

HIGH-IMPACT TRANSPORTATION EVENTS

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Transportation accidents are in some ways like lightning – there are lots of incidents but only major events tend to get much national attention. But U.S. Department of Transportation statistics show that about 7400 people are killed in the United States in an average year due to weather-related accidents. This dwarfs the fatalities due to severe storms and other direct weather causes.

This paper focuses mainly on the impacts of weather on aviation during 2009. Weather delays and other impacts cost the aviation industry billions of dollars per year. And in this case, weather impacts quite often did gather national attention.

One aviation incident was due to a flock of geese, which clogged the engines of US Airways flight 1549 on January 15, 2009, forcing a perfect emergency landing on the Hudson River. While most bird encounters don't cause accidents or fatalities, the incidents are by no means rare. More than 7000 encounters have been reported per year recently, with hundreds of millions of dollars in losses from repair costs and lost time. This incident brought additional impetus to programs already in place to seek solutions to the problem.

Aircraft icing and the pilot response to it caused the deadly crash of Continental 3407 in Western NY on February 12, 2009. As is usually the case with aircraft

icing events, the weather looks rather tame by “severe weather” standards, with rather low radar reflectivities, and radar tops below 8,000 feet. A separate paper at this conference gives a more thorough examination of the causes, including orographic effects.

Delays on the tarmac made big news in 2009 because of specific incidents, though only 0.01% of flights experienced such delays of 3 hours or more. Most of the delays were in December 2008, January, June, and July 2009.

The most notorious tarmac delay was probably on August 7, 2009, when passengers of a Continental Connections flight 2816 were diverted from their intended landing at Minneapolis, MN and wound up spending the night (6h+) in the aircraft on the tarmac at Rochester, MN. Lines of thunderstorms crossed the state that evening/night, but – like many aviation situations – this was by no means an extreme severe thunderstorm event. National attention brought to tarmac delays by this incident played a significant role to the Department of Transportation enacting new regulations on December 21, 2009 increasing passenger rights and airline fines for their violation in these situations.

Just about everyone who has flown has experienced delays, often related to weather. There were more than 4000 flights in 2009 delayed by 2 hours or more, but just 0.08% of all flights. These can occur for a variety of reasons, either because of adverse weather at one or more airports or their holding areas, or because of weather impacting the airspace typically used between airports. Delays originating in one area can then have a “domino” effect, affecting many other airports because of delays of arriving aircraft and crew.

There is no shortage of examples of weather causing flight delays. One instance occurred on March 1, 2009 when a winter storm or blizzard affected Charlotte, NC and parts of the Mid-Atlantic. 1400 people spent the night in the terminal at Charlotte.

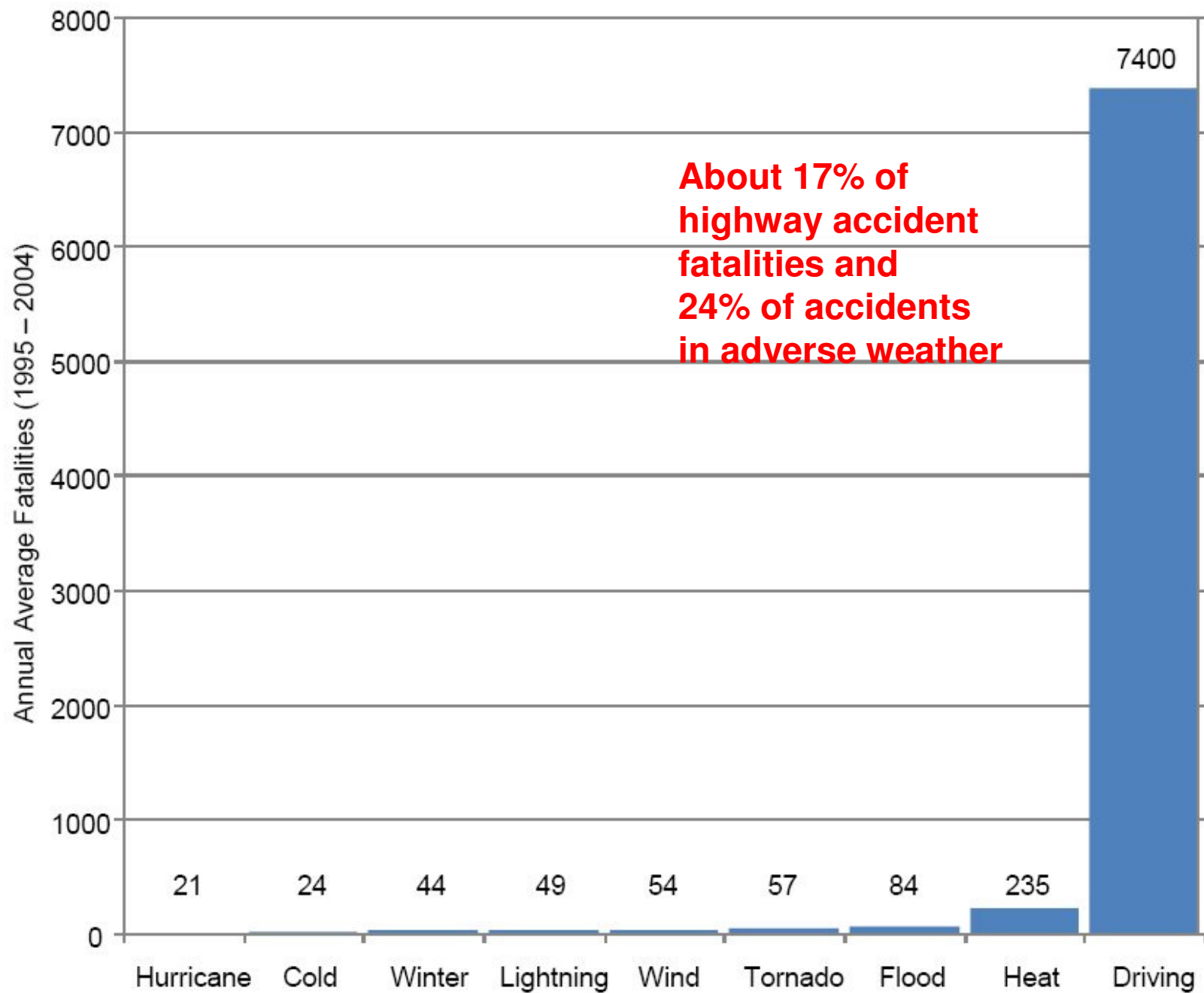
An incident that the author experienced first-hand was from a rainstorm at New York City and the Northeast on July 23, 2009. It was not even a thunderstorm event to start, but an ill-positioned band of rain, low ceilings, and low visibility stalled over New York City that kept my plane from getting to Boston. My departure was delayed about 3 hours.

Patches of thunderstorms on July 26, 2009 moved repeatedly in the area near Washington, DC, Baltimore, Philadelphia, Newark, and New York City, impacting the flight routes. Delays of 5 hours ensued at Newark and 4 hours at JFK in New York.

