



CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

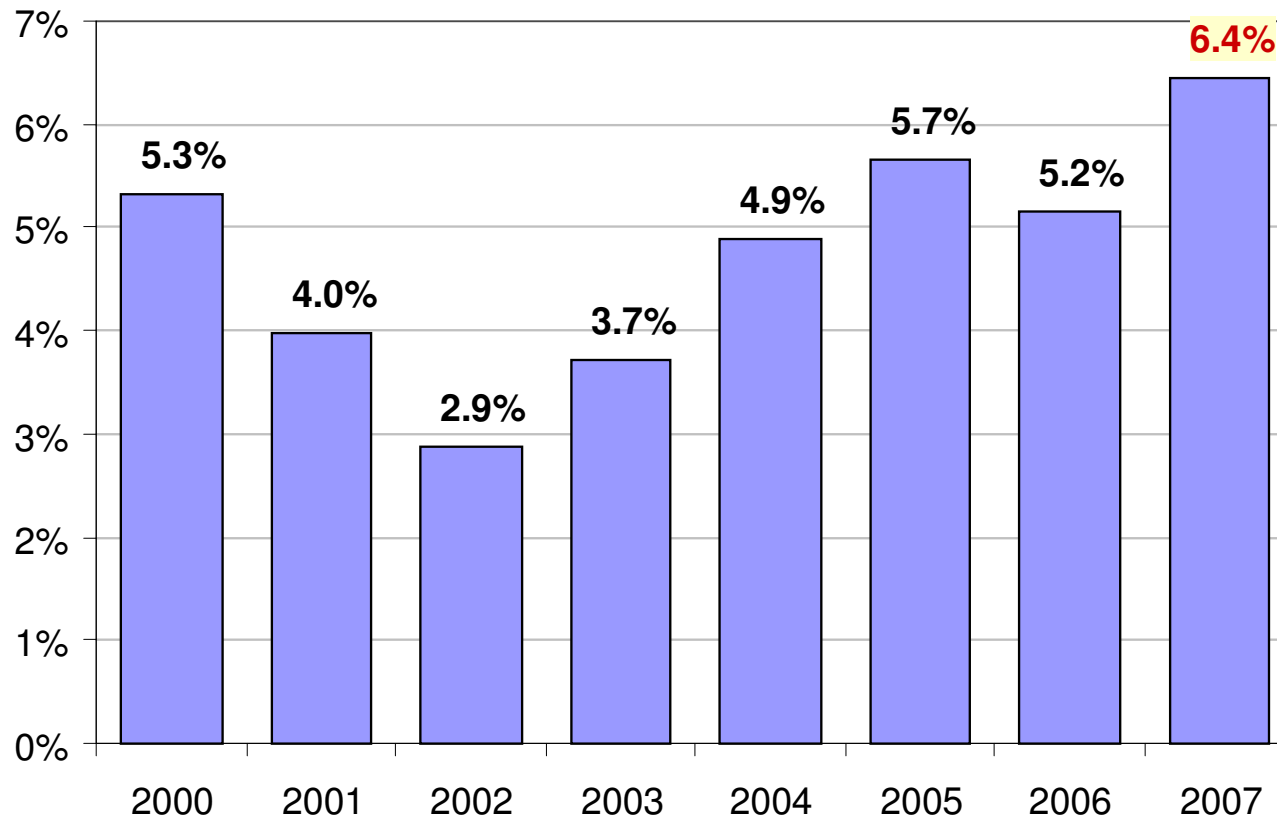
# Recent Delay Trends

*Ken Wright*  
*September 6, 2007*



## Hour-long Schedule Delays Up in Summer 2007

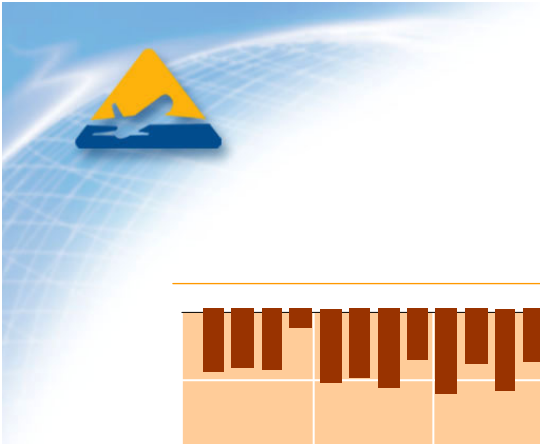
Percent of Flights Arriving More than 1 Hour Late (ASPM)



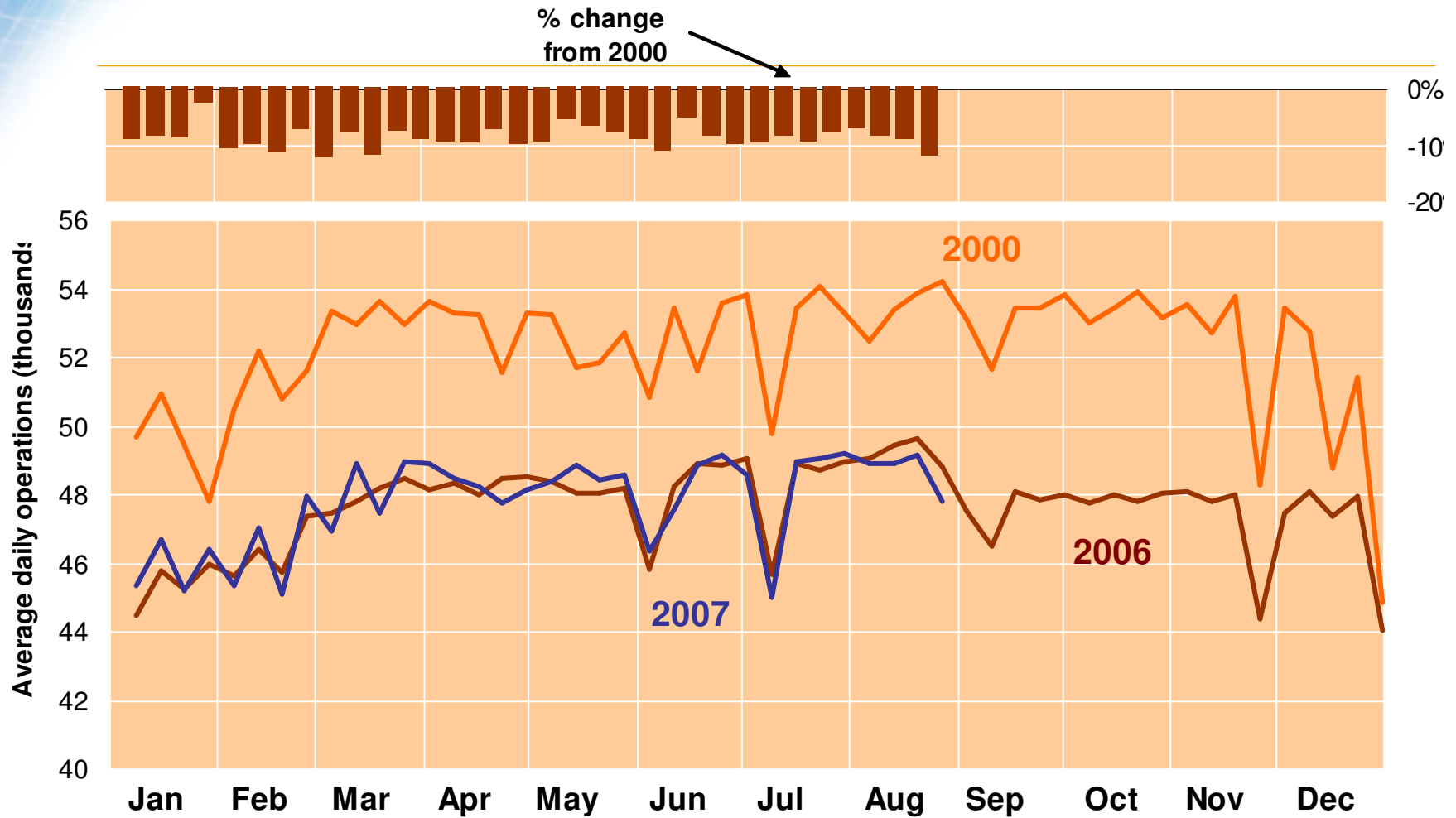
Source: ASPM, June-August

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# Airport Ops



Weekly average, OPSNET (45 airports)

