The May 31, 2010 Memorial Day Smoke Out

Introduction

On Memorial Day morning, May 31, 2010 residents across the North Country and much of central and eastern New England awoke to the unusual and acrid smell of smoke. While many initially thought the smoke was of local origin, it quickly became apparent that the plumes were occurring from multiple large wildfires across central Quebec. Many of these fires were caused by lightning on the morning of May 25th when a large area of thunderstorms crossed the region. Visibilities between 1 and 3 miles were commonplace during the morning and afternoon hours, with air quality indices nearing the very unhealthy 200 level in a few spots around midday. Smoke began to slowly disperse by later in the day and into the evening hours as a warm front lifted northward through the area allowing winds to turn southerly. While quite rare in our region similar cases have been documented, the most notable recent event occurring on July 7, 2002.

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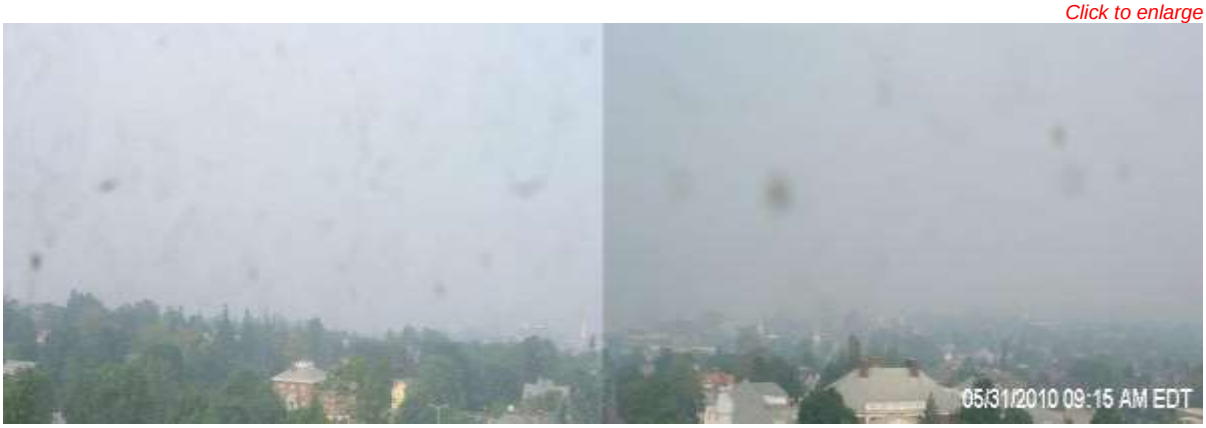

Satellite Images, Trajectories, Surface Observations:

During the early morning hours on 31 May 2010 thick smoke from numerous forest fires in Quebec, developed across much of the North Country. This smoke reduced surface visibilities below 2 miles across the region and created unhealthy air quality readings. The forest fires were started on the early morning hours of 25 May 2010, when a large complex of storms with copious amounts of cloud to surface lightning strikes, moved across the boreal forest north of Montreal. The fires started between 200 and 250 miles north of Burlington and given the trajectory of the light low level winds, the smoke took over 5 days to reach the North Country.

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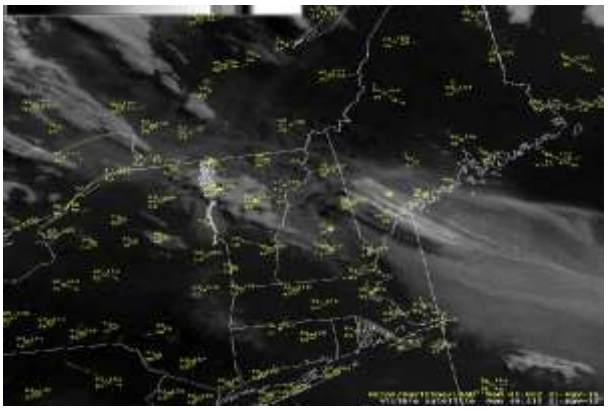
Figure 2 shows a visible satellite loop on 31 May 2010 from 1031 UTC (631 AM EDT) to 1331 UTC (931 AM EDT) across the Northeastern United States and clearly shows the smoke caused by the fires.



The milky like clouds across most of Vermont, New Hampshire, and the Gulf of Maine are areas of smoke, while the brighter white clouds near the Maine/New Hampshire border and streaming across northern New York into central Vermont with some vertical development, are mid-level alto-cumulus clouds, not related to the smoke.