Rainy weather and equipment problems resulted in more than 800 flight delays in the Northeast during the week of November 19, 2009.

PERCEPTIONS AND REALITY

- Major weather disasters get most national attention
- But lightning often cumulatively causes more deaths
- Even more deaths due to heat
- Far more deaths due to weather-related traffic accidents



No Shortage of Weather Driving Impacts



OREGON LOCAL NEWS

Real-Time updates and breaking news from Portland and Oregon

INSIDE OREGON NEWS

with *The Oregonian*

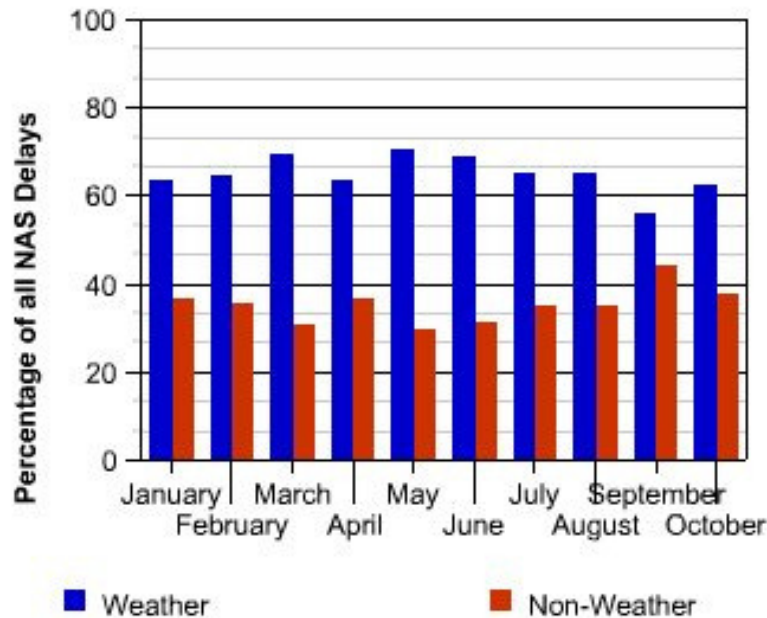
Commuters disgruntled at warning, response to Tuesday's drivetime snow storm

By *The Oregonian*

December 30, 2009, 8:47PM

Ice, Thunderstorms, Birds, and Other Air Transportation Woes, 2009

- Weather caused about 60% of flight delays in 2009



Source: FAA, US DOT
RITA – Bureau of Transportation
Statistics

- Airline industry loses about \$3 billion each year in fuel costs, expense vouchers, and other costs associated with weather delays and cancellations (Kulesa, 2002)
- Delays can be from local weather or from en-route weather, then cascade regionally and nationwide – domino effect

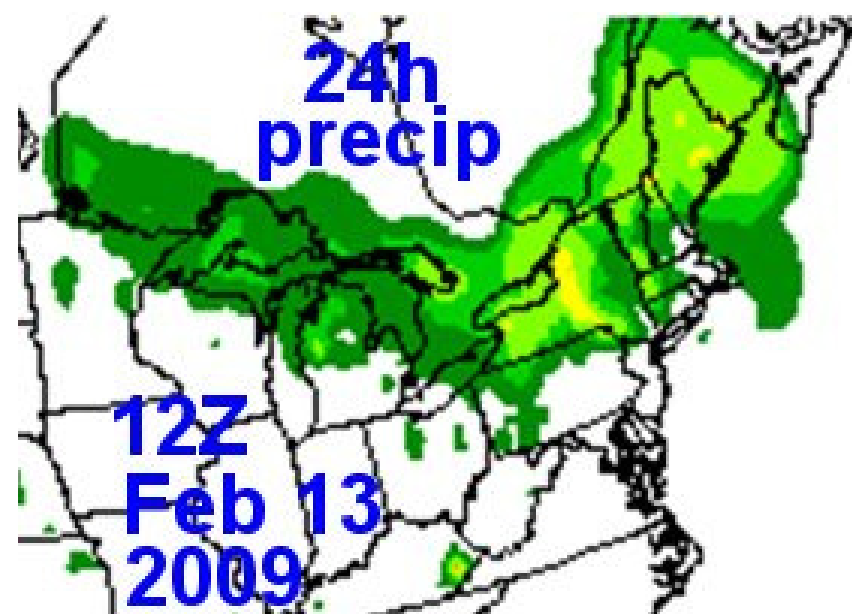
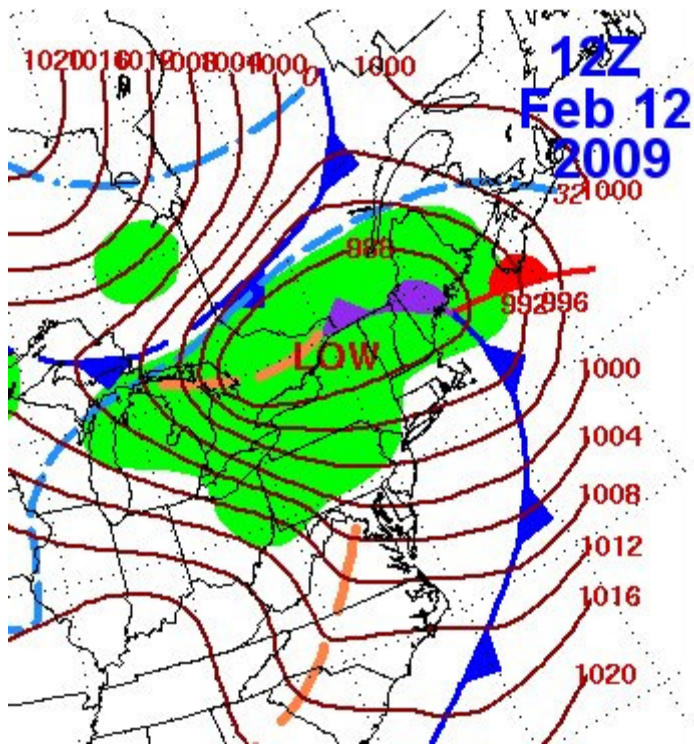
January 15, 2009 – Flock of Canadian Geese bring down US Airways Flight 1549 in Hudson River

- over 7500 bird and wildlife strikes in US in 2008 to civil aviation
- record pace through mid-2009
- \$600 million in US losses per year to civil aviation
- \$100 million in US losses per year, military
- 219 deaths worldwide since 1988