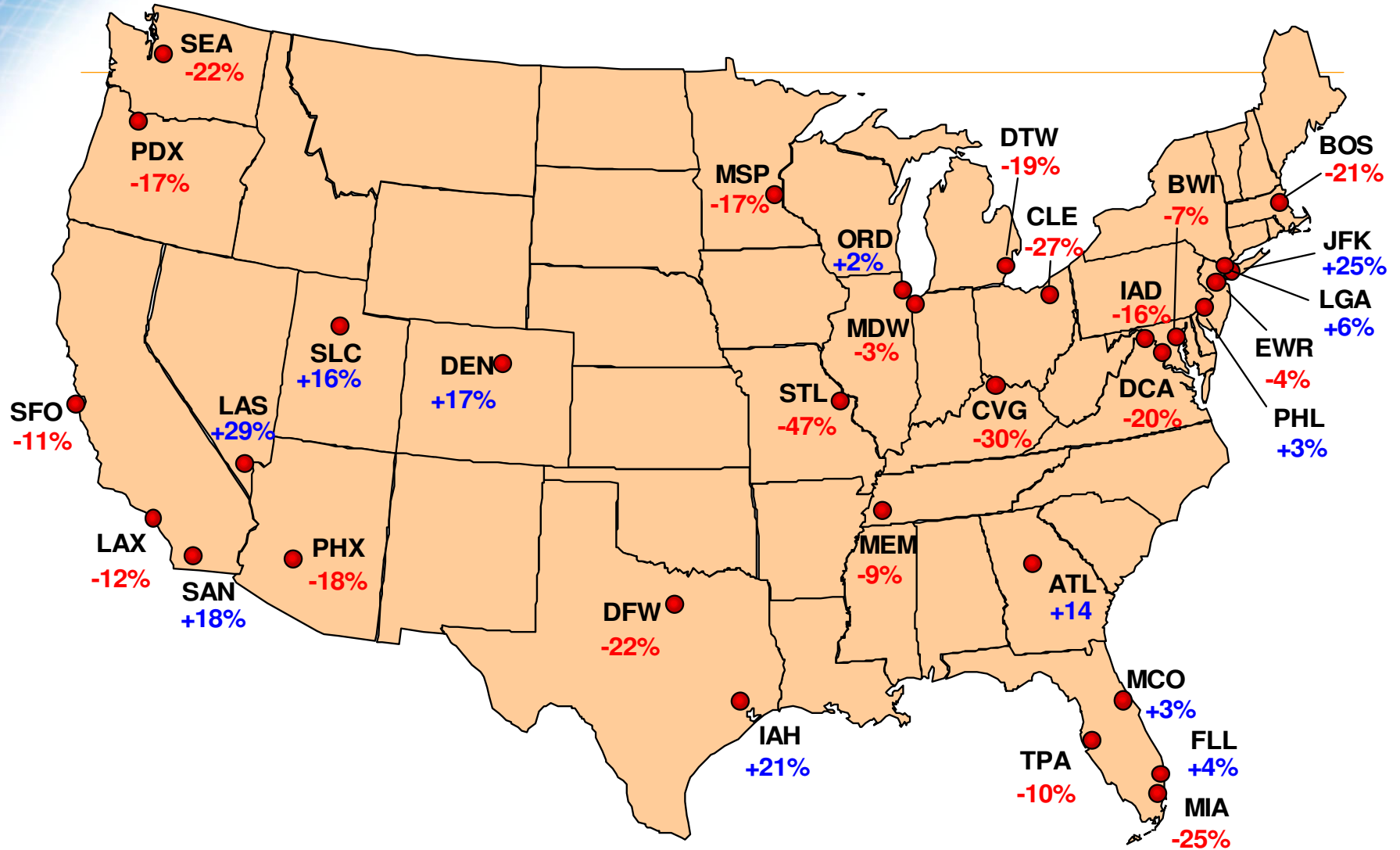
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# Change in Operations by Major Airport

Summer 2007 vs. Summer 2000



Source: OPSNET, Weekdays

Overall Change = -8%

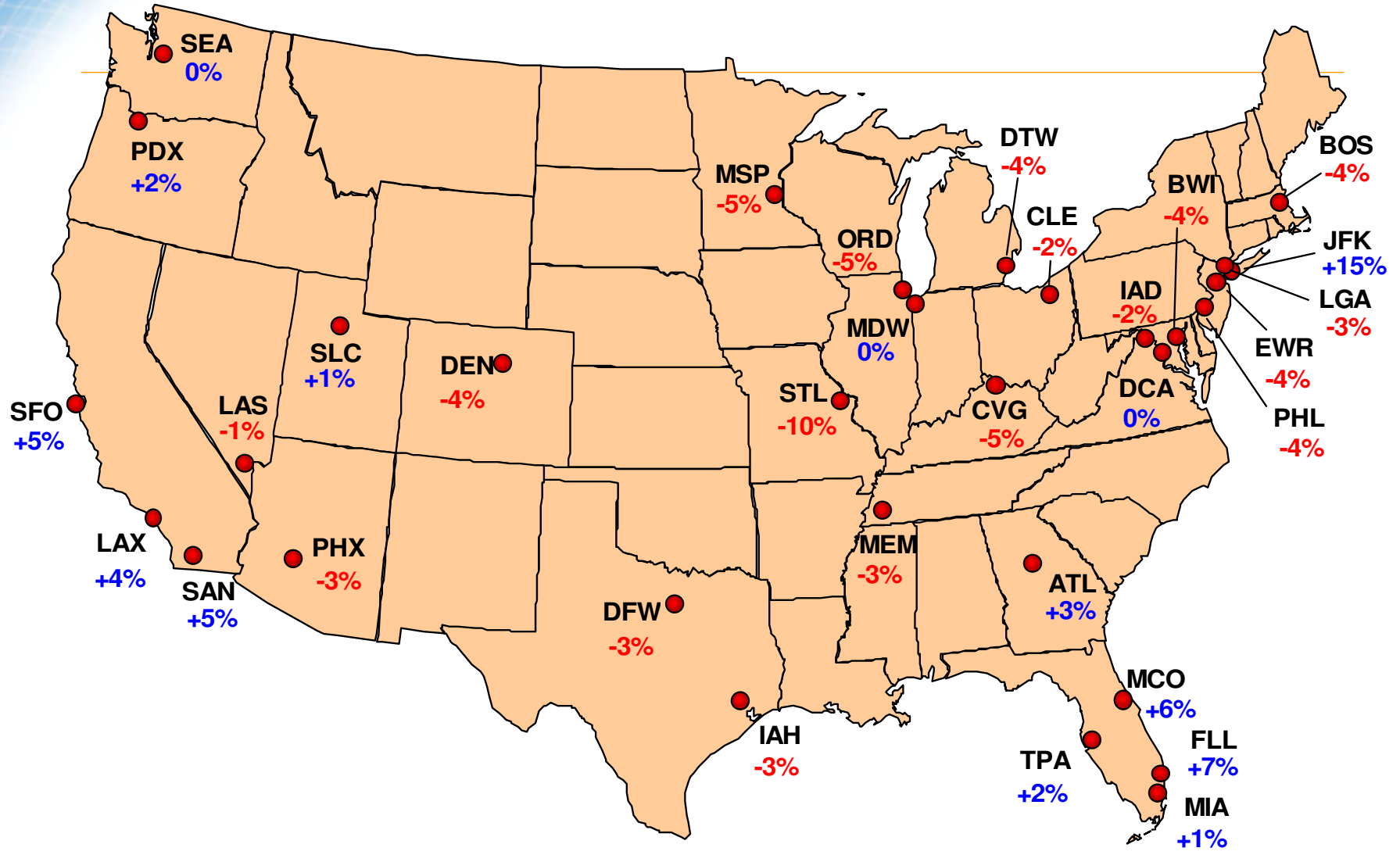
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# Change in Operations by Major Airport

