Image courtesy: Mt. Washington Observatory

Québec fires – air quality & monitoring via satellites

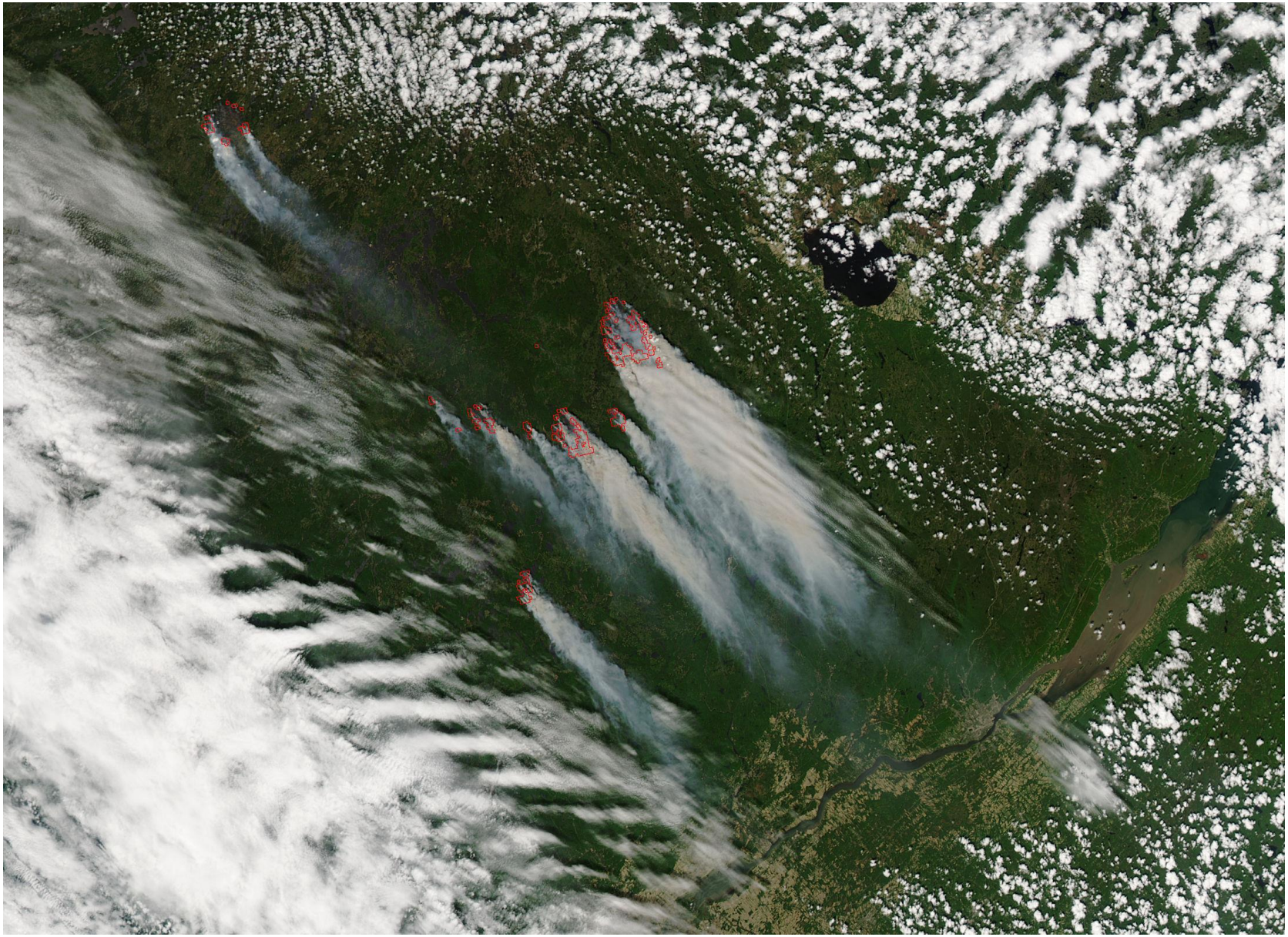
31 May, 2010 event

SWAC

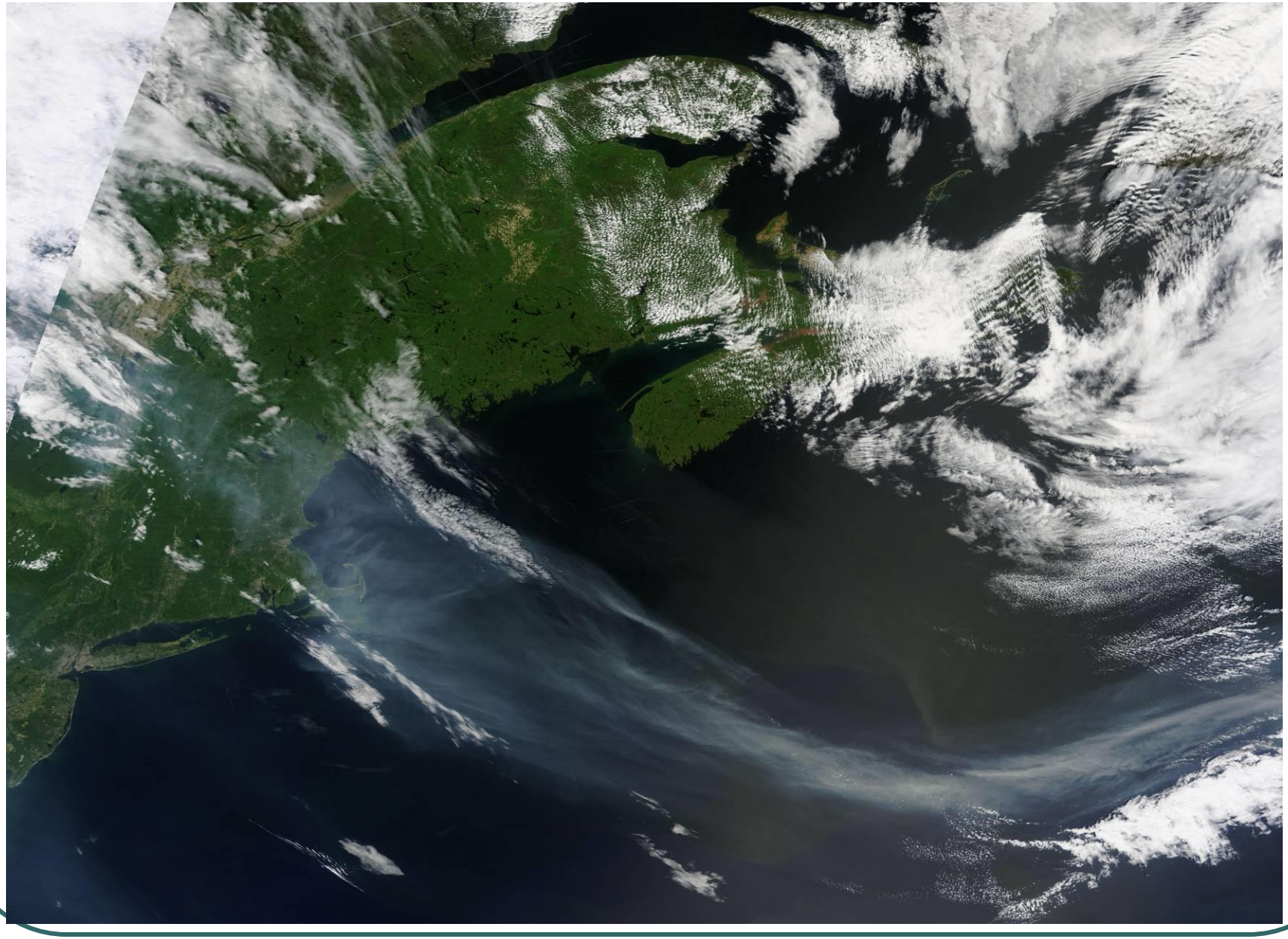
The UNIVERSITY of VERMONT

NSF

VERMONT

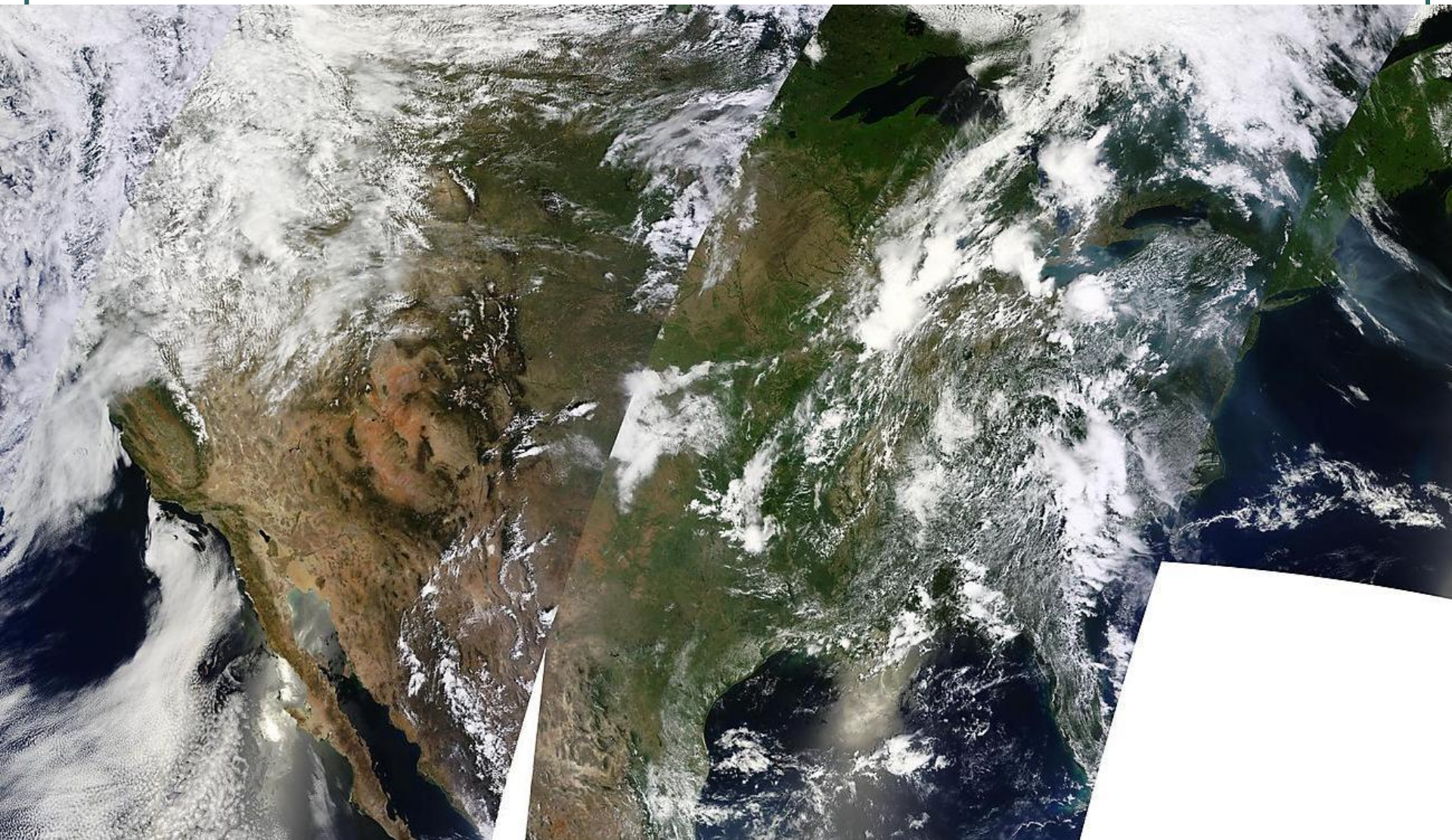


At least 54 fires in southern Québec – NASA MODIS image – 30 May 2010

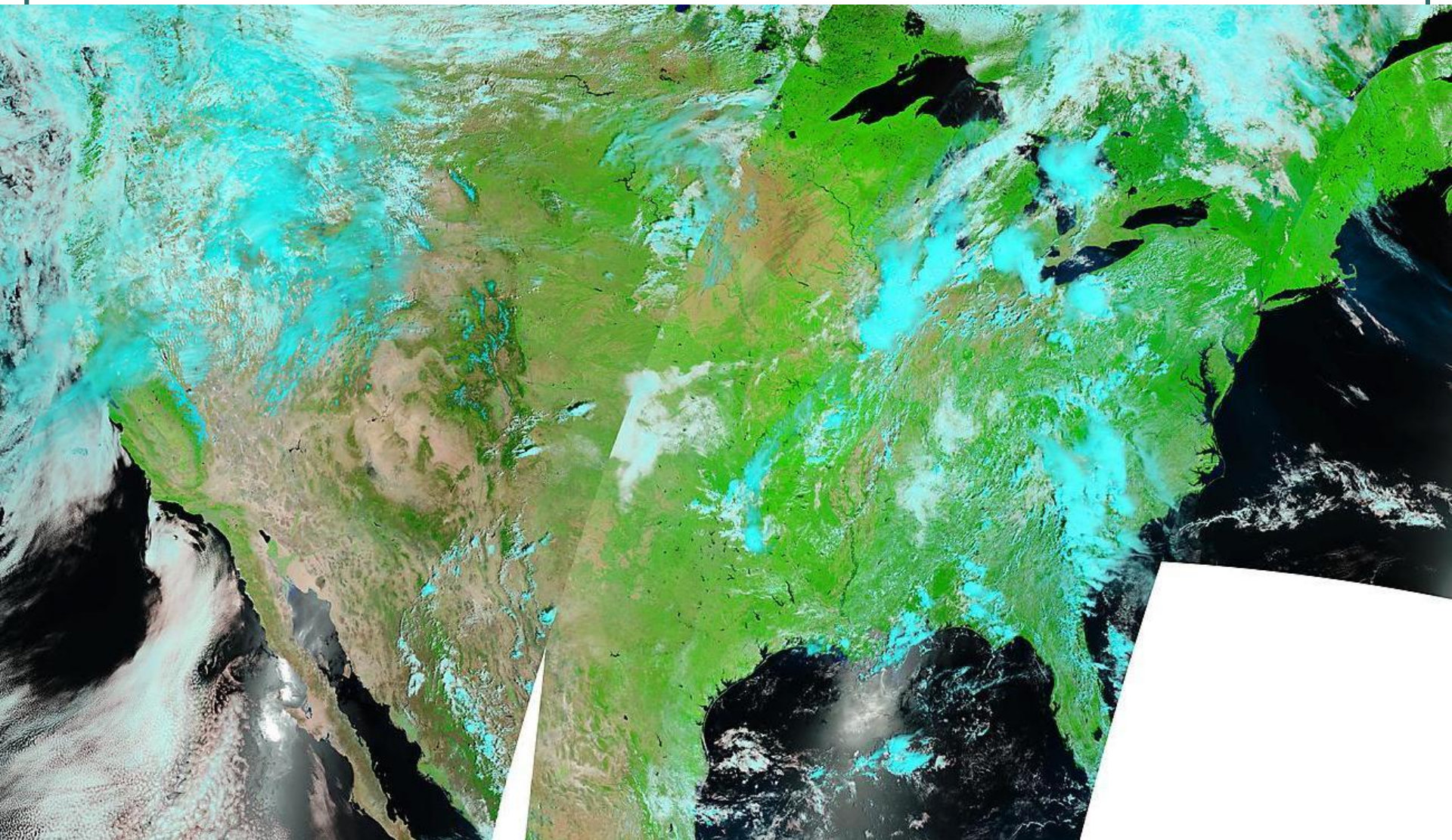