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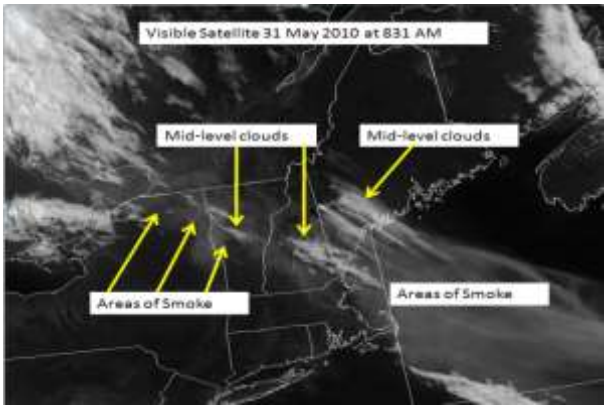
Figure 3 is a detailed visible satellite image on 31 May 2010 at 831 AM EDT. The image clearly shows areas of dense smoke, which reduced surface visibilities below 2 miles and created poor air quality. The low level milky like clouds indicates areas of smoke, while the brighter white clouds are associated with mid-level alto-cumulus clouds, across central Vermont into parts of New Hampshire and southern Maine.



Note the smoke is thicker across the Gulf of Maine, due to the cooler waters creating a low level temperature inversion, which limits the mixing and concentrates the smoke near the surface of the water.

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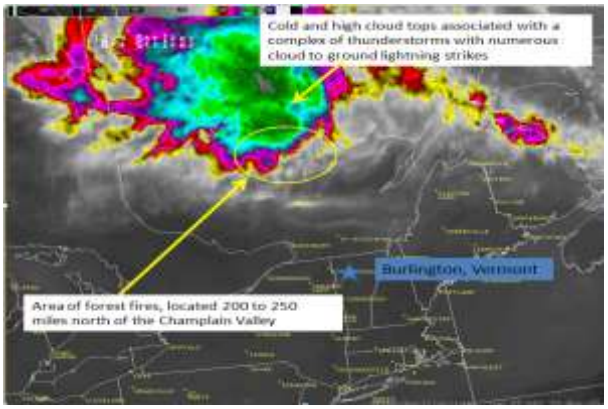
Figure 4 shows an infrared red satellite picture of a cluster of thunderstorms with numerous cloud to ground lightning strikes, which resulted in the Quebec fires starts.



The brighter colors show the taller and colder cloud tops associated with deep thunderstorm convection. Please note no lightning data is available across central Canada. The fires are located between 200 and 250 miles north of Burlington, Vermont and have burned thousands of acres to date.

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Figure 5 shows the 500 meter backwards air parcel trajectories from the NOAA HYSPLIT Model, which plainly shows our low level air-mass, was coming from Central Quebec, Providence. The different colors on the map below shows multi-trajectories at different locations, and explains why most of central and northern New England was influenced by the thick smoke.

The black star at the end of each trajectory shows where the air parcel will be at 21 UTC on 31 May 2010. This thick/dense smoke reduced visibility below 2 miles in many locations across Central and Northern New England, caused by the large forest fires in Quebec.

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Figure 6 shows surface observations at Burlington International Airport, Vermont, on early Monday 31 May 2010. From the chart below you can see how quickly the surface visibility dropped from 10 miles to less than 2 miles between 5:54 AM EDT and 8:25 AM EDT on 31 May 2010.

Also, helping to concentrate the smoke near the surface was light and variable winds, which prevented the smoke from mixing out. In the weather column the label "FU HZ" indicates smoke with hazy.

Other documented events:

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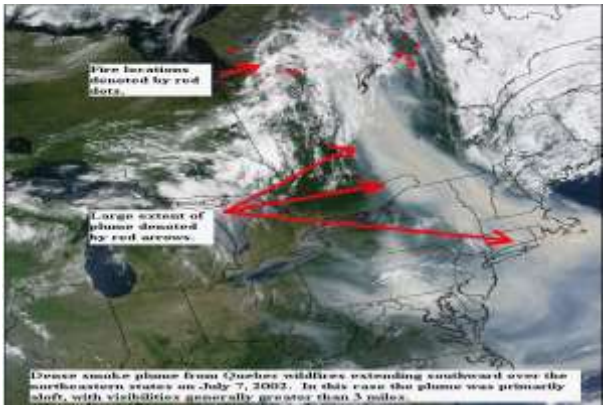
While quite unusual, cases of Canadian forest fire smoke affecting our area have been documented, the most recent occurring on July 7, 2002. During this episode the culprit fires occurred in a very similar location across central Quebec, with northerly winds transporting the dense smoke plumes southward into our area (see figure at right).



Dense smoke plume from Quebec wildfires extending southward over the northeastern states on July 7, 2002. In this case the plume was primarily aloft, with visibilities generally greater than 5 miles.

As is often the case in separate weather events, slight differences were noted between the 2002 case and this most recent event. Most notably the majority of the plume was aloft in the 2002 case, with surface visibilities being generally higher across the area. As a result, corresponding air quality values were not as high.

Other photos:

The following photos were taken atop Mount Washington in New Hampshire and are courtesy of the Mount Washington Observatory.

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References

For current air quality conditions and forecasts across the U.S. please refer to www.airnow.gov. This comprehensive website is run through the cooperation of several government agencies, including the EPA, NOAA, NASA and Environment Canada. Another nice website is www.enviroflash.info. This site is run in collaboration with AIRNow, and allows the user to receive email alerts when air quality thresholds exceed unhealthy levels.