Summer 2007 vs. Summer 2006



Source: OPSNET, Weekdays

Overall Change = -1%

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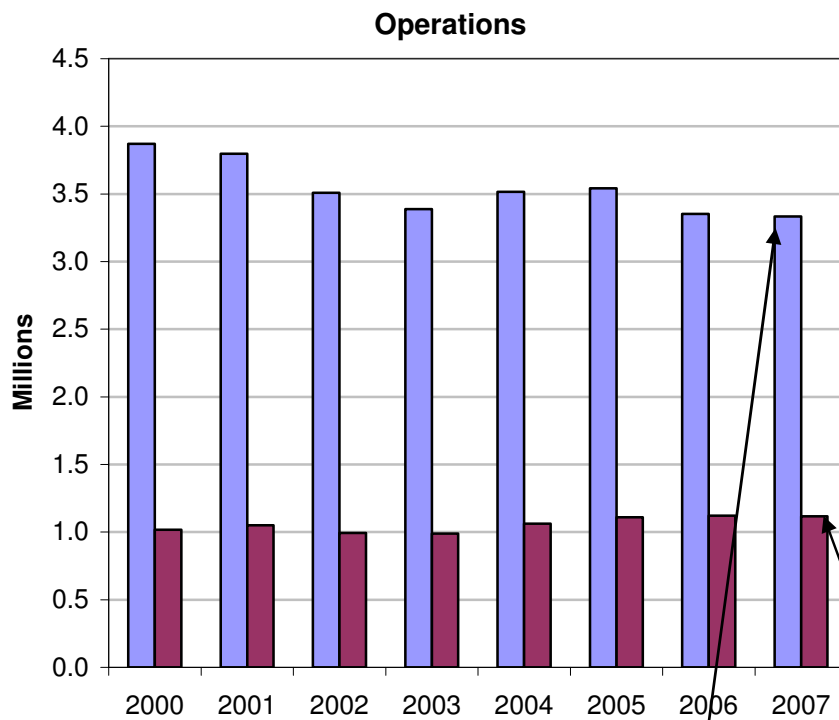
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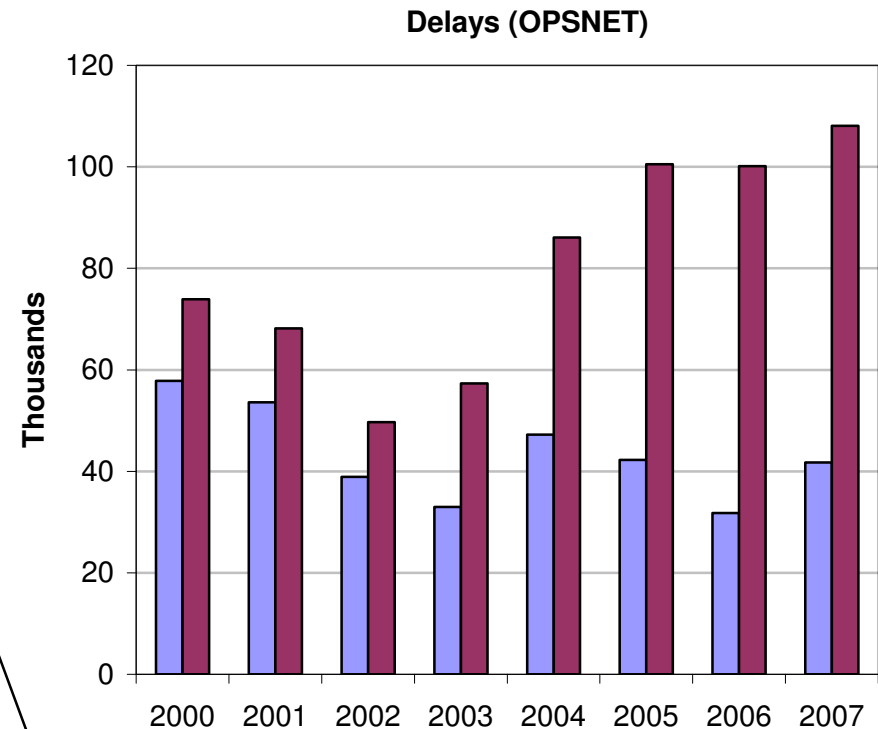
# Schedule Growth Shifts Delays to Busy Hubs

Seven airports accounted for 55% of delays in 2000. These 7 account for 72% of delays in 2007.

■ 38 apts      ■ ATL, ORD, EWR, LGA, JFK, PHL, IAH



Down 14% Compared to 2000



Up 10% Compared to 2000



# OPSNET, June-August

## Operations (Millions)

Year	ATL, ORD, EWR, LGA, JFK, PHL, IAH		
	38 apts	JFK, PHL, IAH	45 Airports
2000	3.87	1.02	4.89
2001	3.80	1.05	4.85
2002	3.51	0.99	4.50
2003	3.39	0.99	4.38
2004	3.52	1.06	4.58
2005	3.54	1.11	4.65
2006	3.35	1.12	4.47
2007	3.33	1.12	4.45
Change 2000 to 2007	-13.9%	9.7%	-8%

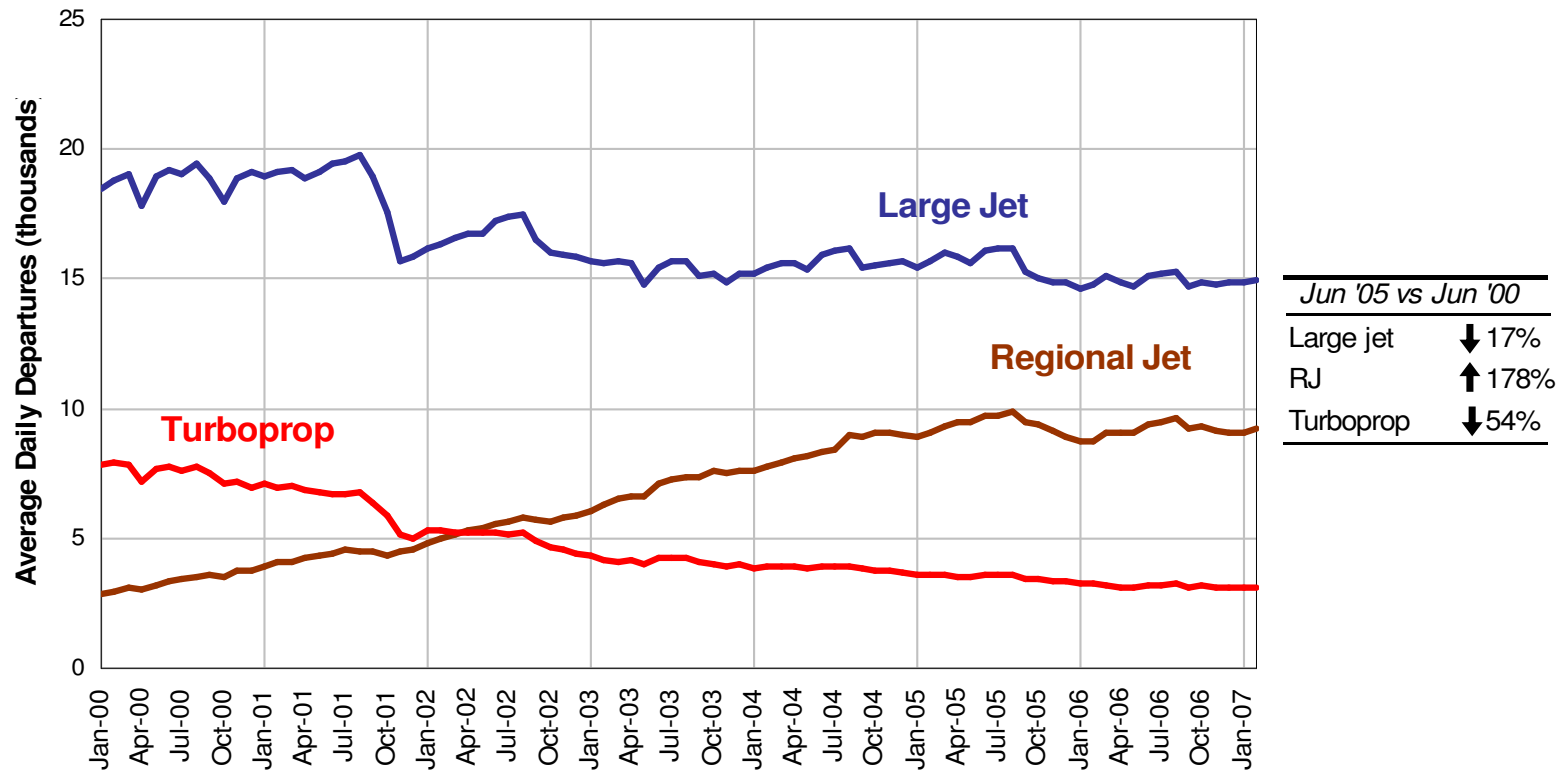
## Delays (Thousands)

