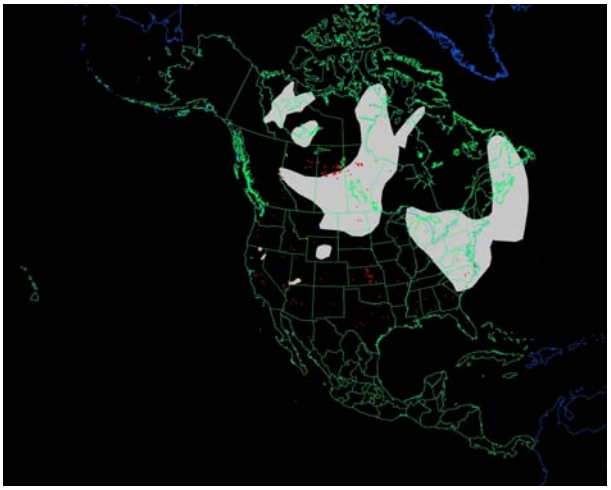
Haze is visible over the East Coast in the MODIS Terra image below and as Nikisa said yesterday, this is probably due to smoke mixing with haze from local sources. IDEA reported Aerosol Optical Depth (AOD) levels as high as ~0.8 over North Carolina.


TERRA MODIS 2006-07-01 1545-1555 UTC Bands 010403; Mid-Atlantic US
SSEC UW-MADISON DIRECT BROADCAST


MODIS Aerosol Optical Depth 2006 07 01
0.0
0.2
0.4
0.6
0.8
1.0
AOD
0
10
20

Smoke is still visible in Canada in the MODIS AQUA image below and HMS reports large smoke plumes over Canada and the Eastern USA.