MODIS close-up of the smoke from the Quebec fires – 31 May, 2010

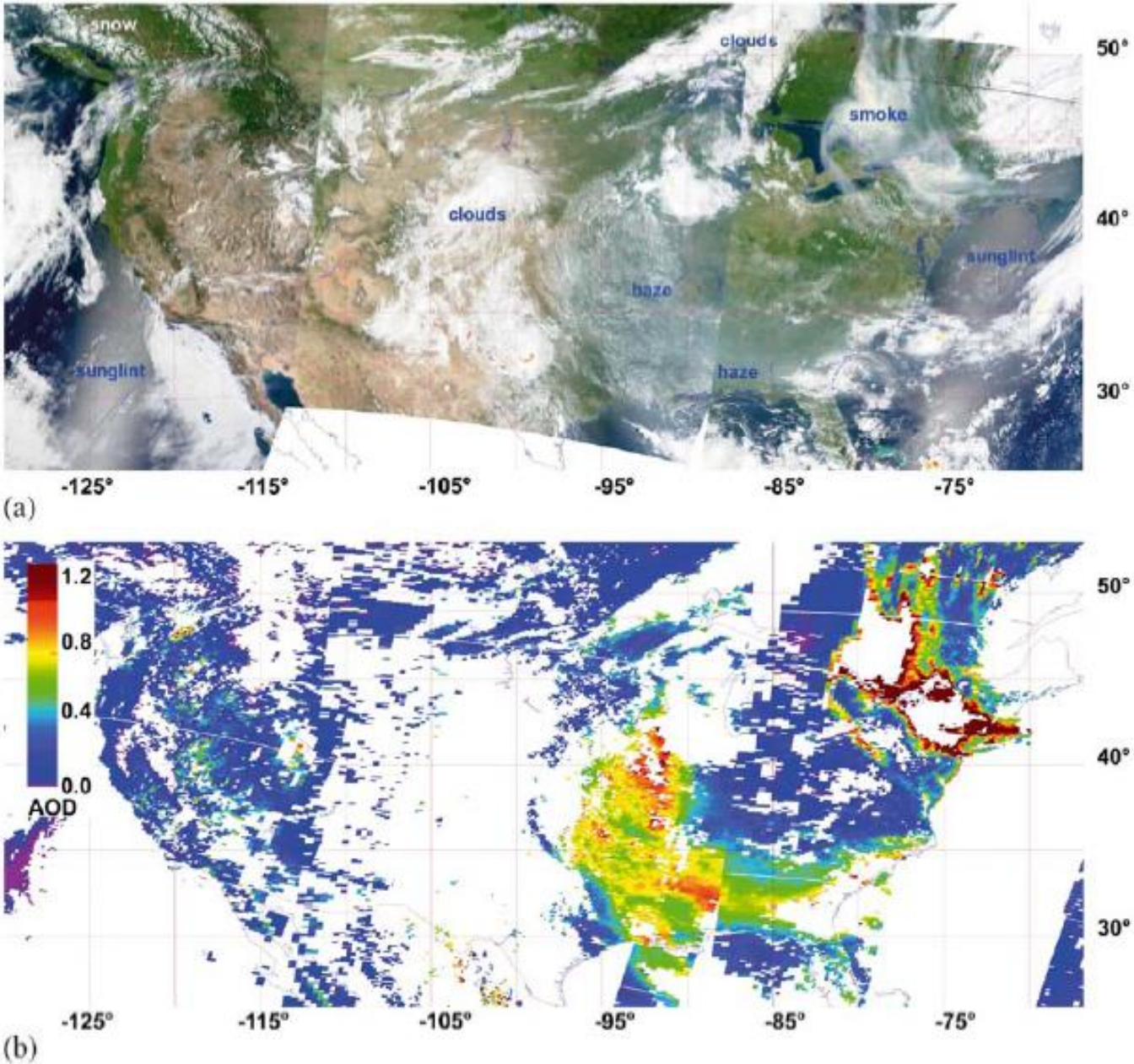
31 May 2010 - MODIS



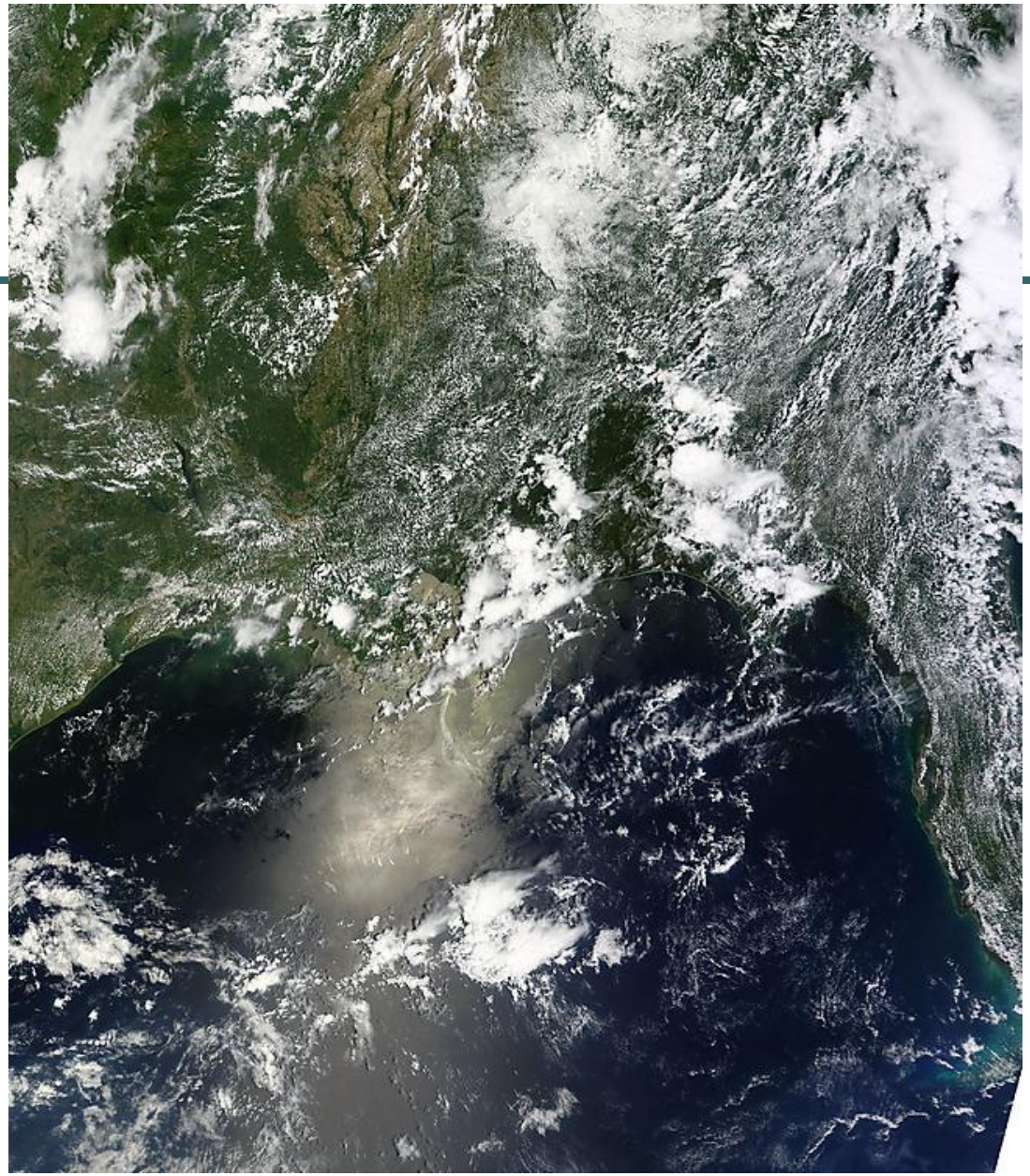
31 May 2010 – MODIS false color



J.A. Engel-Cox et al. / Atmospheric Environment 38 (2004) 2495-2509

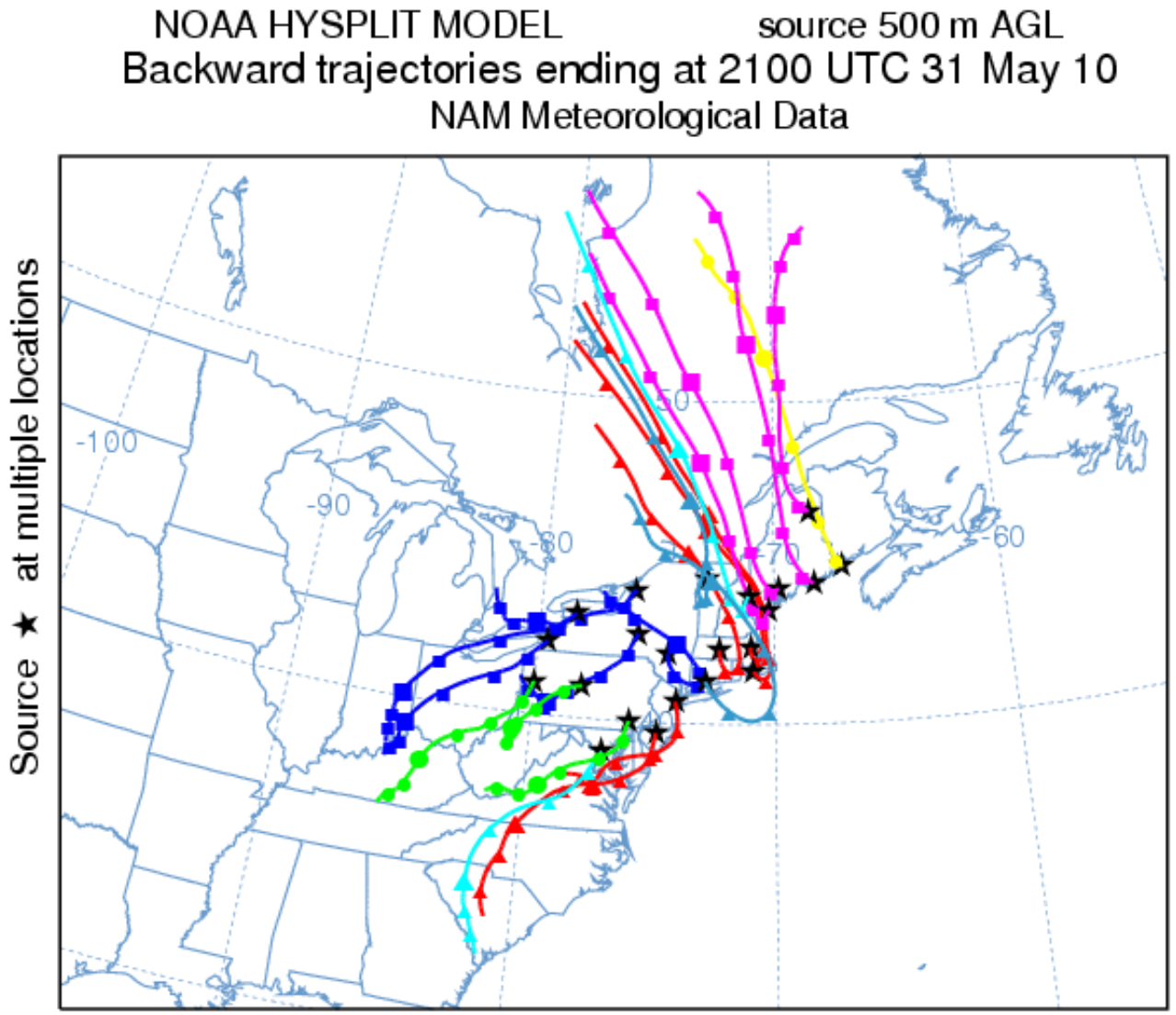


MODIS Data, 6 July 2002. (Upper) Level 1b RGB composite image; (Lower) Level 2 AOD.