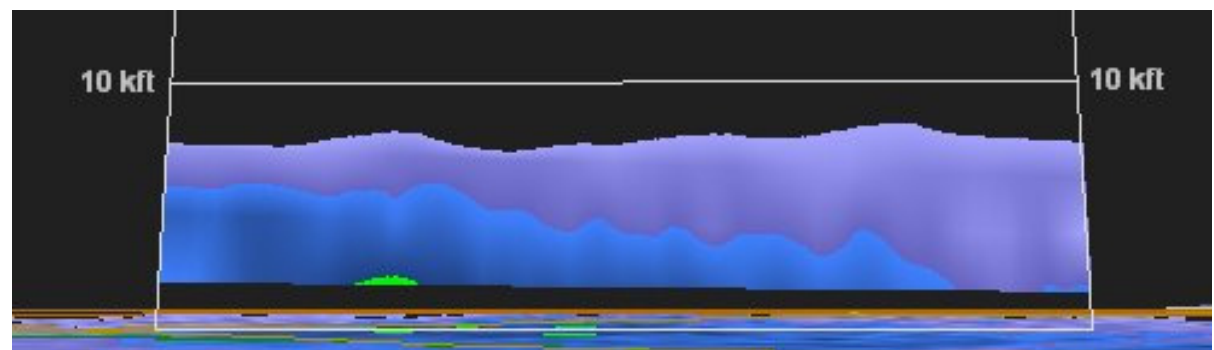
Source: Flickr <http://flickr.com/photos/22608787@N00/3200086900> Plane crash into Hudson River

February 12
Continental Connection 3407, Clarence Center, NY
Aircraft Icing - deadliest crash in more than 7 years



49 killed + 1 on ground

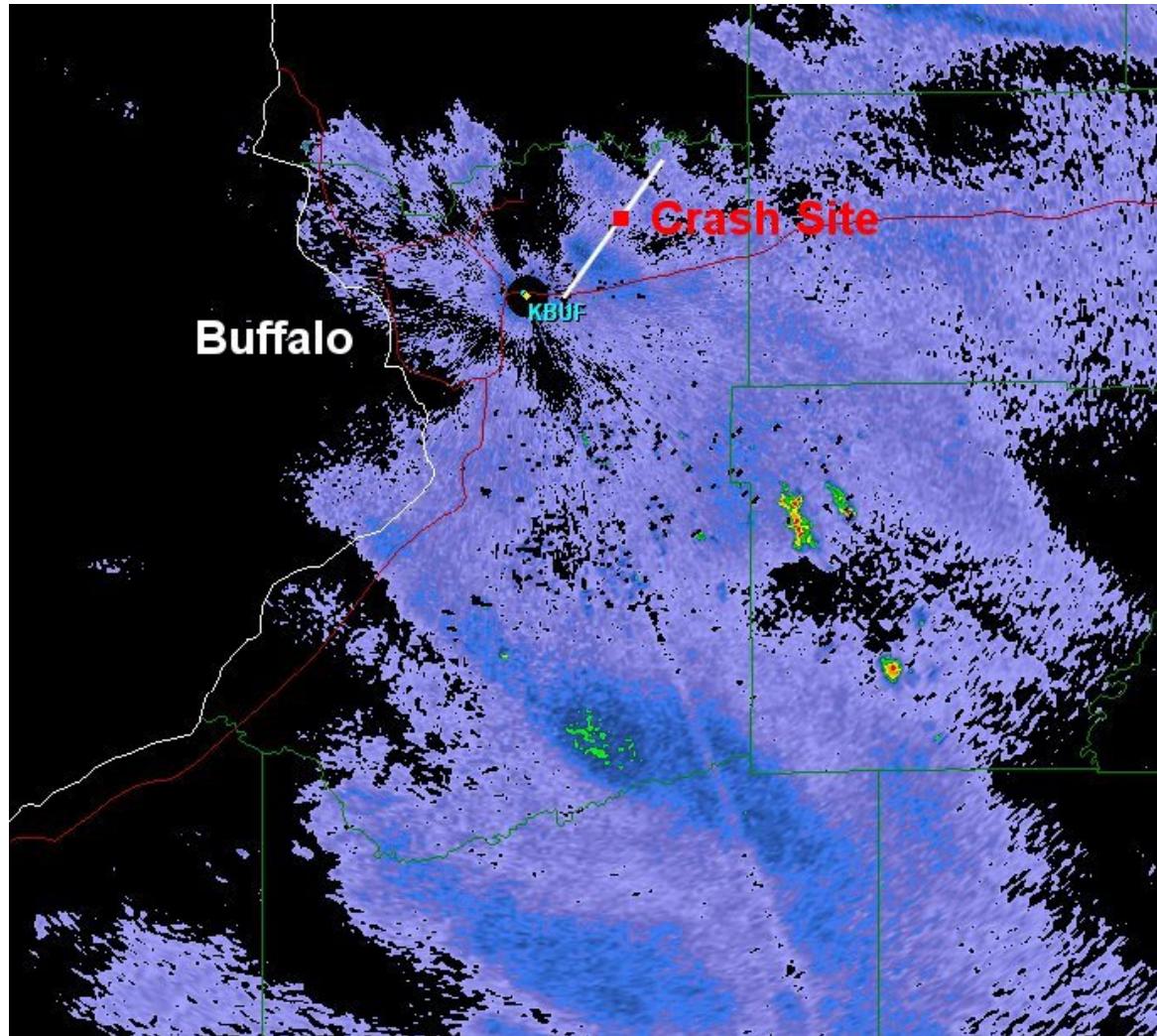
**Heaviest precip
Area
Feb 13, 2009
0314Z**



**Feb 13, 2009
0314UTC**

BUF Radar

**Max about
30 dBZ →**



**Max
20-29
dBZ**



WEATHER DELAYS

- **Numerous instances of weather snarling air transportation**
- **Long tarmac delays prompt push for Airline Passengers' Bill of Rights Legislation**

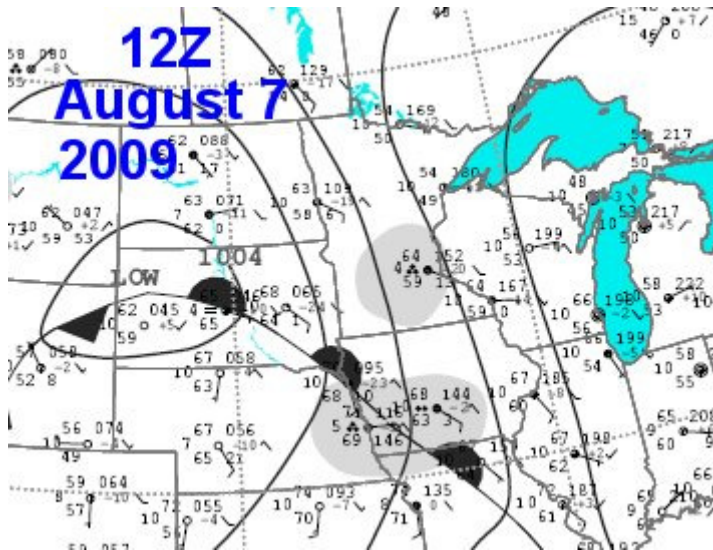
TARMAC DELAYS

Oct 2008-Oct 2009

| | Number of Regularly Scheduled Flights | Tarmac Times of 3 Hours or Longer | |
|-----------|---------------------------------------|-----------------------------------|---------|
| | | Total | Percent |
| Oct 2008 | 556,205 | 49 | 0.01 |
| Nov 2008 | 523,272 | 7 | 0.00 |
| Dec 2008 | 544,958 | * 187 | 0.03 |
| Jan 2009* | 532,339 | * 87 | 0.02 |
| Feb 2009 | 488,410 | 43 | 0.01 |
| Mar 2009 | 557,422 | 88 | 0.02 |
| Apr 2009 | 537,793 | 81 | 0.02 |
| May 2009 | 546,832 | 35 | 0.01 |
| June 2009 | 557,594 | * 278 | 0.05 |
| July 2009 | 580,134 | * 164 | 0.03 |
| Aug 2009 | 568,301 | 70 | 0.01 |
| Sep 2009 | 510,852 | 6 | 0.00 |
| Oct 2009 | 531,799 | 12 | 0.00 |