Year	ATL, ORD, EWR, LGA, JFK, PHL, IAH		
	38 apts	JFK, PHL, IAH	45 Airports
2000	57	78	137
2001	55	70	127
2002	40	51	93
2003	32	60	94
2004	43	94	138
2005	38	106	147
2006	35	99	137
2007	42	108	152
Change 2000 to 2006	-27%	39%	11%



# Increased Use of Regional Jets

Scheduled Departures by Equipment Type (285 Airports)



Source: OAG

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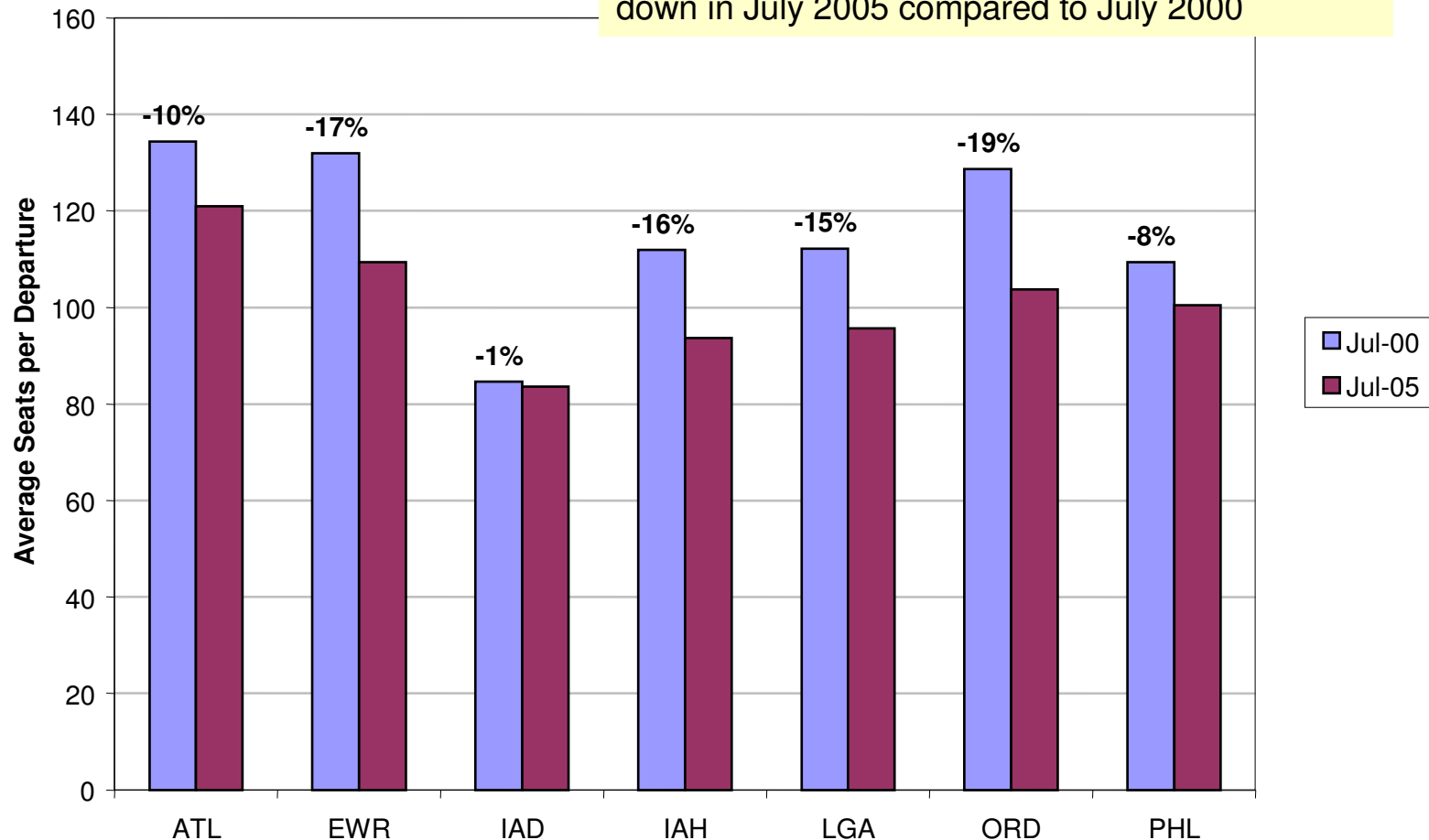
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# Average Number of Seats per Departure has Decreased

Average number of seats per scheduled departure down in July 2005 compared to July 2000



Source: OAG

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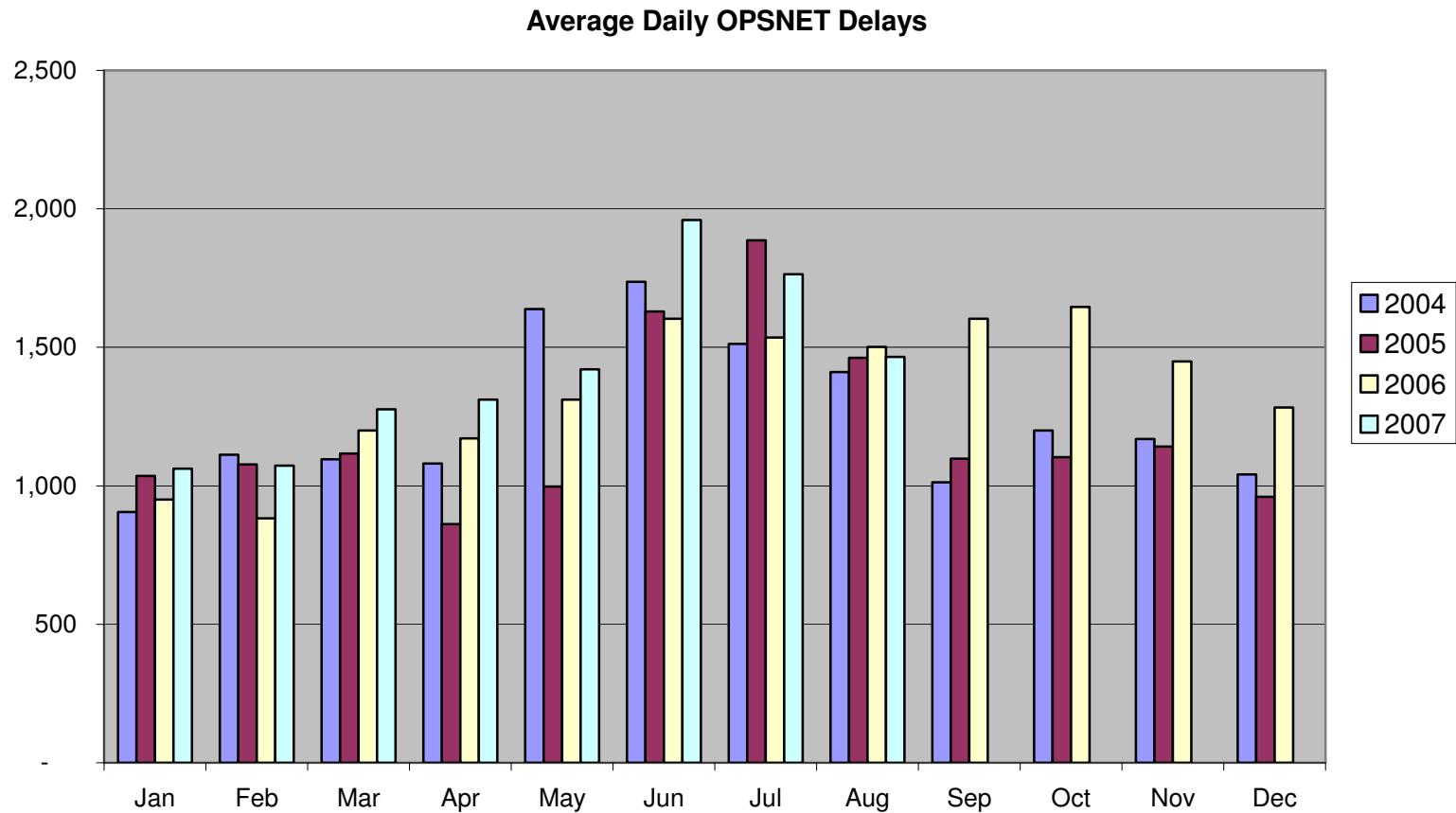