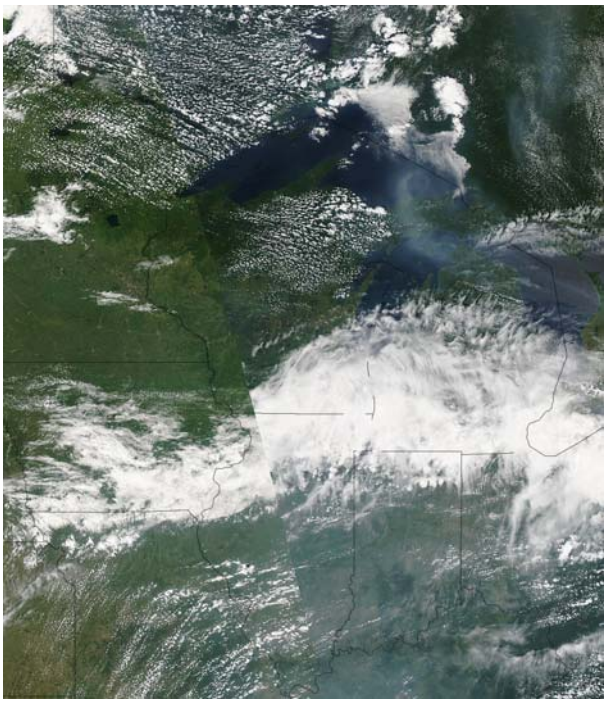


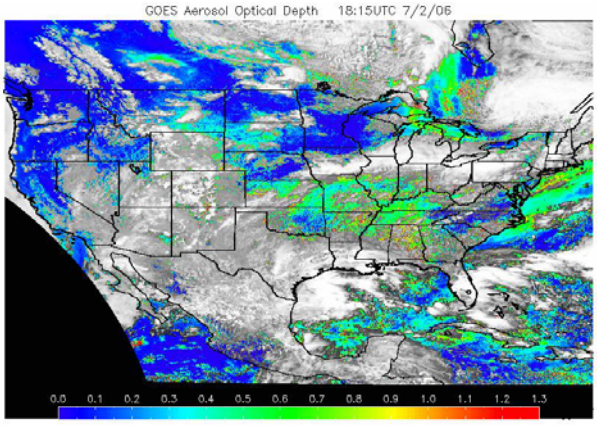
Posted by Amy Corner Erwin at 7:57 PM

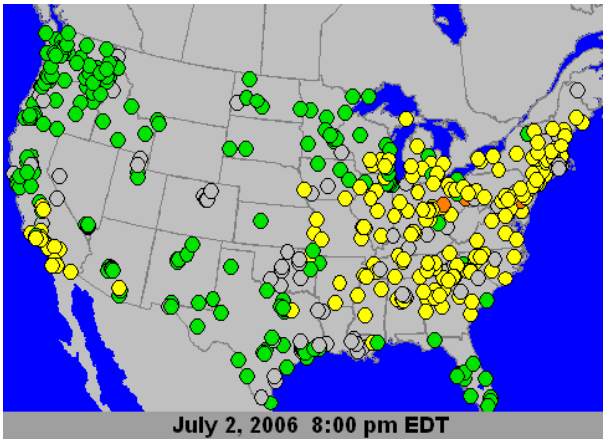
July 2, 2006

Canadian smoke across U.S. continued

Smoke continued to arrive in the U.S. from multiple fires in Canada, covering significant portions of the eastern and midwestern U.S. Below are two MODIS Aqua subsets showing some of the extent of the smoke, including flowing off the coast over the Atlantic. Below also are the images showing the GOES aerosol optical depth and the moderate PM2.5 values.




GOES Aerosol Optical Depth 18:15UTC 7/2/06
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3


July 2, 2006 8:00 pm EDT

References

1. Hazard Mapping System (HMS). Image from HMS, July 1, 2006. NOAA Satellite and Information Service, National Environmental Satellite, Data, and Information Service (NESDIS), Hazard Mapping System Fire and Smoke Product, http://www.ssd.noaa.gov/PS/FIRE/hms.html.

2. MODIS Active Fire Mapping Program, USDA Forest Service, Remote Sensing Application Center, Saskatchewan – 2006. http://activefiremaps.fs.fed.us/canada/activefiremaps.php?op=archive&rCode=sas&month=7&year=2006

3. Map of Canada. Map: Canada – geopolitical, Drawn and adapted by E Pluribus Anthony from Atlas of Canada. http://images.google.com/imgres?imgurl=http://content.answers.com/main/content/wp/en/a/a2/Map_Canada_political-geo.png&imgrefurl=http://www.answers.com/topic/map-canada-political-geo-png&h=1128&w=1280&sz=495&tbnid=gyZmwKTqPcZ_yM:&tbnh=132&tbnw=150&prev=/images%3Fq%3Dmap%2Bof%2Bcanada%26um%3D1&start=2&sa=X&oi=images&ct=image&cd=2

4. Hazard Mapping System (HMS). Image from HMS, July 1, 2006. NOAA Satellite and Information Service, National Environmental Satellite, Data, and Information Service (NESDIS), Satellite Fire Detection – National Geophysical Data Center, http://map.ngdc.noaa.gov/website/firedetects/viewer.htm .

5. Bernhardt, Darren, The StarPhoenix, “Forest Fire Still Raging - Nearly 300 people from three communities have left their homes”, Published: Wednesday, June 28, 2006.

6. Global Fire Monitoring Center (GFMC), The GFMC is an Activity of the UN International Strategy for Disaster Reduction (ISDR), http://www.fire.uni-freiburg.de/ .

7. Natural Resources Canada, Canadian Forest Service, Fire Management & Forest Protection Branch, Prince Albert, Saskatchewan, e-mail from Edwina Lewis: October 3, 2007.

8. Natural Resources Canada, Canadian Forest Service, National Site, Fire Management & Forest Protection Branch, “2006 – Number of Fires by Province”. http://fire.cfs.nrcan.gc.ca/report/archives_e.php?graph_year=06&graph=02

9. “IMPROVE Steering Committee Meeting Summary”, June 2 & 3, 2004, Glacier National Park Community Building; West Glacier, MT, Draft by Gloria Mercer & edited by Marc Pitchford – June 21, 2004.

10. Ammann, Harriet, Washington Department of Health; Robert Blaisdell and Michael Lipsett, California Office of Environmental Health Hazard Assessment, Susan Lyon Stone, U.S. Environmental Protection Agency; and Shannon Therriault, Missoula County Health Department, et al. "Wood Smoke – A Guide for Public Health Officials". June, 2001.

11. Pace, Thompson G., "Session I - PM Composition & Sources, Ambient Composition, What are the Important Sources". EPA National Emissions Inventory Conference, New Orleans, LA. May 15, 2006.

12. Kwangsam Na, Aniket A. Sawant, Chen Song, David R. Cocker III*, "Primary and secondary carbonaceous species in the atmosphere of Western Riverside County, California ', Bourns College of Engineering, Center for Environmental Research and Technology, University of California, Riverside, CA 92521, USA, Received 26 May 2003; accepted 24 November 2003.

13. U.S. Air Quality, The Smog Blog, Http://alg.umbc.edu/usaq/archives/2006_07.html , July 2006.

14. Battye, William and Rebecca. "Development of Emissions Inventory Methods for Wildland Fire", EC/R Incorporated, EPA Contract No. 68-D-98-046, Durham, NC, February 2002.