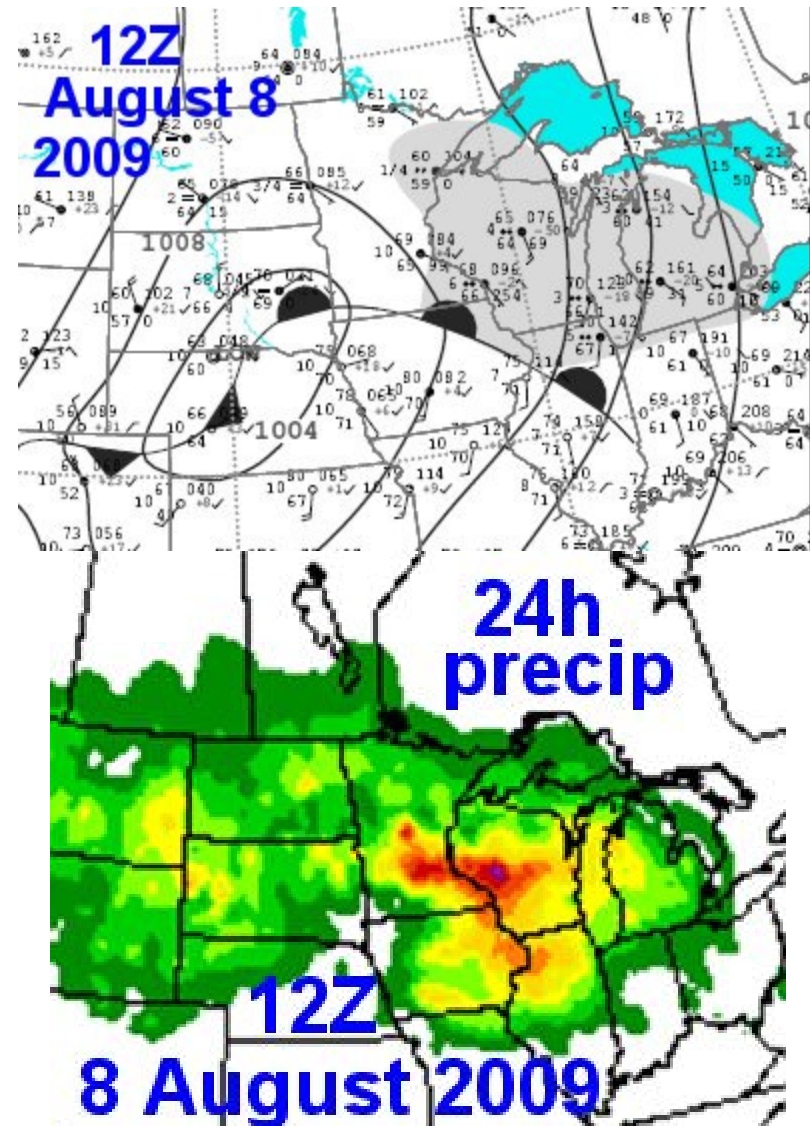
0.01% of flights had 3+ hour tarmac delays (US DOT RITA/BTS)

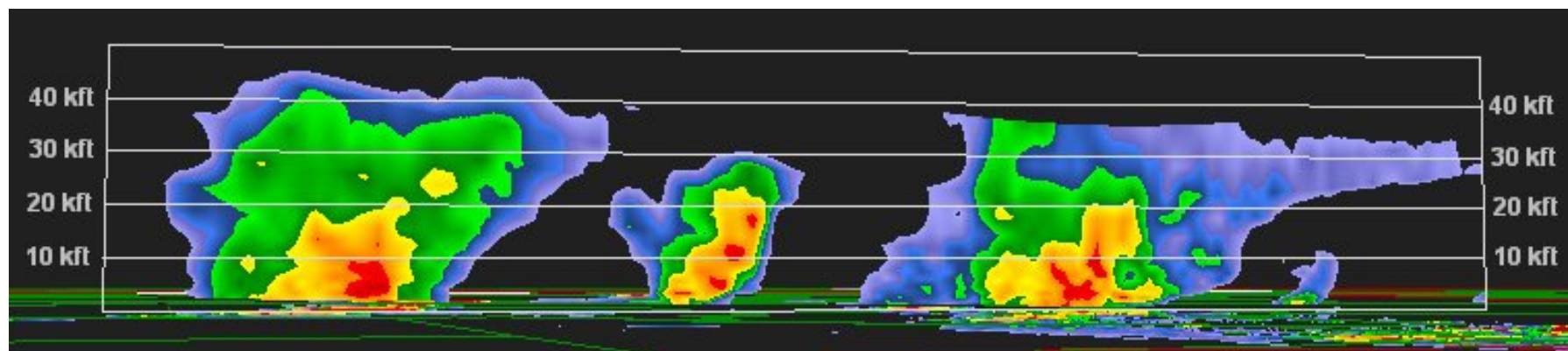
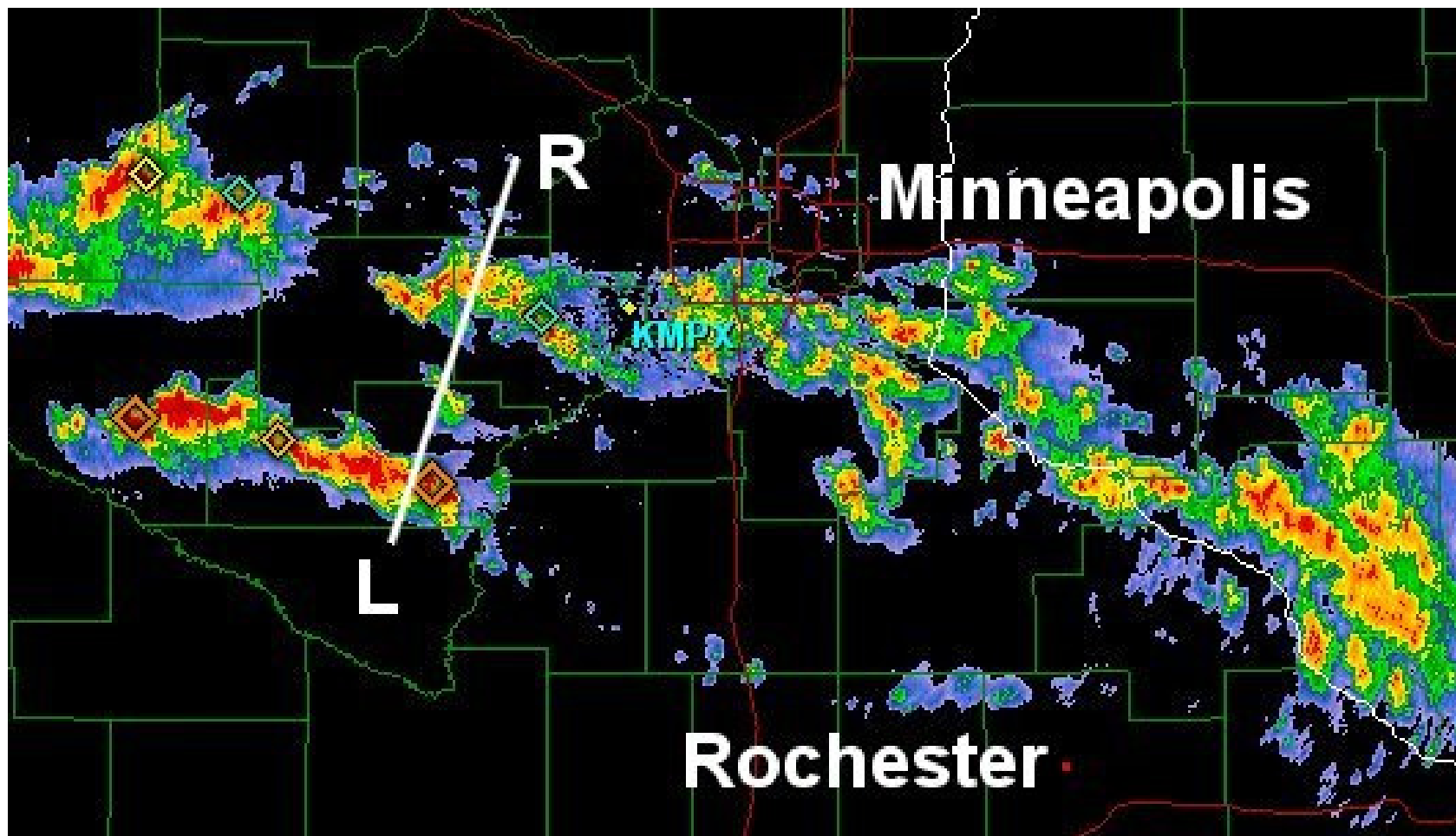
August 7 – Continental 2816, Rochester MN 47 passengers spend the night (6h) on board