Sunglint in Gulf of Mexico – 31 May

How do we know where the smoke originated?

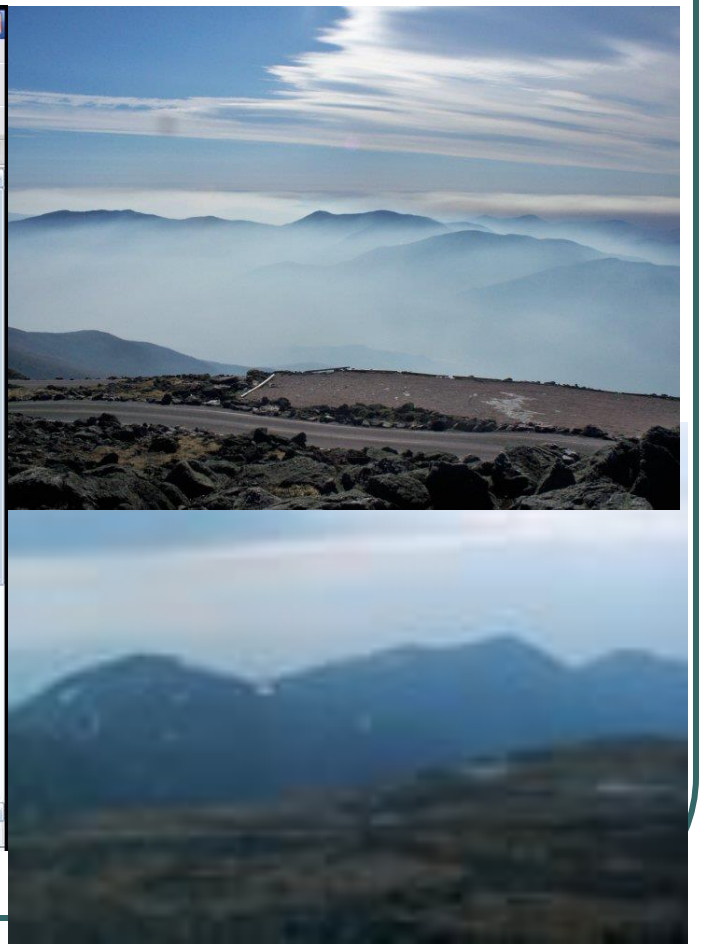

NOAA HYSPLIT MODEL
source 500 m AGL
Backward trajectories ending at 2100 UTC 31 May 10
NAM Meteorological Data
Source ★ at multiple locations
-100
-90
-80
-70
-60

Ground observations

Webcam view of downtown Burlington on the morning of May 31, 2010 showing visibility reduced to below 2 miles in smoke.