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# New York



# Average Daily OPSNET Delays



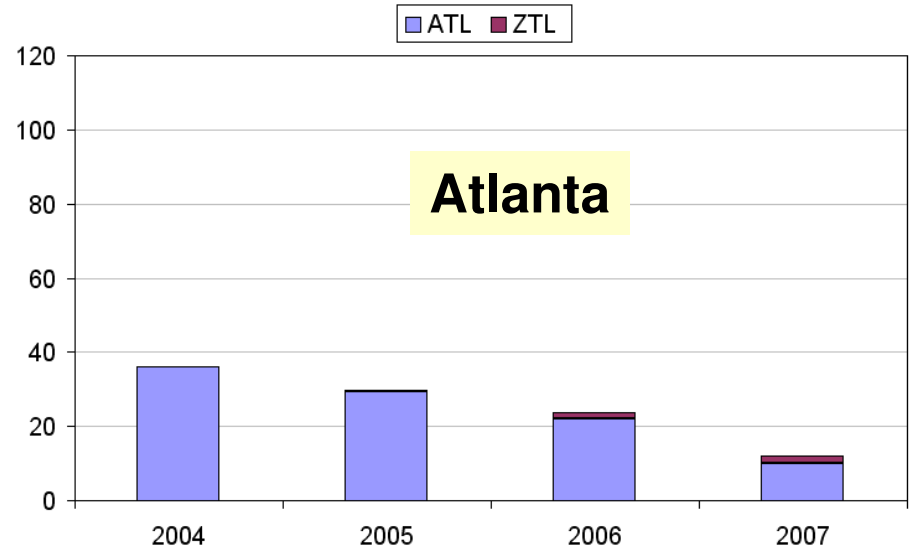
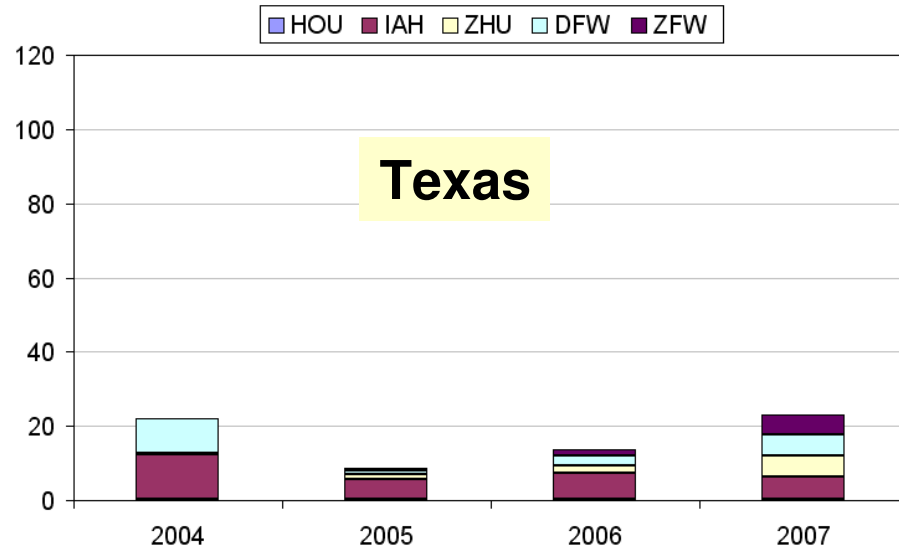
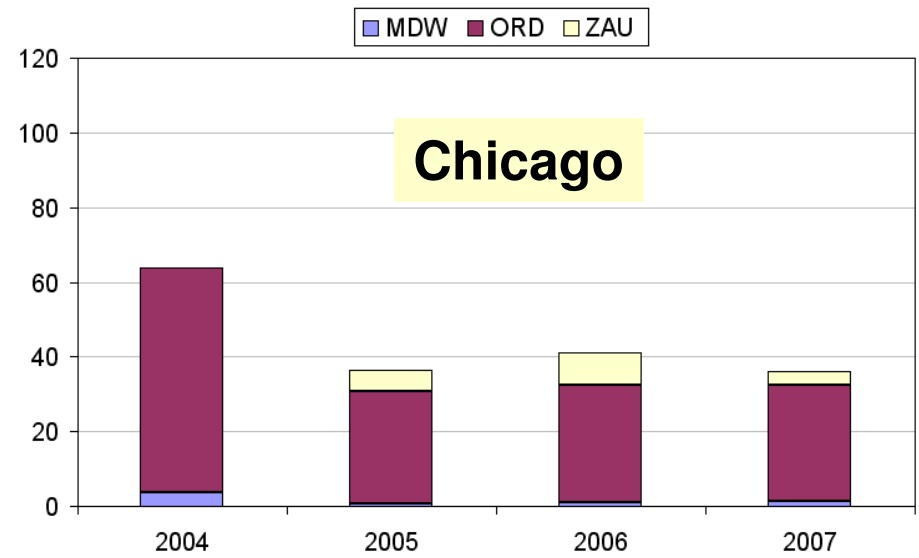
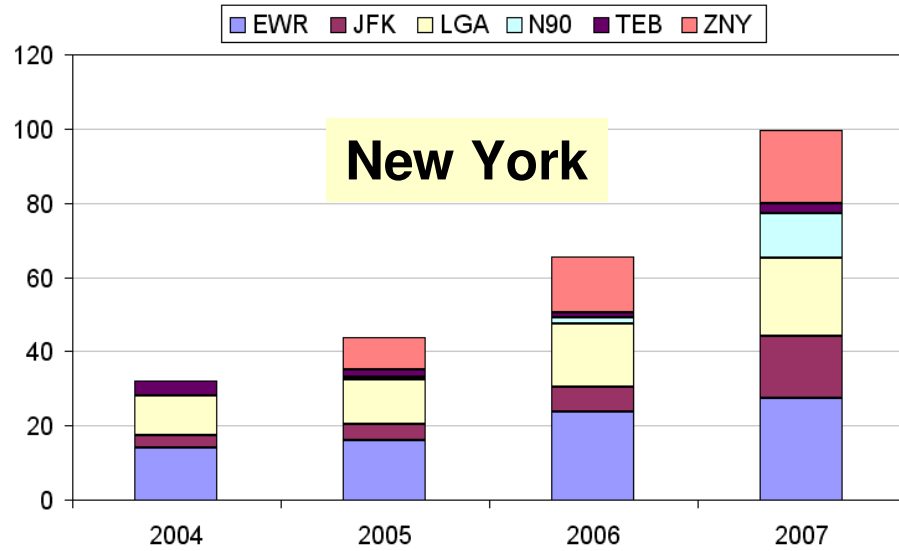
All Facilities