Diverted from scheduled
landing at MSP

DOT issued \$175,000 in
fines to Continental and
Mesaba Airlines





New DOT Regulations on Tarmac Delays, Dec. 21, 2009

- **Possible airline fines of \$27,500 per passenger**
- **Food and water after 2 hours**
- **Working Lavatories**
- **Opportunity to deplane after 3h**

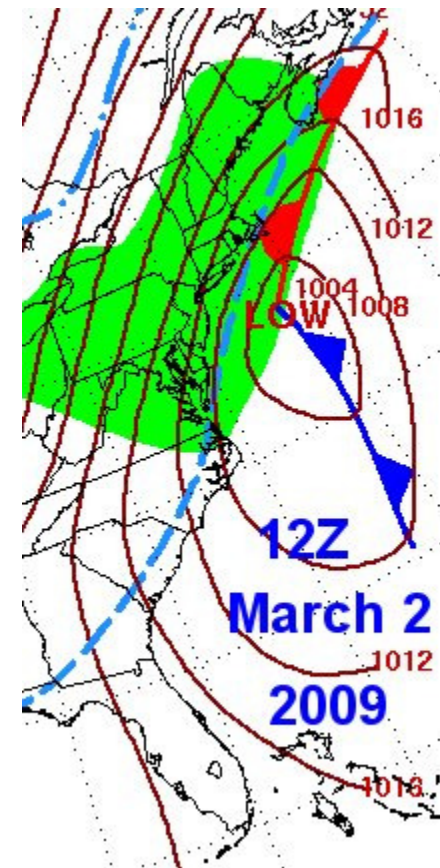
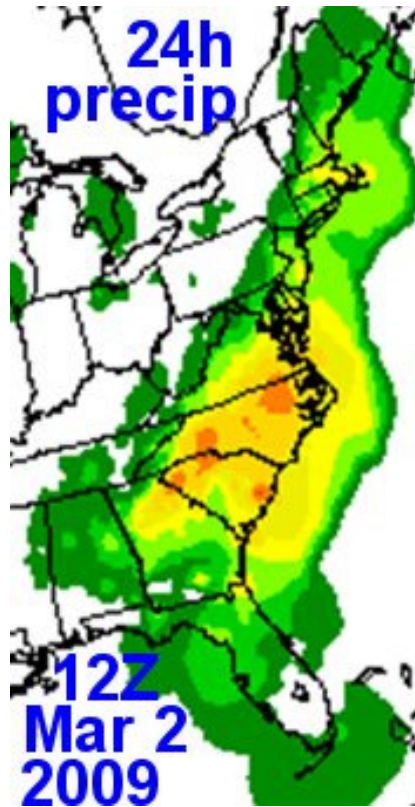
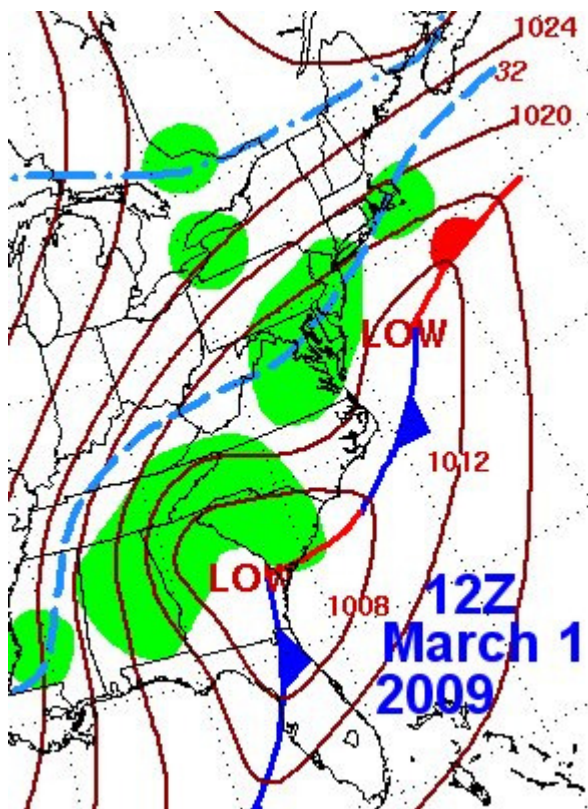
TAKEOFF DELAYS