National Weather Service Burlington

Mt. Washington – 31 May, 2010

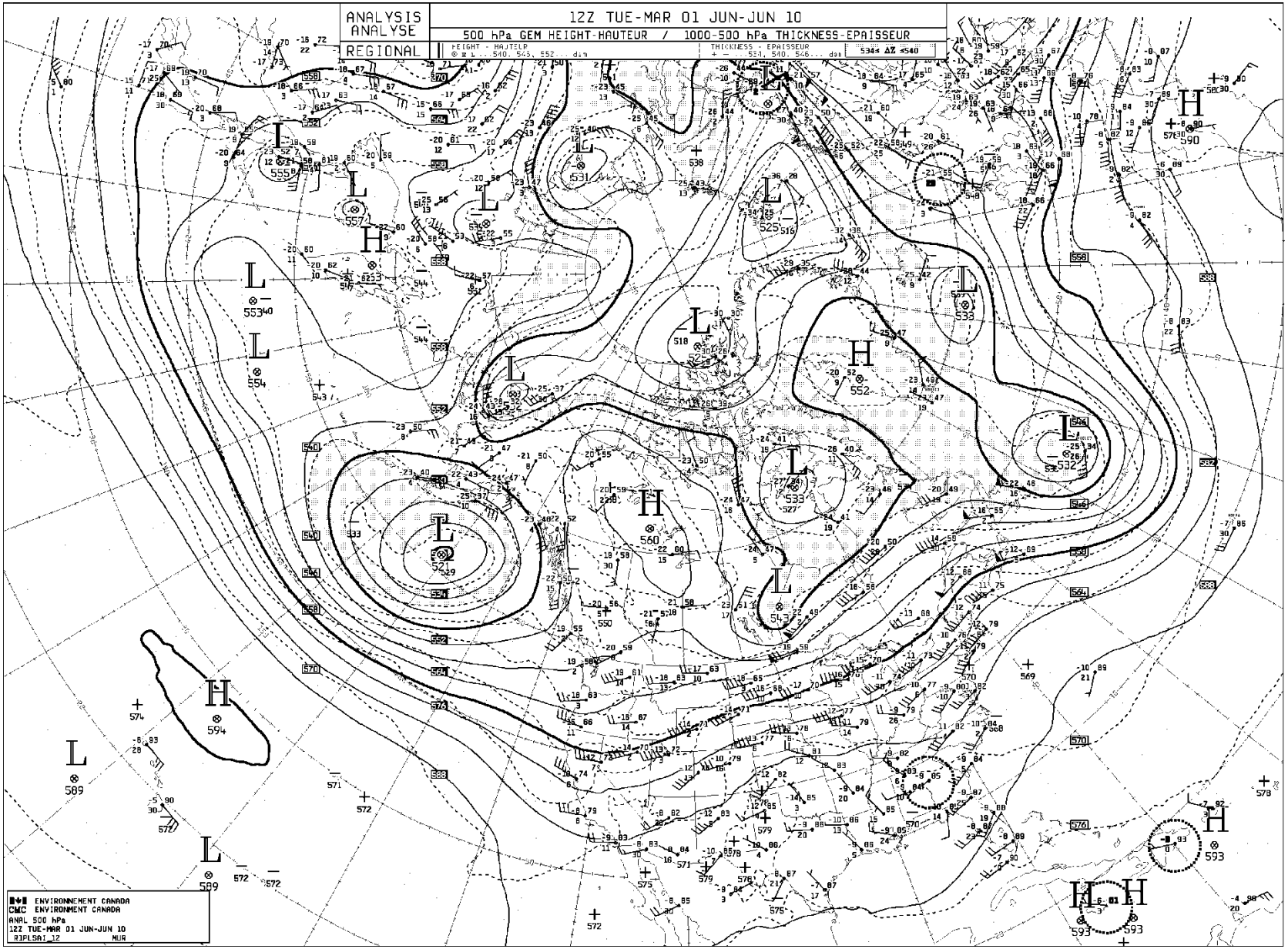


Images courtesy: Mt. Washington Observatory

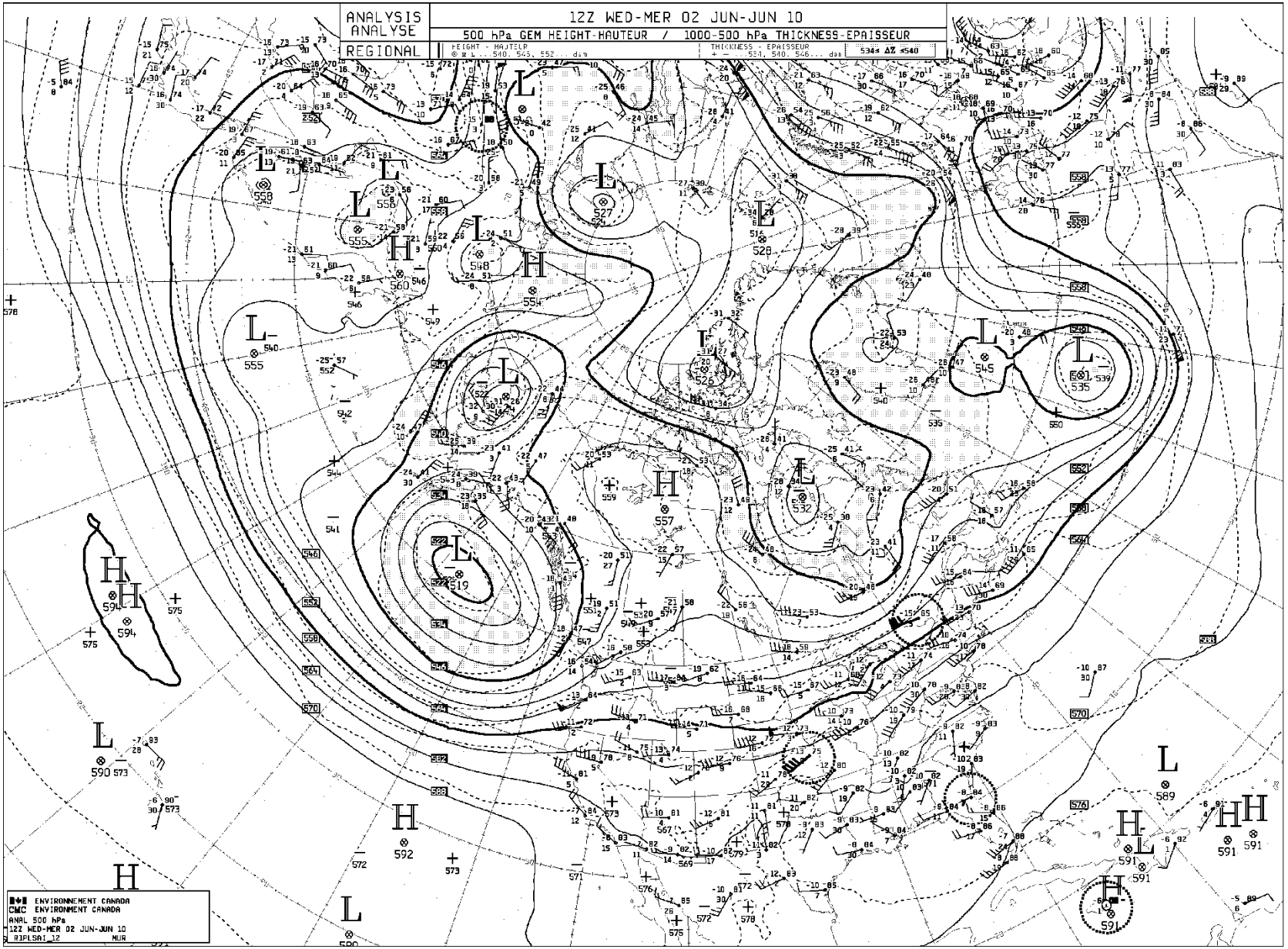
Brian Clark – Observer and Meteorologist (Mt. Washington)

- “We actually started to see effects from these wildfires earlier in our shift last week. Ryan commented on the red moon he saw a few days ago, which in retrospect, was most certainly caused by smoke or ash aloft. Yesterday morning, we saw the first signs of significant amounts of smoke with what I have been calling a "smoke undercast", for lack of better term, below the summit. We often see cloud undercasts, which are simply clouds that we are looking down on the tops of below the mountain. In this case, there was a distinct layer of smoke filling the valleys below and blocking our view of anything below about 5,000 feet.” 22:17 31 May, 2010

Why was this episode relatively short-lived?

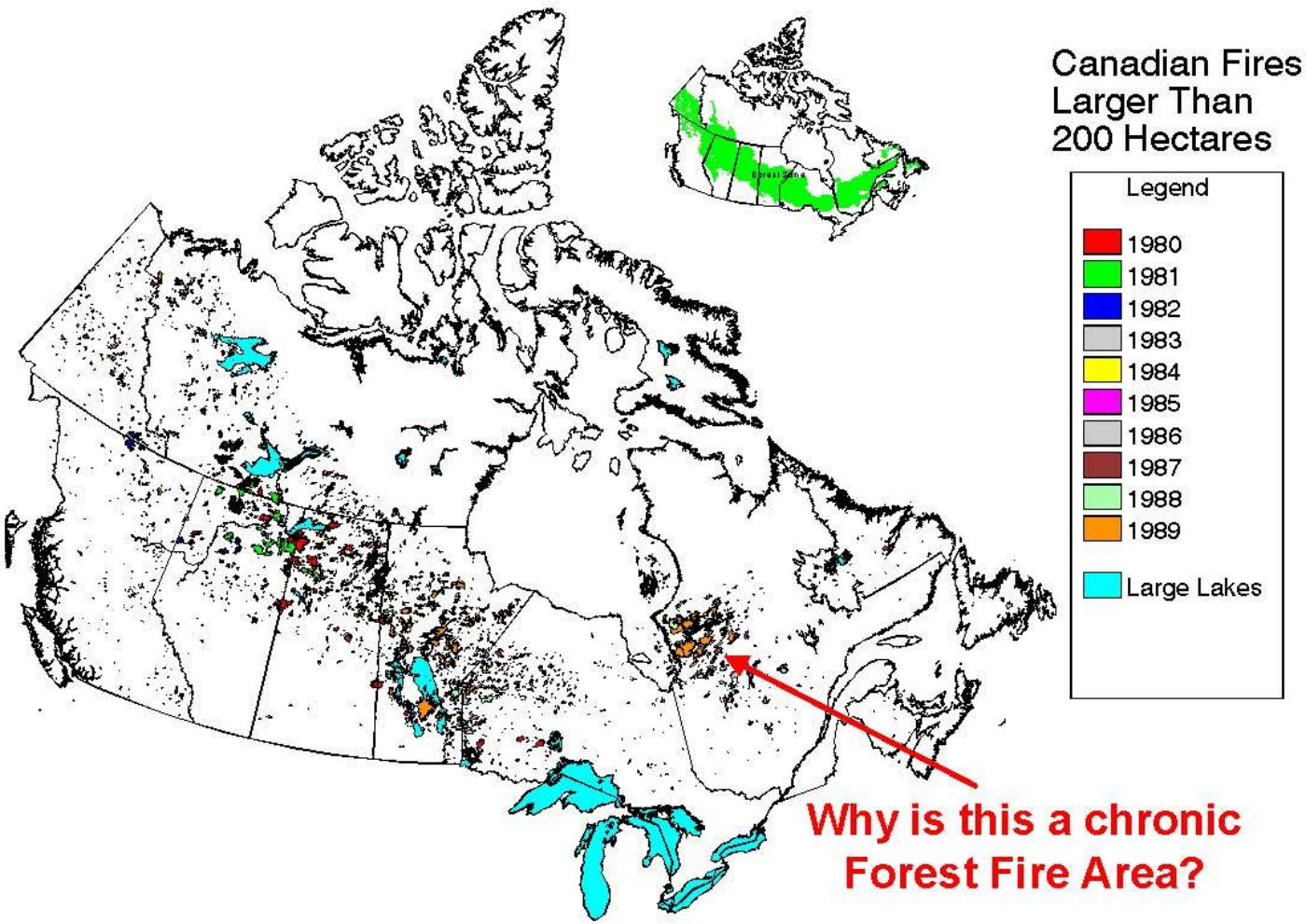


Jet stream (500-mb) map from Environment Canada – 1 June 2010



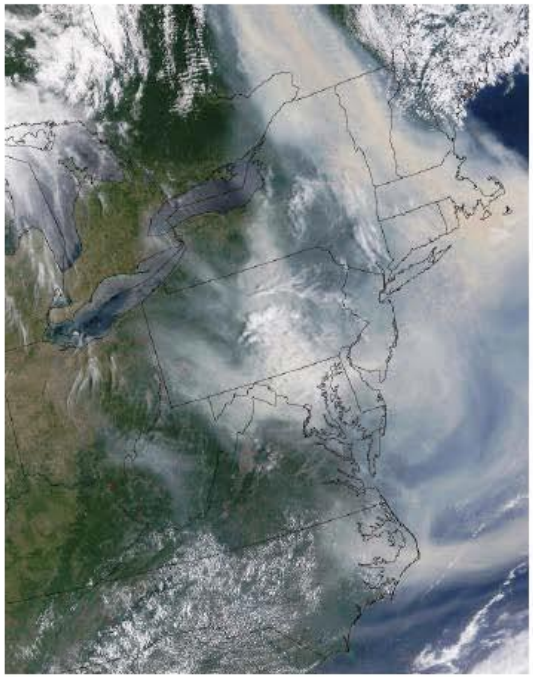
Jet stream (500-mb) map from Environment Canada – 2 June 2010

Why should we be interested in Quebec forest fires?