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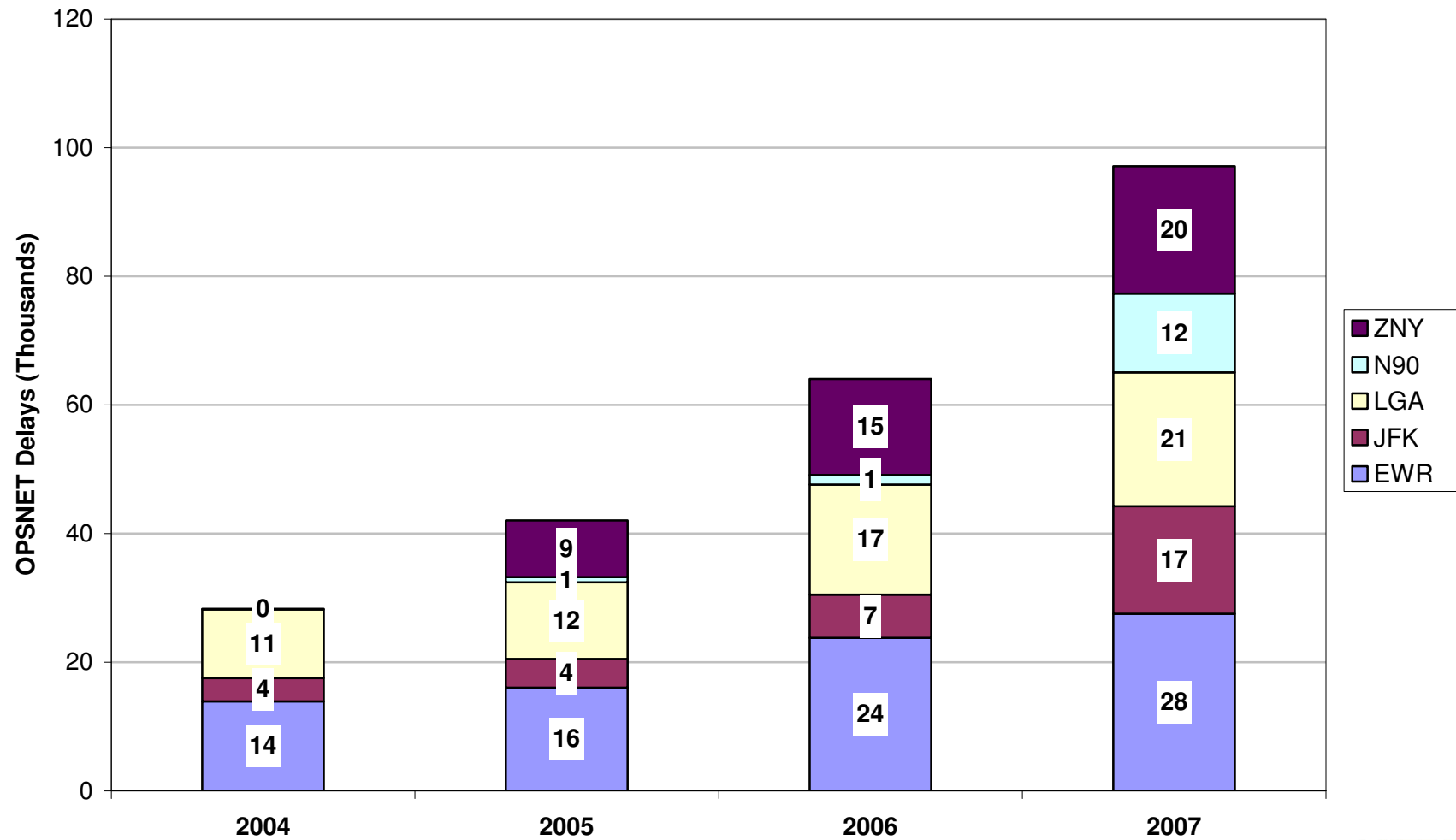
# OPSNET Delays (thousands), January - June