US DOT RITA/BTS

| Carrier Name | Jan-Oct 2009 Flights by Minutes of Taxi-out Time | | | | | | Total Gate Departures |
|--------------------|--|------------|-----------|-----------|----------------|------------|-----------------------|
| | 120-179 | 180-239 | 240-299 | 300+ | Total 120+ | Total 180+ | |
| Delta | 450 | 85 | 19 | 6 | 560 | 110 | 353,238 |
| US Airways | 454 | 67 | 11 | 1 | 533 | 79 | 343,476 |
| United | 254 | 55 | 9 | 0 | 318 | 64 | 314,848 |
| American | 401 | 55 | 3 | 0 | 459 | 58 | 453,811 |
| JetBlue | 247 | 47 | 8 | 1 | 303 | 56 | 160,141 |
| Comair | 258 | 33 | 7 | 1 | 299 | 41 | 125,433 |
| ExpressJet | 353 | 27 | 2 | 1 | 383 | 30 | 253,607 |
| American Eagle | 278 | 29 | 1 | 0 | 308 | 30 | 355,257 |
| Northwest | 157 | 26 | 0 | 0 | 183 | 26 | 247,446 |
| Southwest | 152 | 20 | 3 | 0 | 175 | 23 | 943,802 |
| Continental | 273 | 14 | 1 | 0 | 288 | 15 | 215,568 |
| Mesa | 80 | 10 | 2 | 0 | 92 | 12 | 200,947 |
| SkyWest | 130 | 11 | 0 | 0 | 141 | 11 | 452,504 |
| AirTran | 99 | 6 | 2 | 0 | 107 | 8 | 207,804 |
| Pinnacle | 81 | 8 | 0 | 0 | 89 | 8 | 216,644 |
| Atlantic Southeast | 66 | 4 | 1 | 0 | 71 | 5 | 245,453 |
| Frontier | 26 | 4 | 0 | 0 | 30 | 4 | 73,236 |
| Alaska | 5 | 0 | 0 | 0 | 5 | 0 | 115,063 |
| Hawaiian | 0 | 0 | 0 | 0 | 0 | 0 | 61,283 |
| Total | 3,764 | 501 | 69 | 10 | * 4,344 | 580 | 5,339,561 |

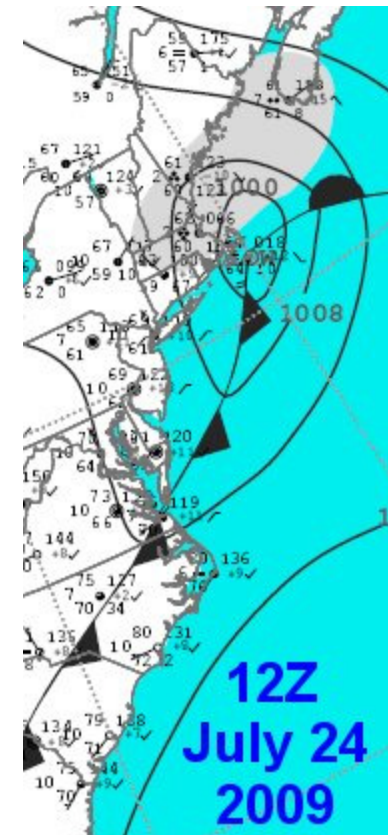
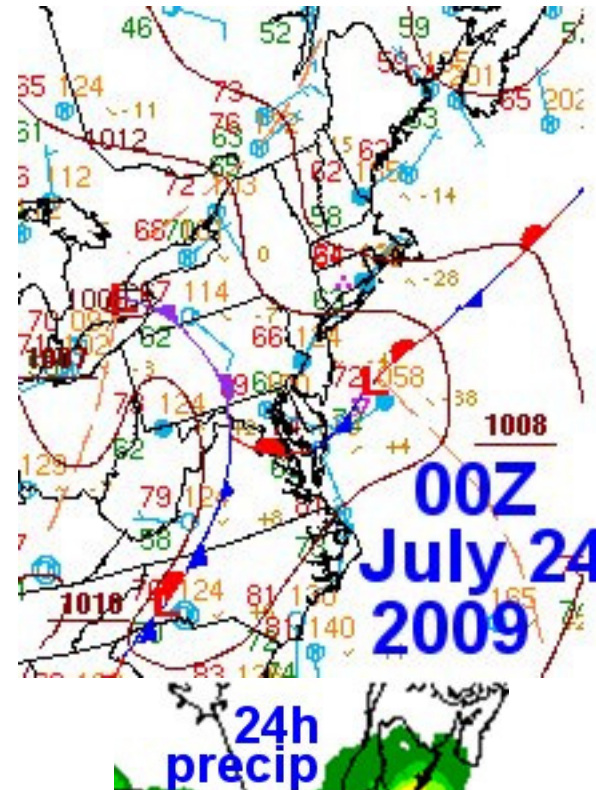
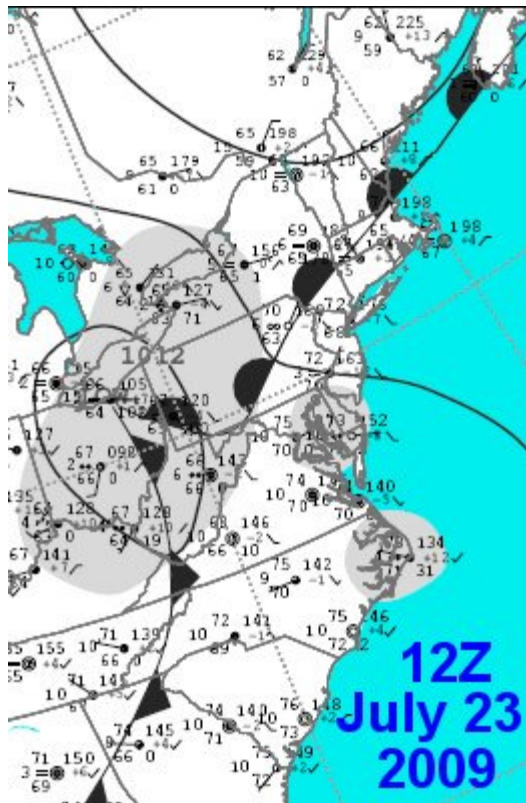
0.08% of flights had departure delays of 2 hours or more