Canadian Fires
Larger Than
200 Hectares
Legend
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
Large Lakes
Why is this a chronic
Forest Fire Area?

July 7, 2002 was one of the haziest days ever observed in VT

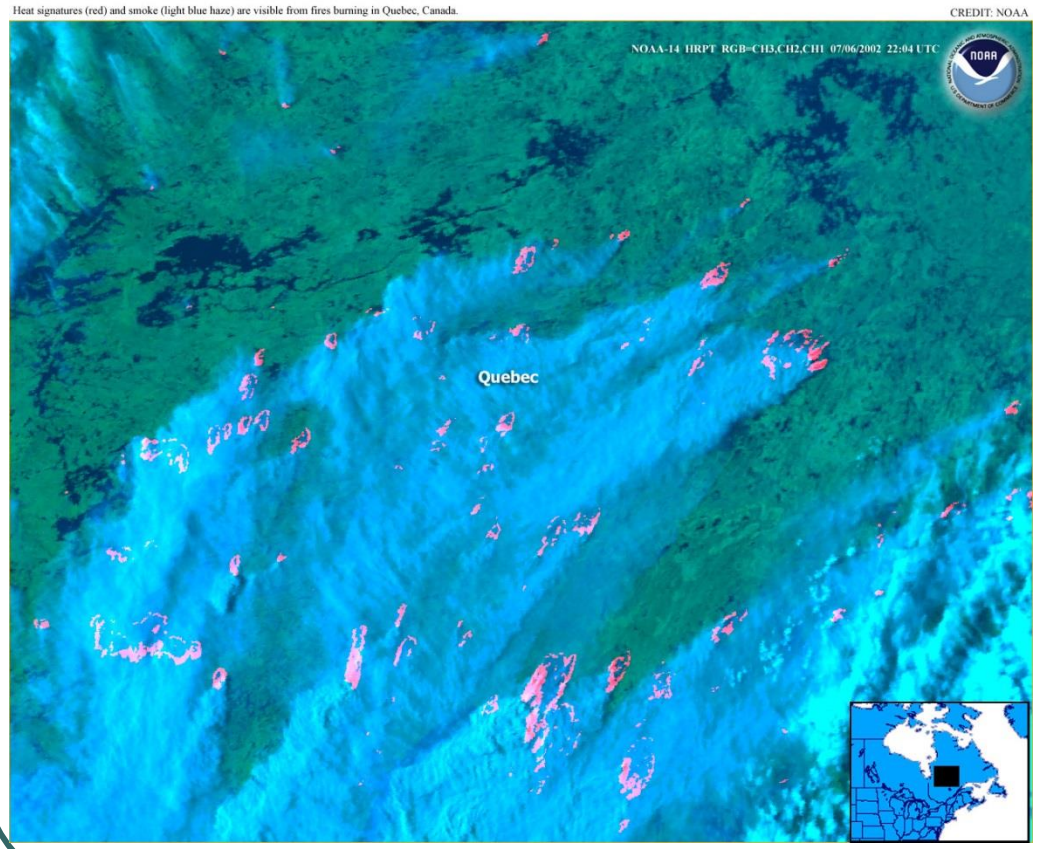
High PM concentrations, Poor Visibility, & unusual "Yellow" color



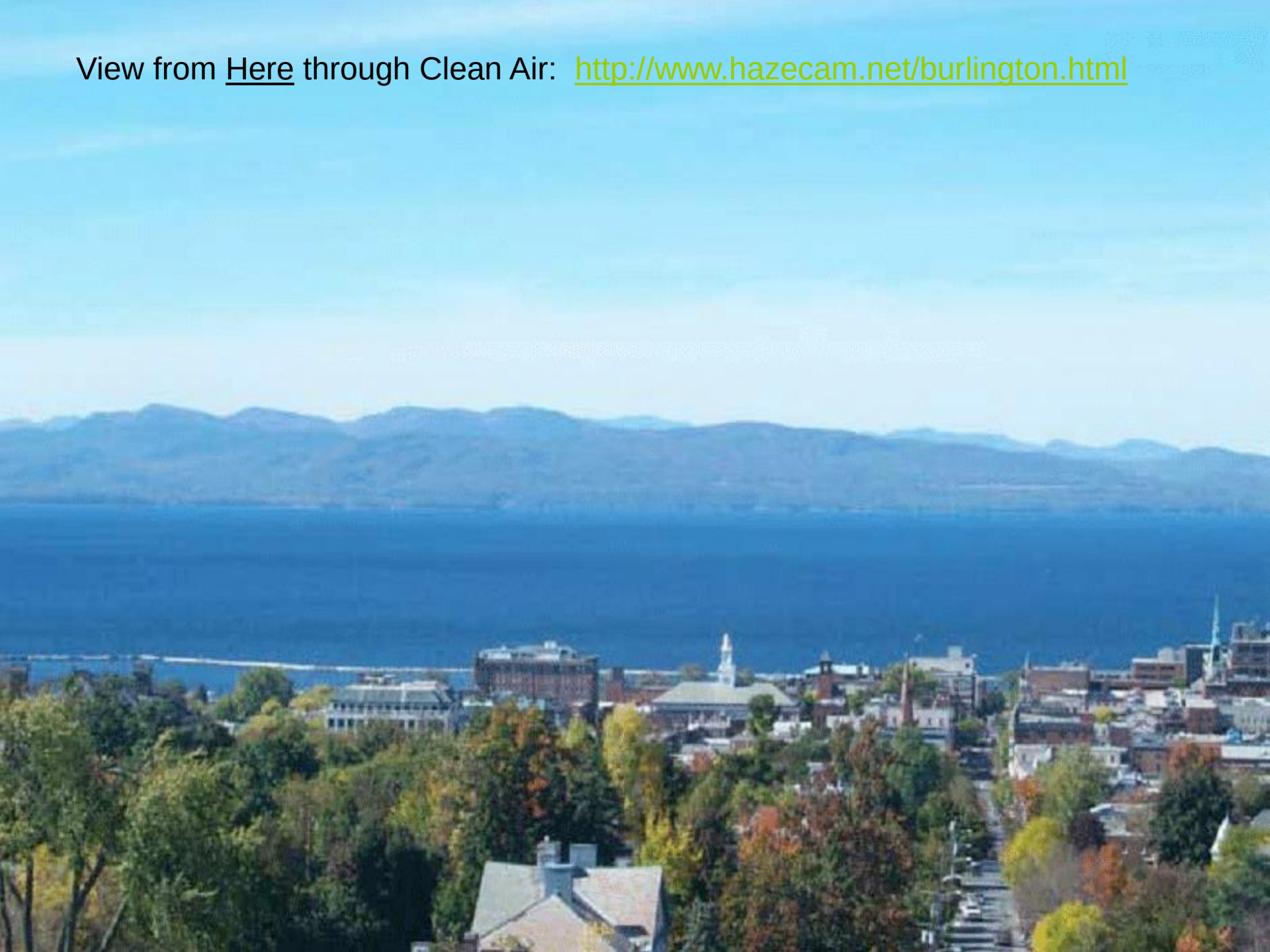
Smoke from Canadian forest fires casts a haze over Vermont.

Photo by Peter Huoppi in the Burlington (VT) Free Press 7/8/02 (taken 7/7/02)

Quebec forest fires



- 6 July, 2002
- smoke shown in light blue
- heat signatures in red
- GOES imagery
- thermal and visible bands