# New York OPSNET Delays

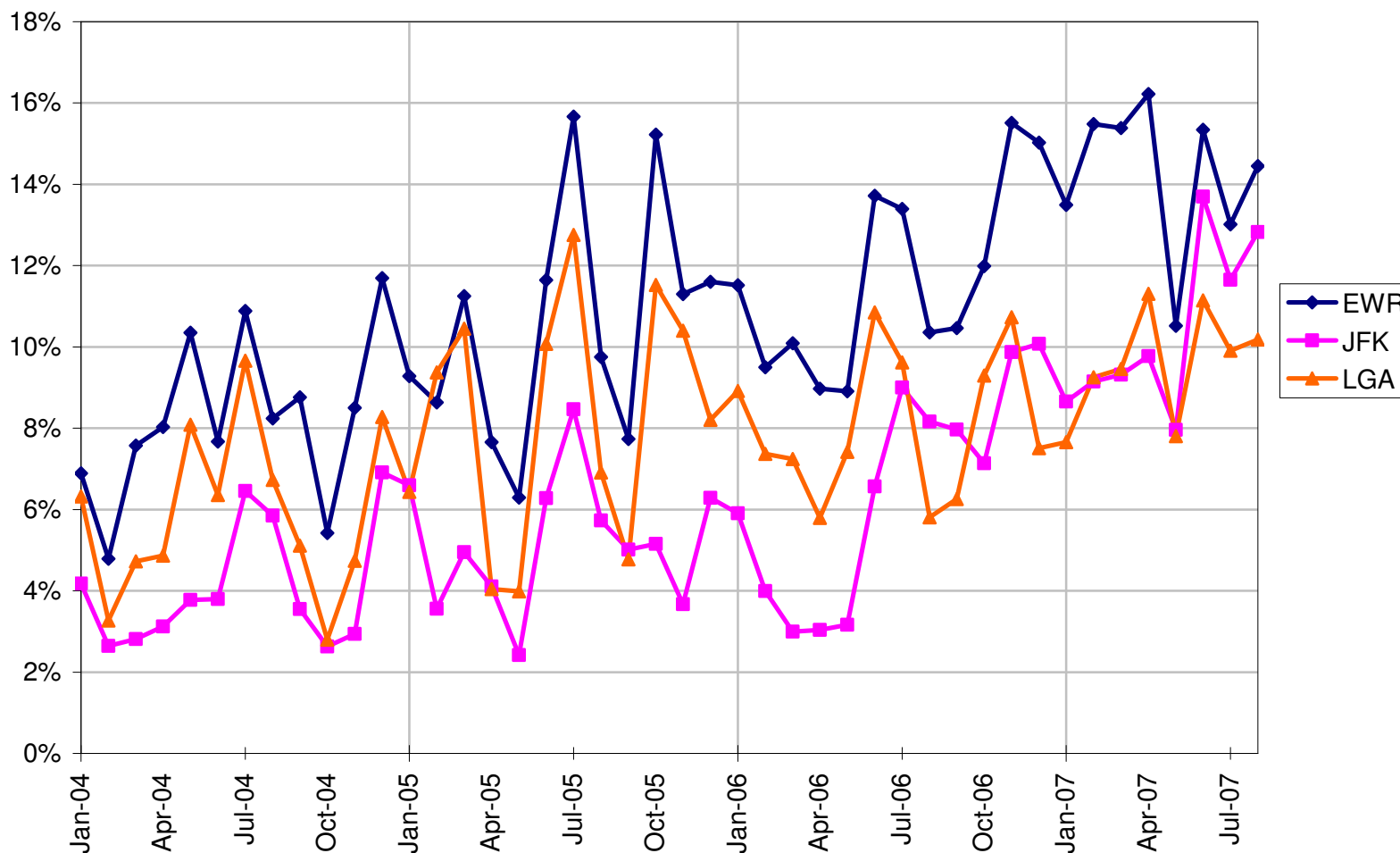
New York OPSNET Delays, January - June





# New York Arrival Delays

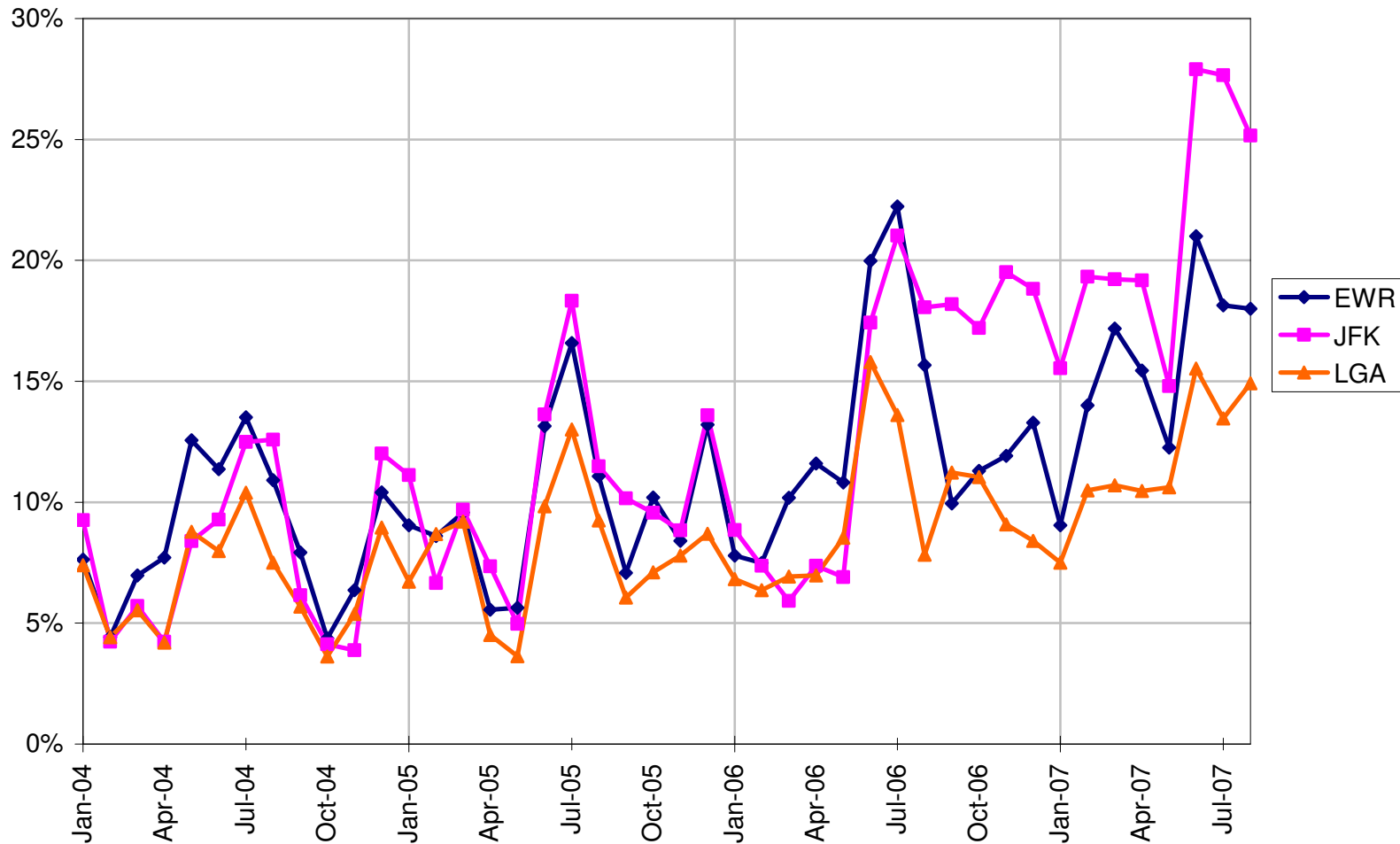
Percent of Flights Arriving More than One Hour Late





# New York Departure Delays

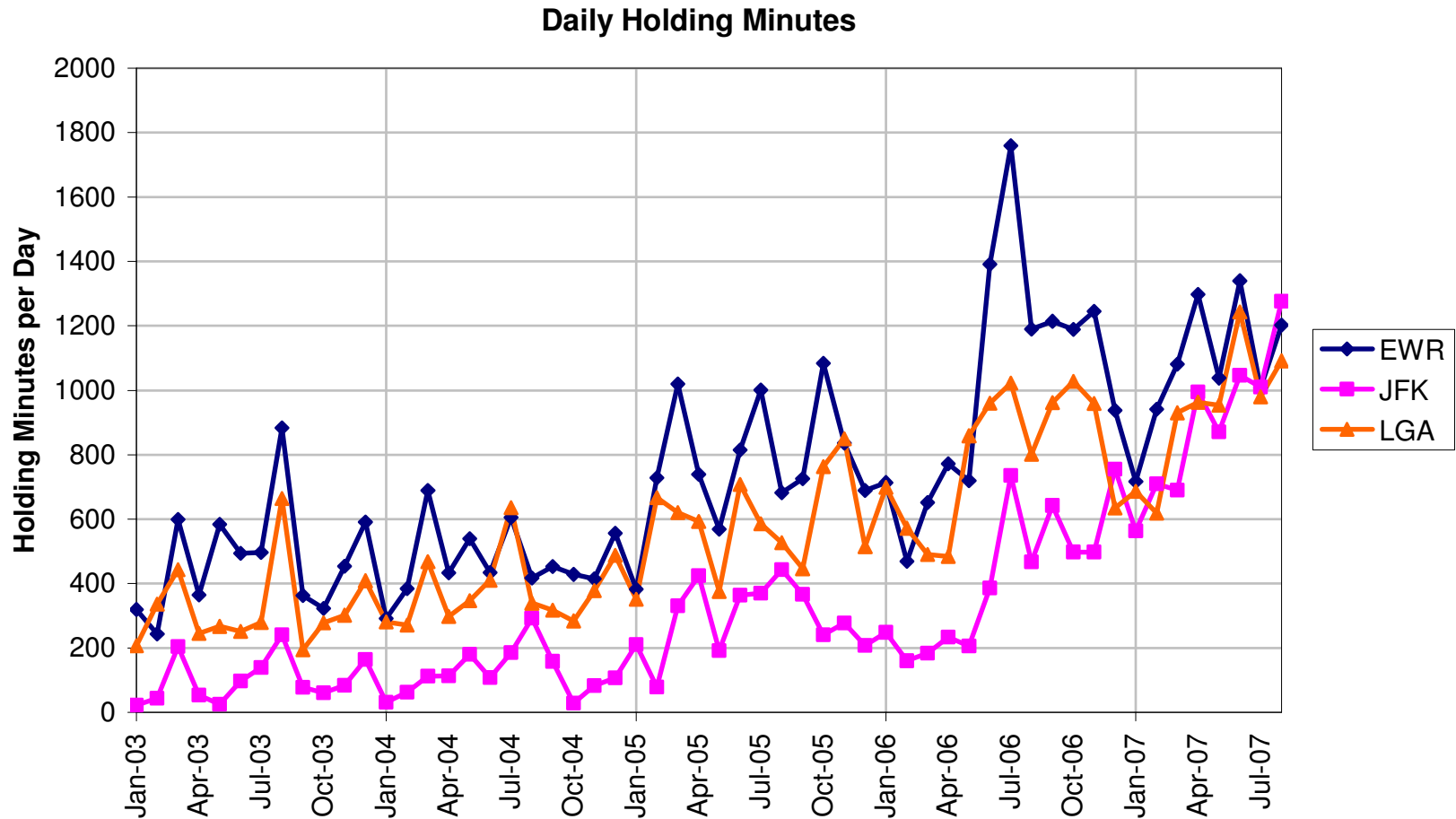
Percent of Flights Departing More than One Hour Late