**March 1 – Charlotte, NC and the East
Winter storm and blizzard, “domino effect”,
cancel hundreds of flights**



1400 people spent the night in the Charlotte, NC terminal

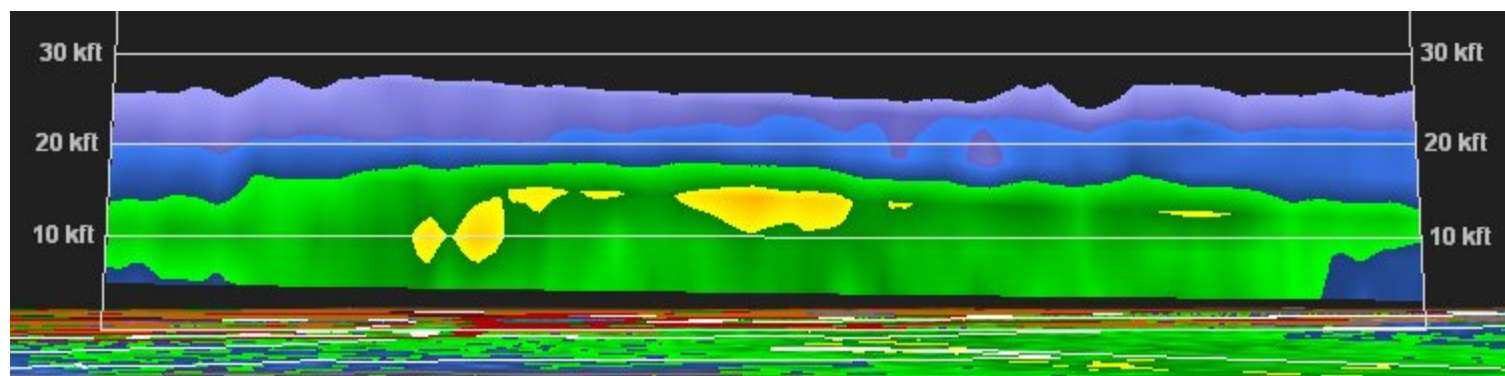
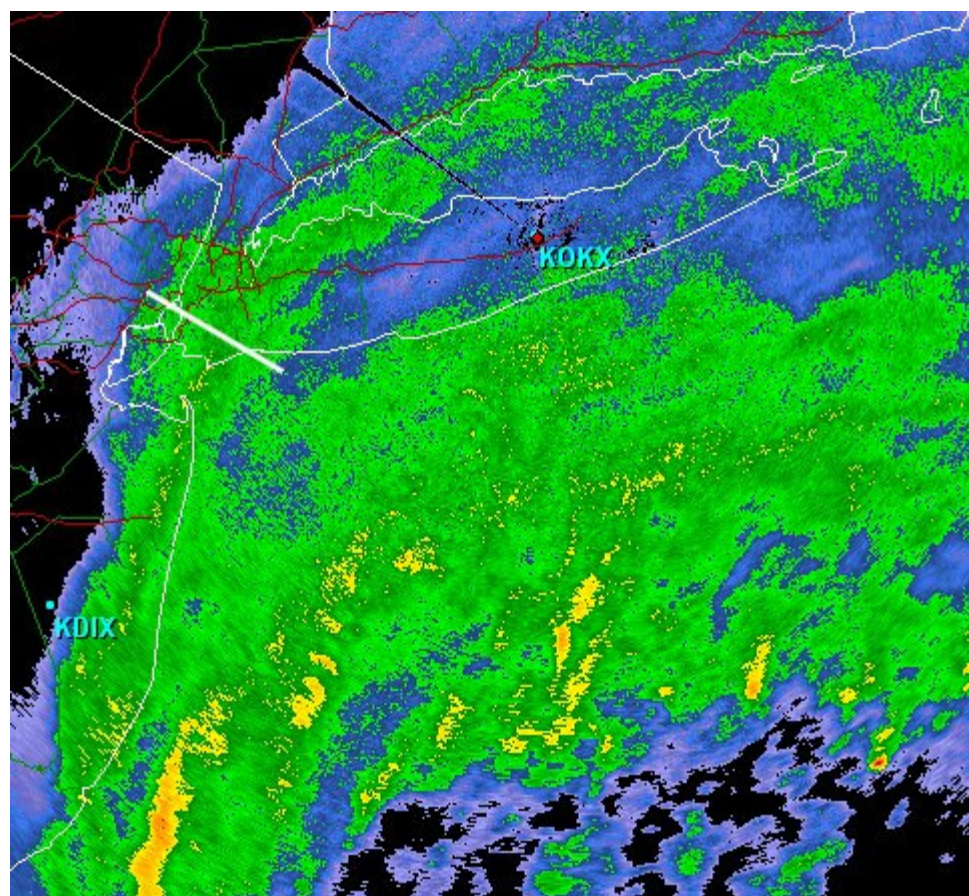
July 23, rain and storms in Northeast



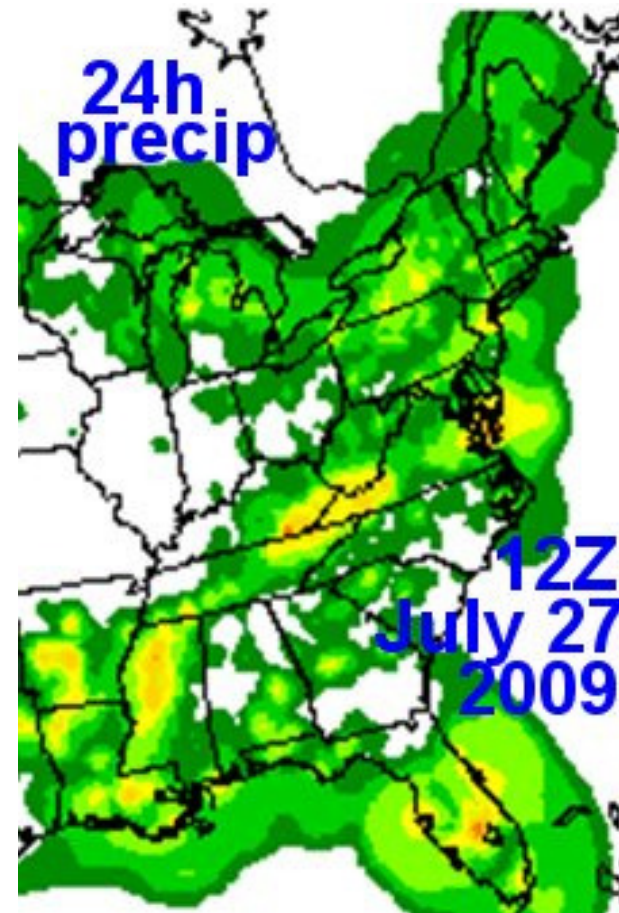
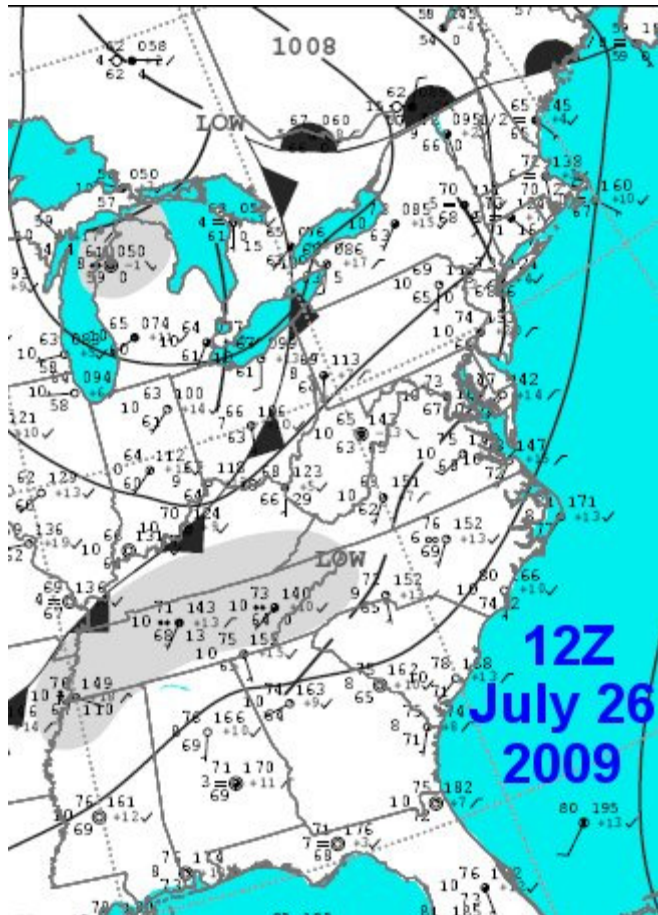
Forbes' takeoff
delayed 3h from
Boston