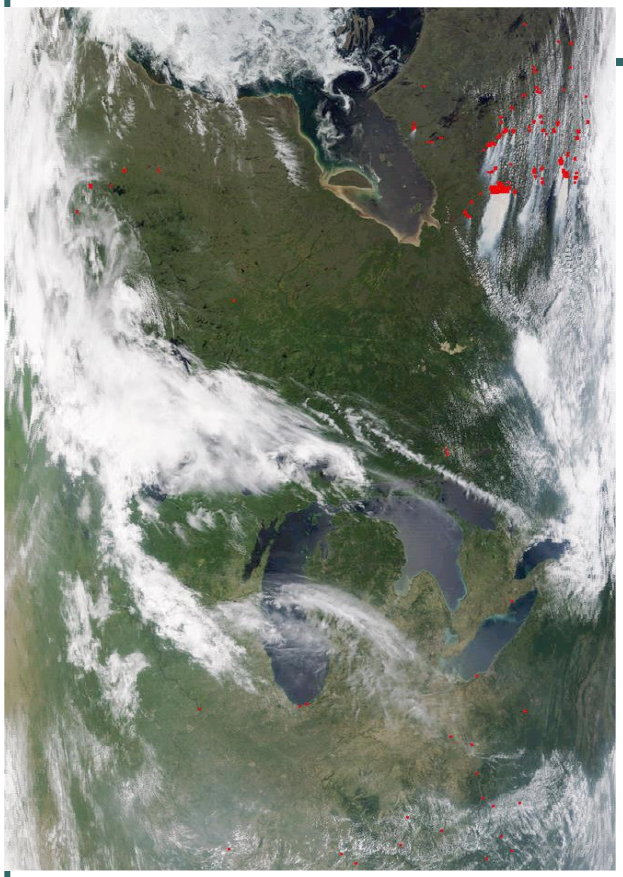

View from Here through Clean Air: http://www.hazecam.net/burlington.html

Quebec Forest Fire, 7/7/02

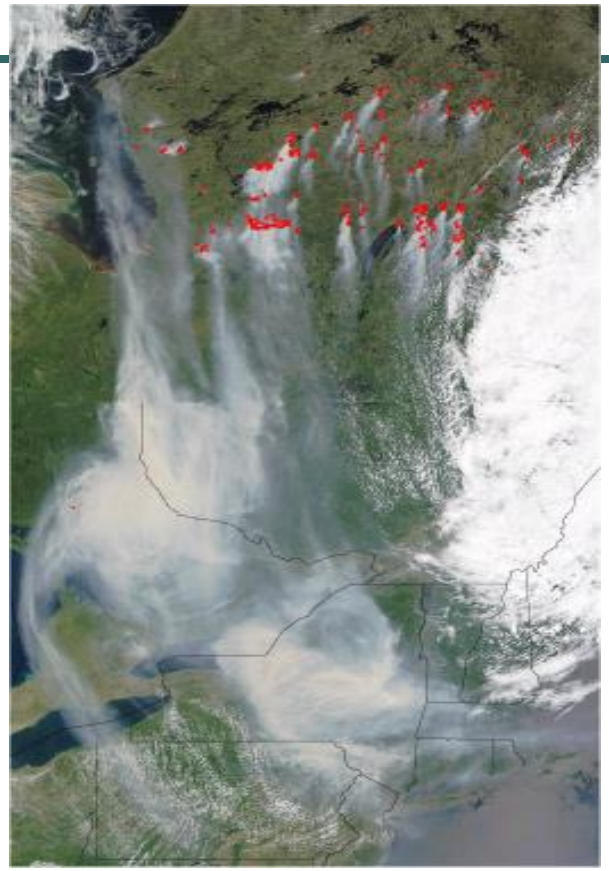
MODIS: The Fine-Scale Picture

MODIS Land Rapid Response System

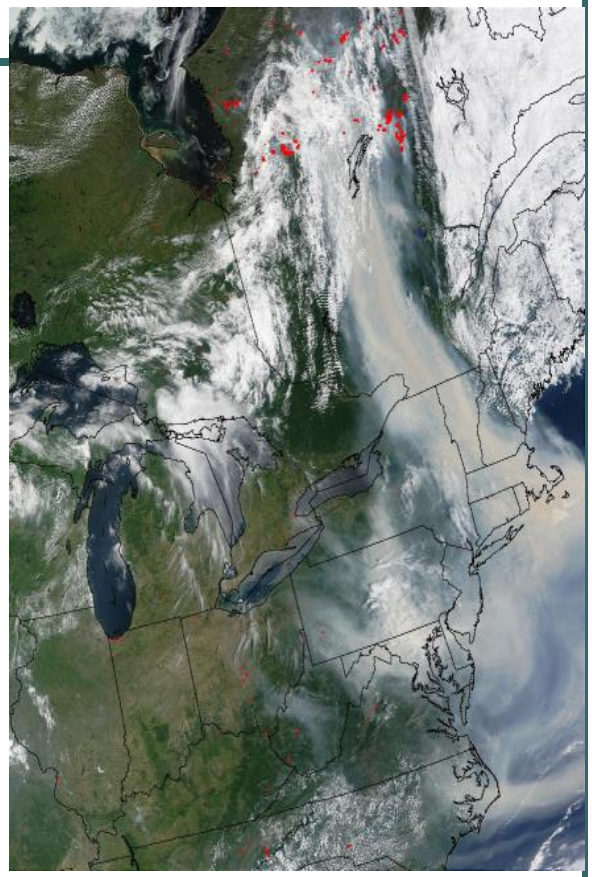
The Fires and the Smoke Transport of Smoke from N. Quebec to SE Canada and NE US.



7/5/02 MODIS

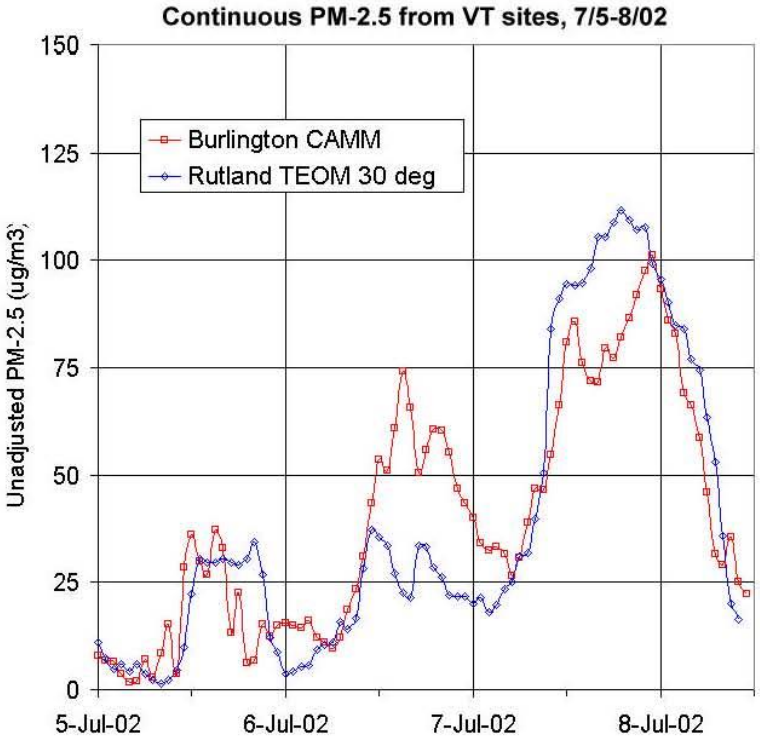


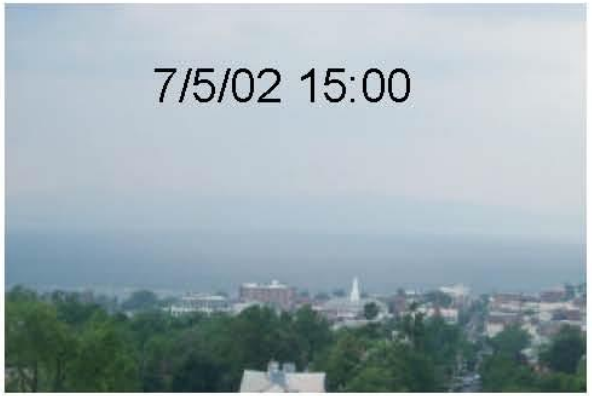
7/6/02 MODIS

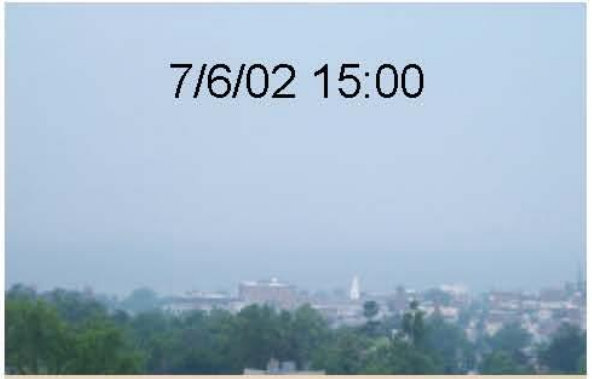


7/7/02 MODIS


Burlington, VT CAMNET


Continuous PM-2.5 from VT sites, 7/5-8/02
Unadjusted PM-2.5 (ug/m3)
150
125
100
75
50
25
0
Burlington CAMM
Rutland TEOM 30 deg
5-Jul-02
6-Jul-02
7-Jul-02
8-Jul-02