**July 23, 2009
2104 UTC**

OKX Radar



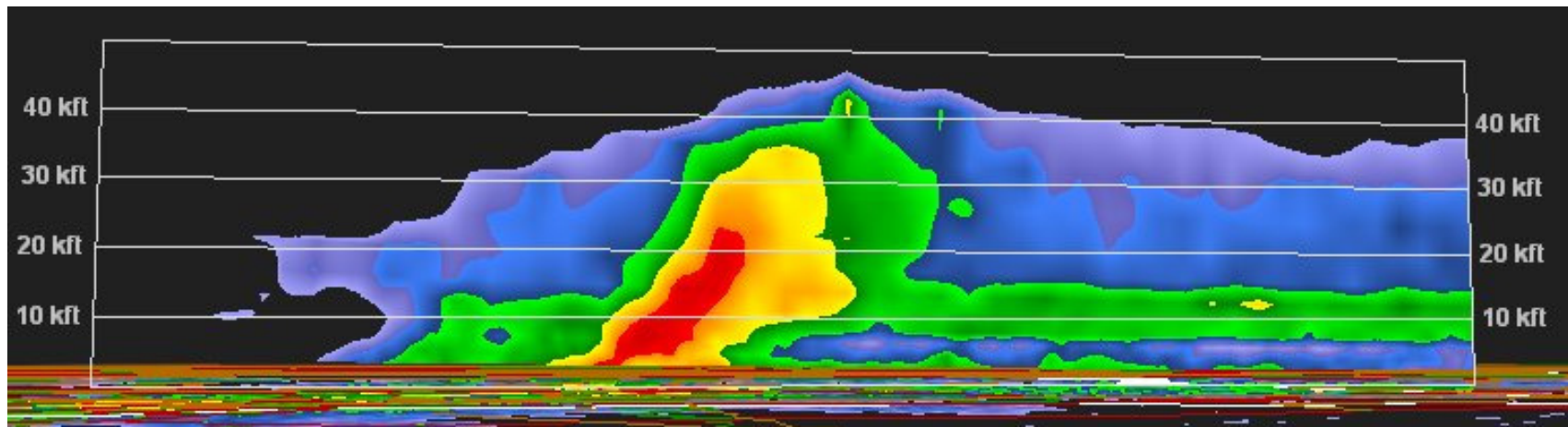
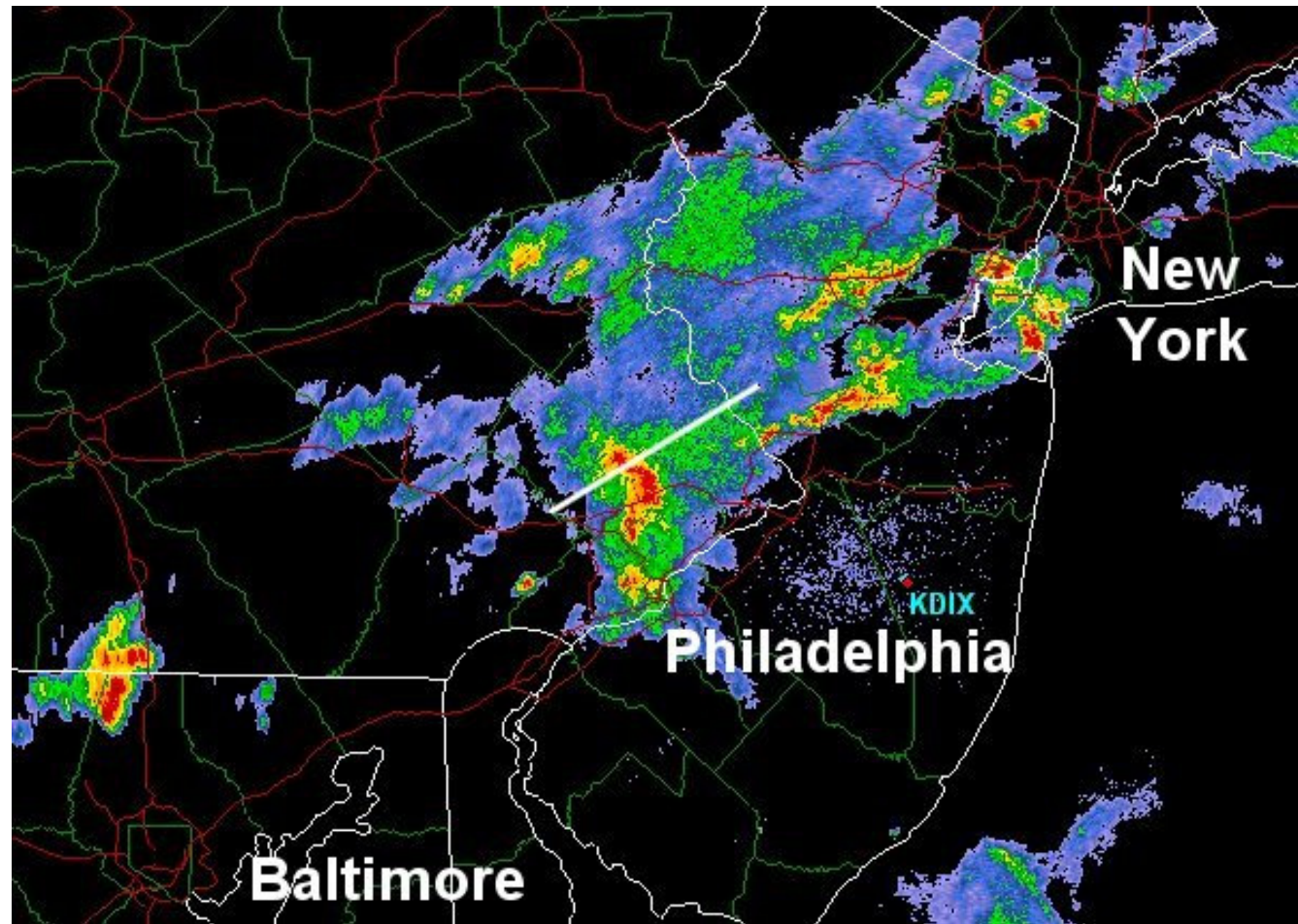
July 26 - Thunderstorms in the Northeast



5h delays at Newark; 4h at JFK by late evening

**July 27,
2009
0103 UTC**

DIX Radar



Week Ending Nov 19, 2009 – 800+ Delays from Weather, Equipment Failures