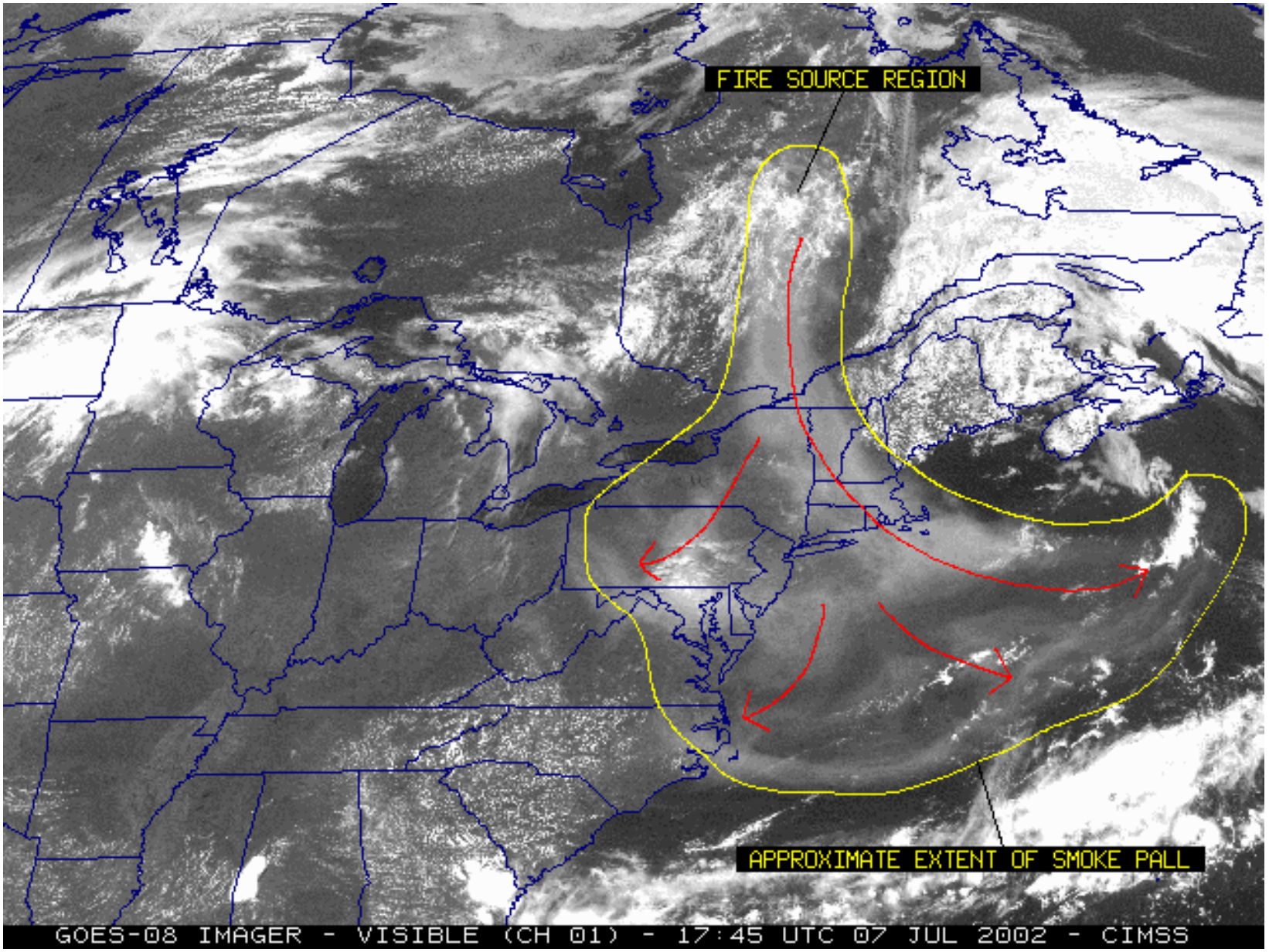

7/5/02 15:00


7/6/02 15:00

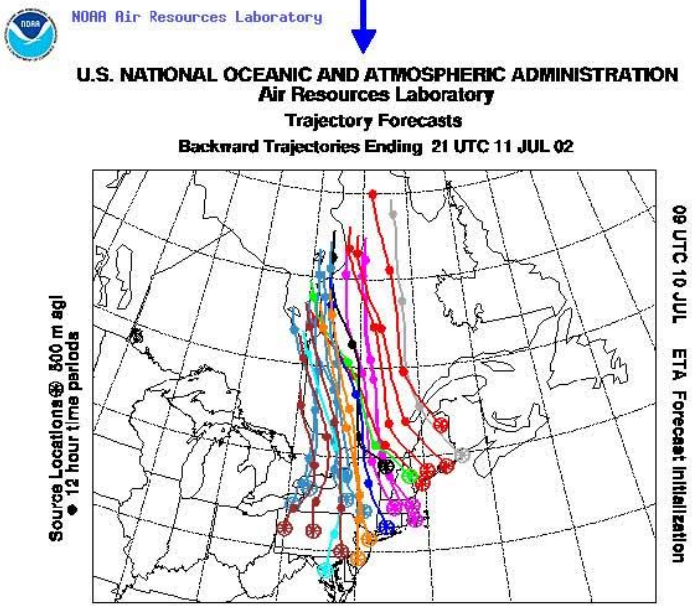

7/7/02 15:00

Acadia impact occurred later (7/8-10) than other NE sites.

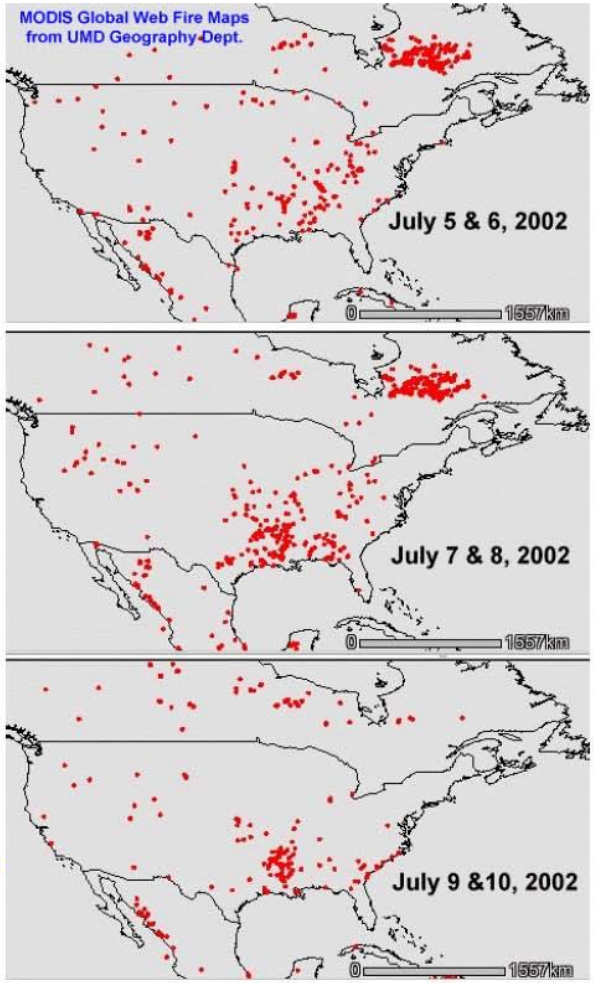
Burlington, VT camera faces West, so afternoon yellow color may be enhanced, but both the haze and the incident light had distinct yellow tint all day on 7/7/02.


FIRE SOURCE REGION
APPROXIMATE EXTENT OF SMOKE PALL
GOES-08 IMAGER - VISIBLE (CH 01) - 17:45 UTC 07 JUL 2002 - CIMSS

Concerns over More Smoke on 7/11/02 Proved Incorrect



It appears the Fires had largely been extinguished by July 9th or 10th →



Forest fire impacts

Forest fire impacts

- tropospheric ozone
- particulate matter
- aviation hazard
- human health

View of the Boston Skyline by automated CAMNET on 7/16/99

(a few hours before JFK Jr's plane went Down near Martha's Vineyard)

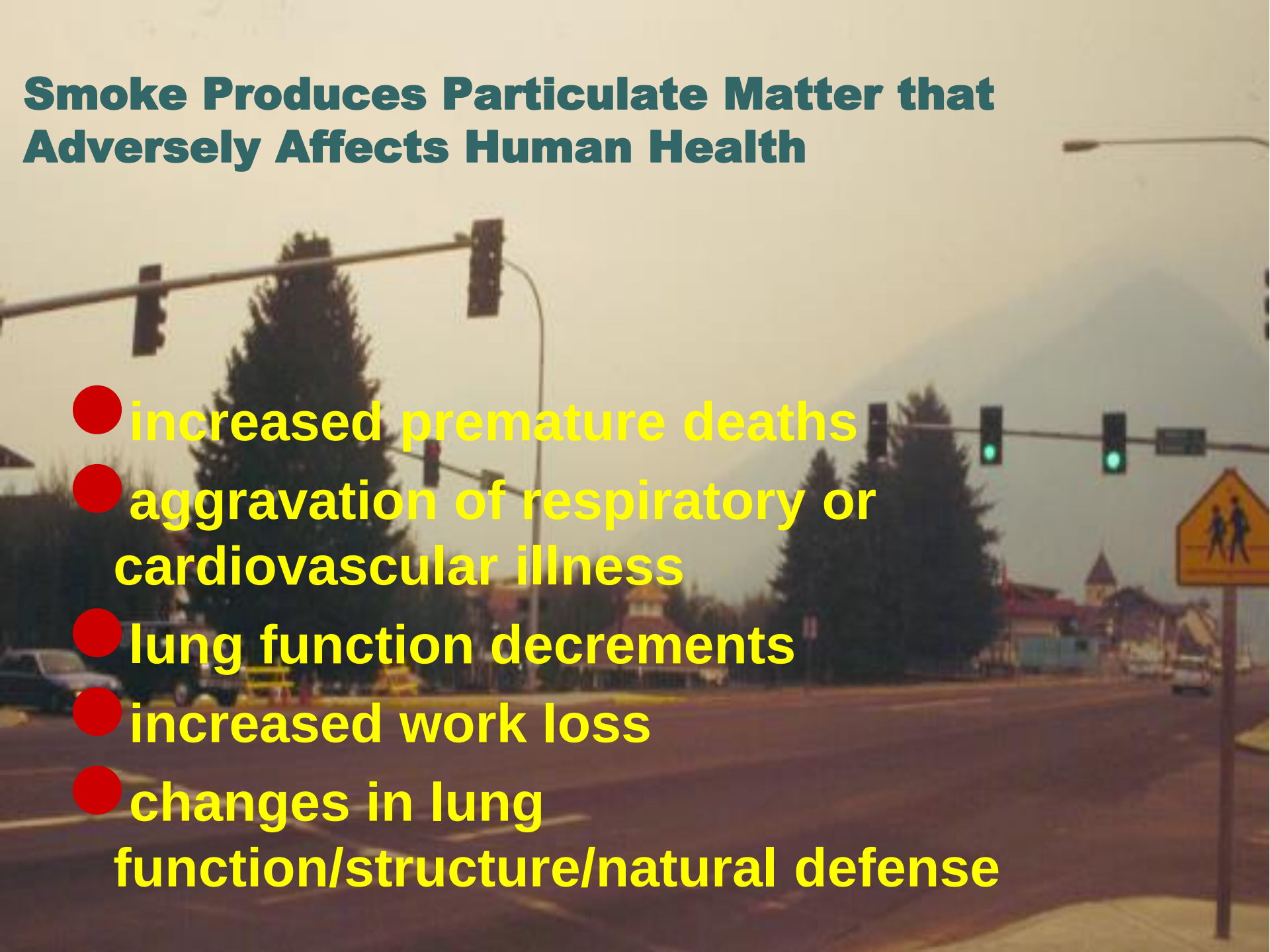
Ozone injury

Ozone injury to milkweed.

Ozone injury to yellow-poplar.

USFS

Smoke Produces Particulate Matter that Adversely Affects Human Health



- increased premature deaths
- aggravation of respiratory or cardiovascular illness
- lung function decrements
- increased work loss
- changes in lung function/structure/natural defense

National Air Quality Standards

Criteria Pollutants

- Carbon Monoxide
- Particulate Matter
- Ozone
- Nitrogen Oxide
- Lead
- Sulfur Dioxide

Key criteria pollutants generated by fire

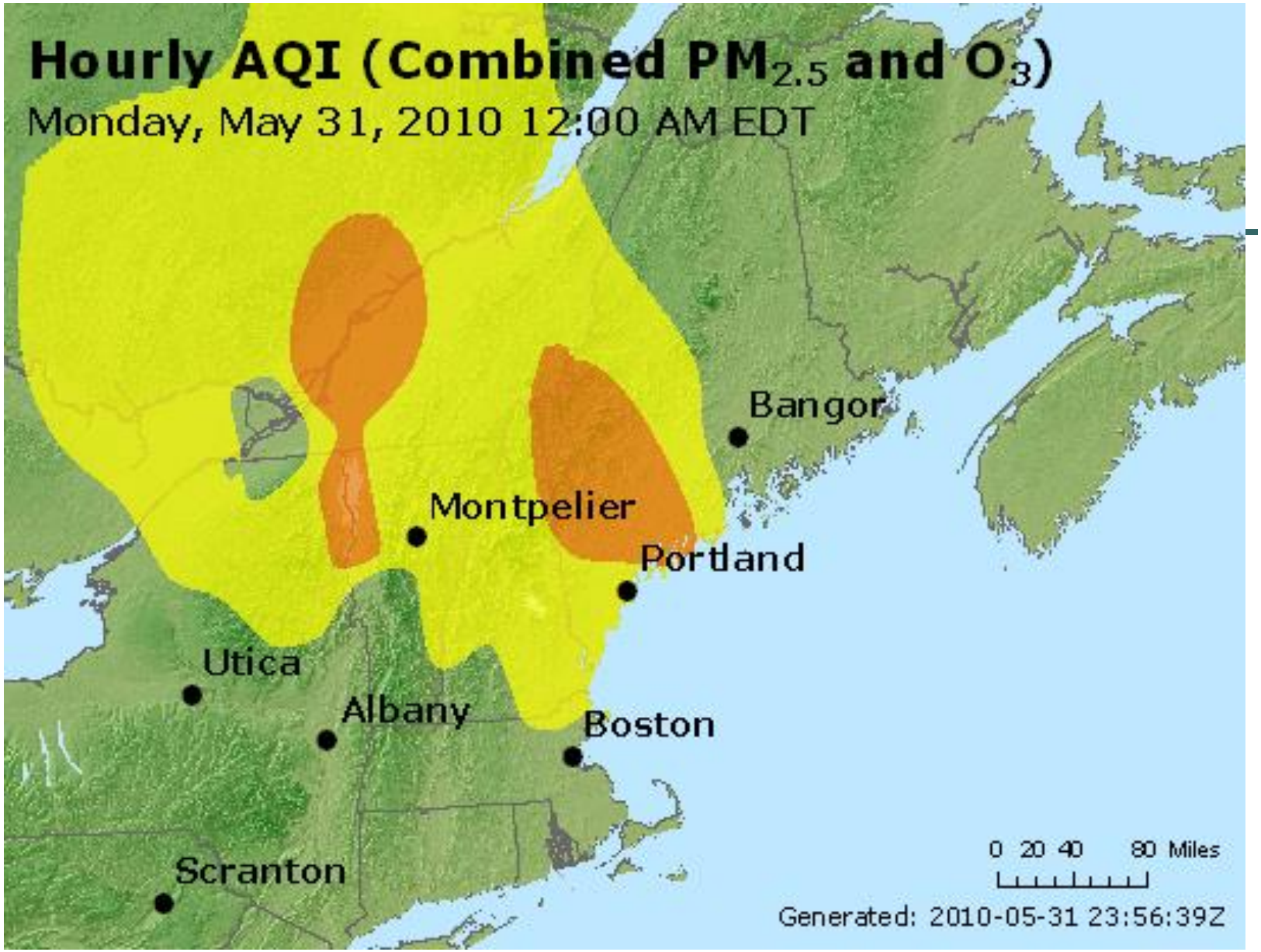


Image (or graphic) obtained from the U.S. Air Quality Smog Blog (http://alg.umbc.edu/usaq).

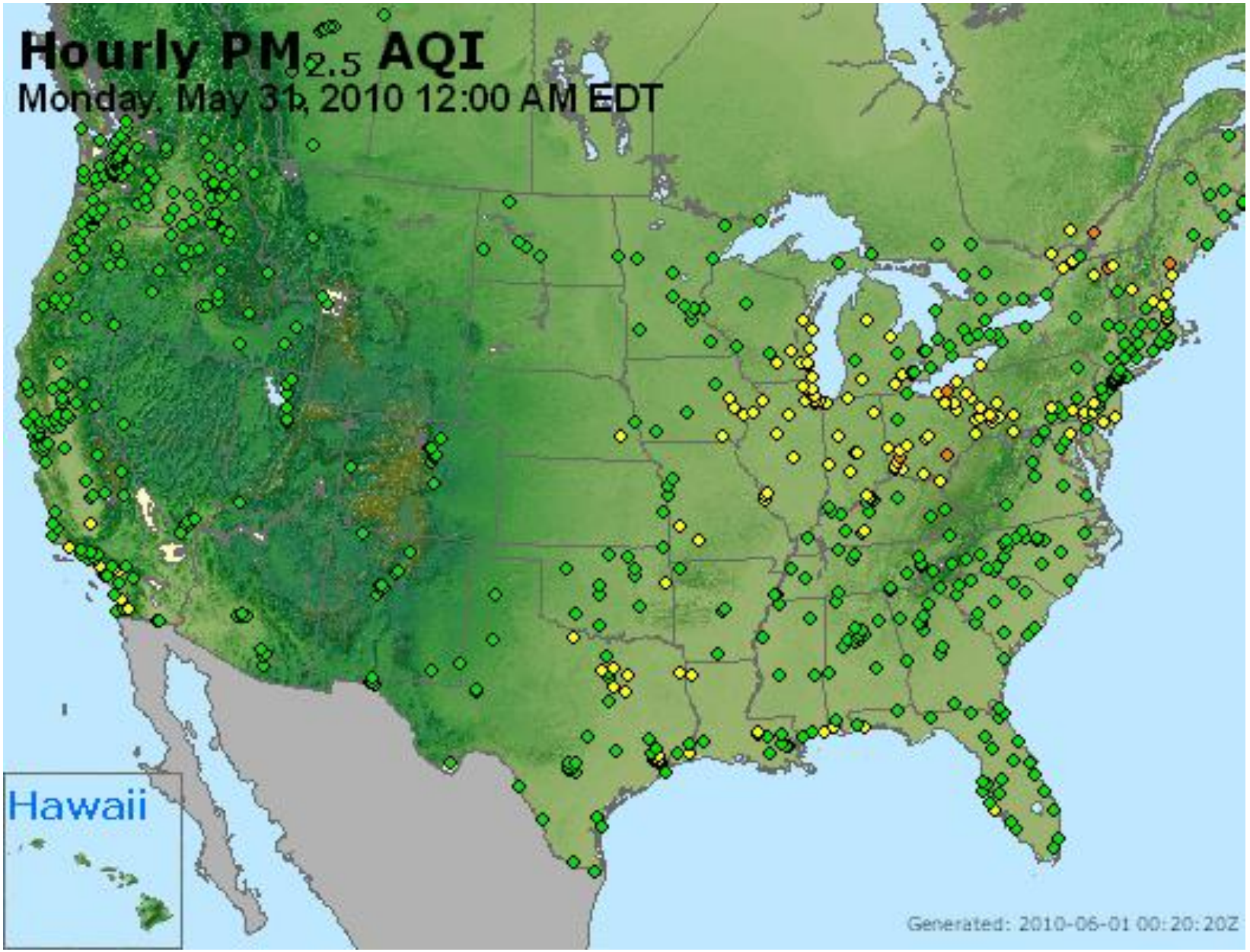


Image (or graphic) obtained from the U.S. Air Quality Smog Blog (http://alg.umbc.edu/usaq).

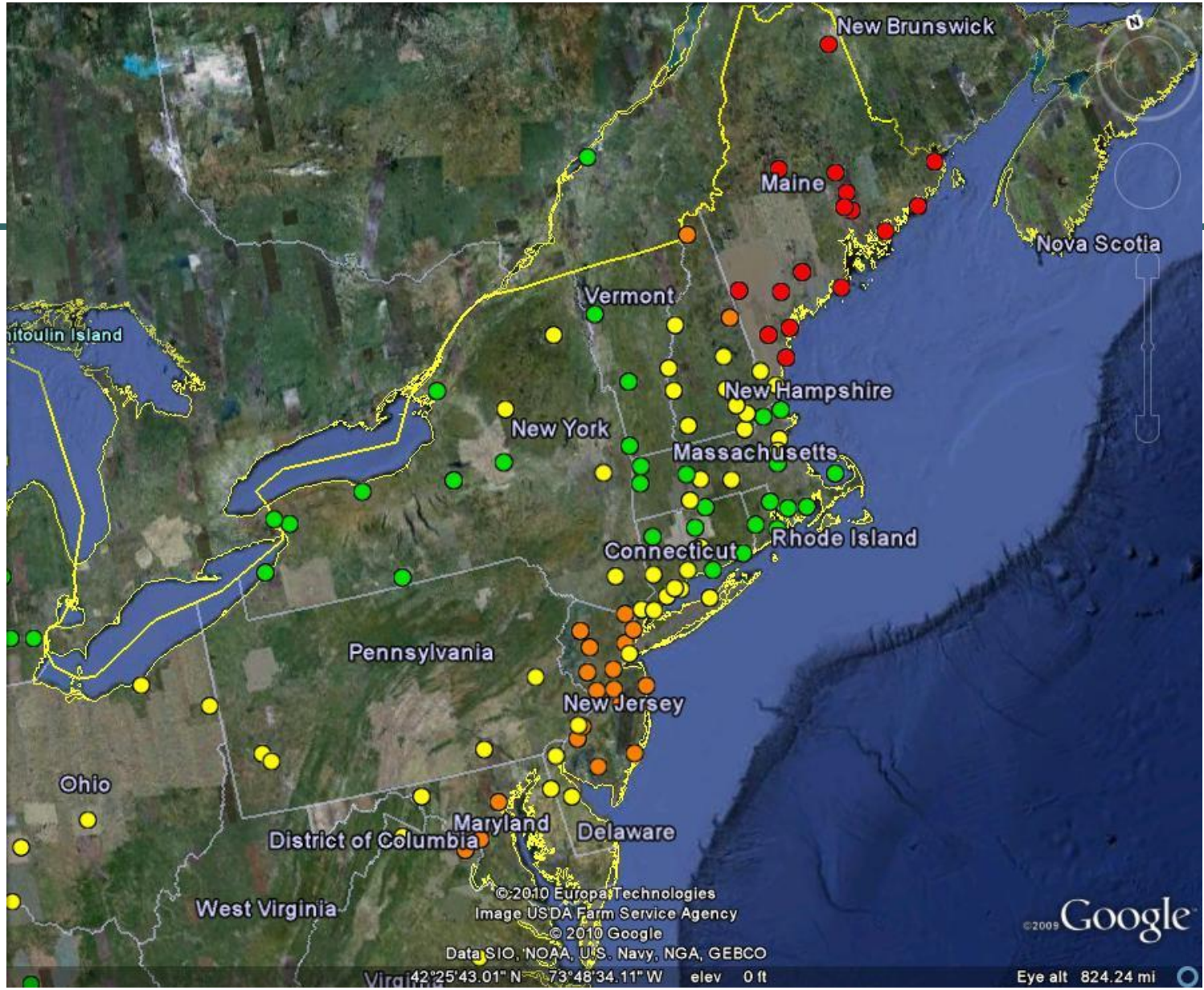

New Brunswick
Maine
Nova Scotia
Vermont
New Hampshire
New York
Massachusetts
Rhode Island
Connecticut
Pennsylvania
New Jersey
Ohio
Maryland
Delaware
District of Columbia
West Virginia
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Image USDA Farm Service Agency
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
42°25'43.01" N 73°48'34.11" W elev 0 ft
Eye alt 824.24 mi
©2009 Google