Source: ASPM



# Daily Minutes of Airborne Holding



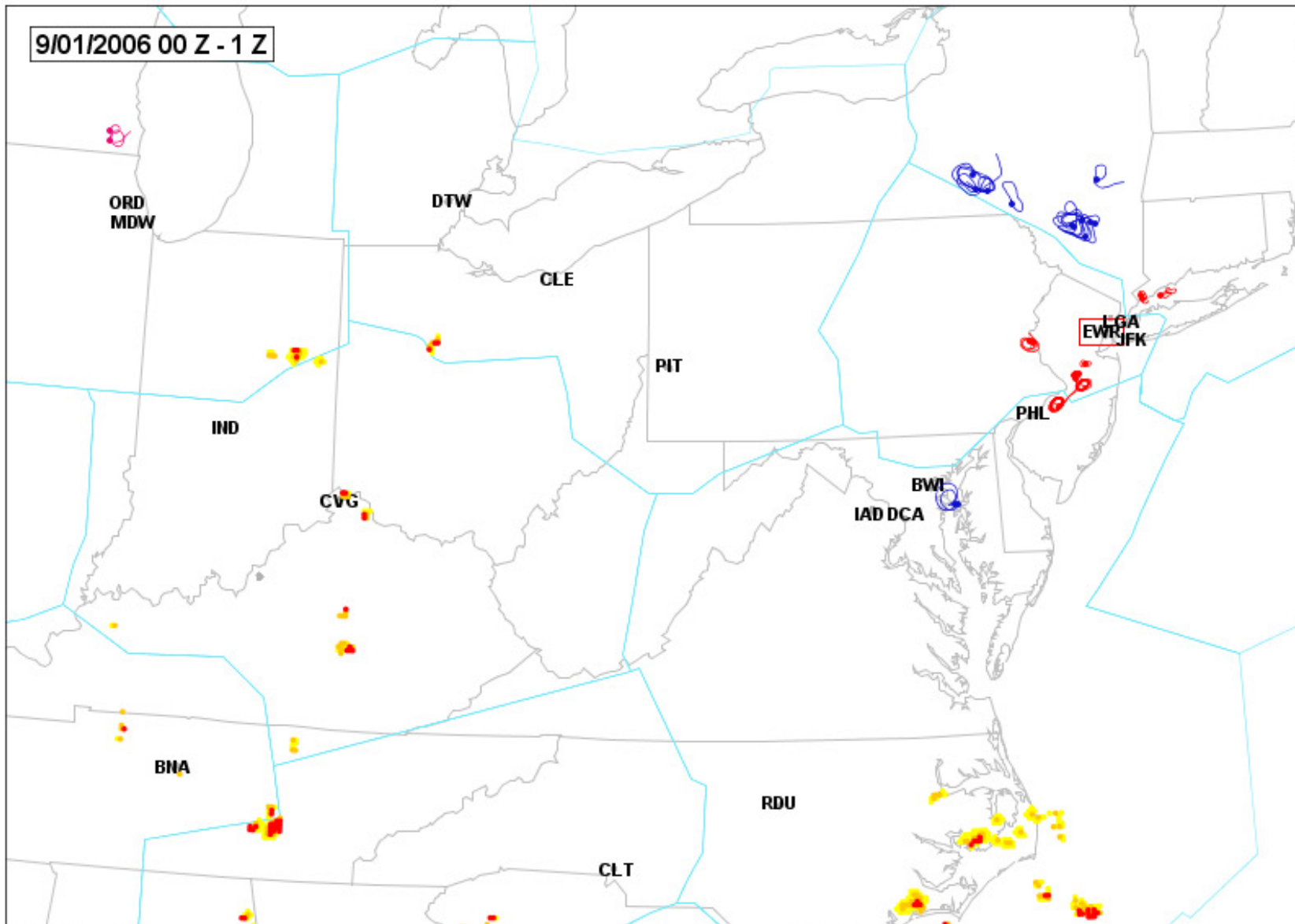
Source: CAASD ETMS

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9/01/2006 00 Z - 1 Z



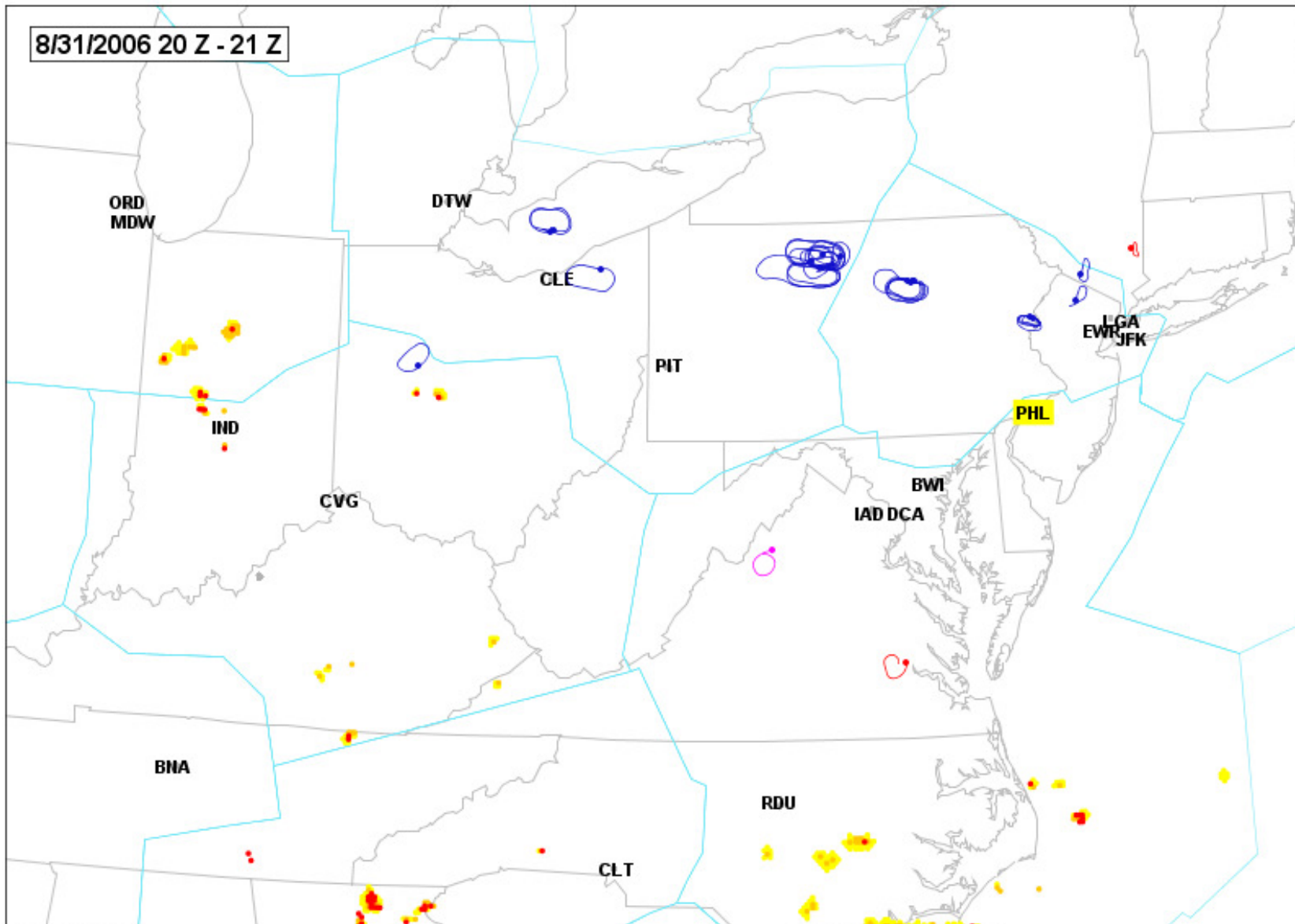
Colored by Destination

- ATL (20)
- EWR (13)
- LGA (12)
- ORD (2)

ATL: GDP-TSTMS

EWR: GS-VOLUME

8/31/2006 20 Z - 21 Z



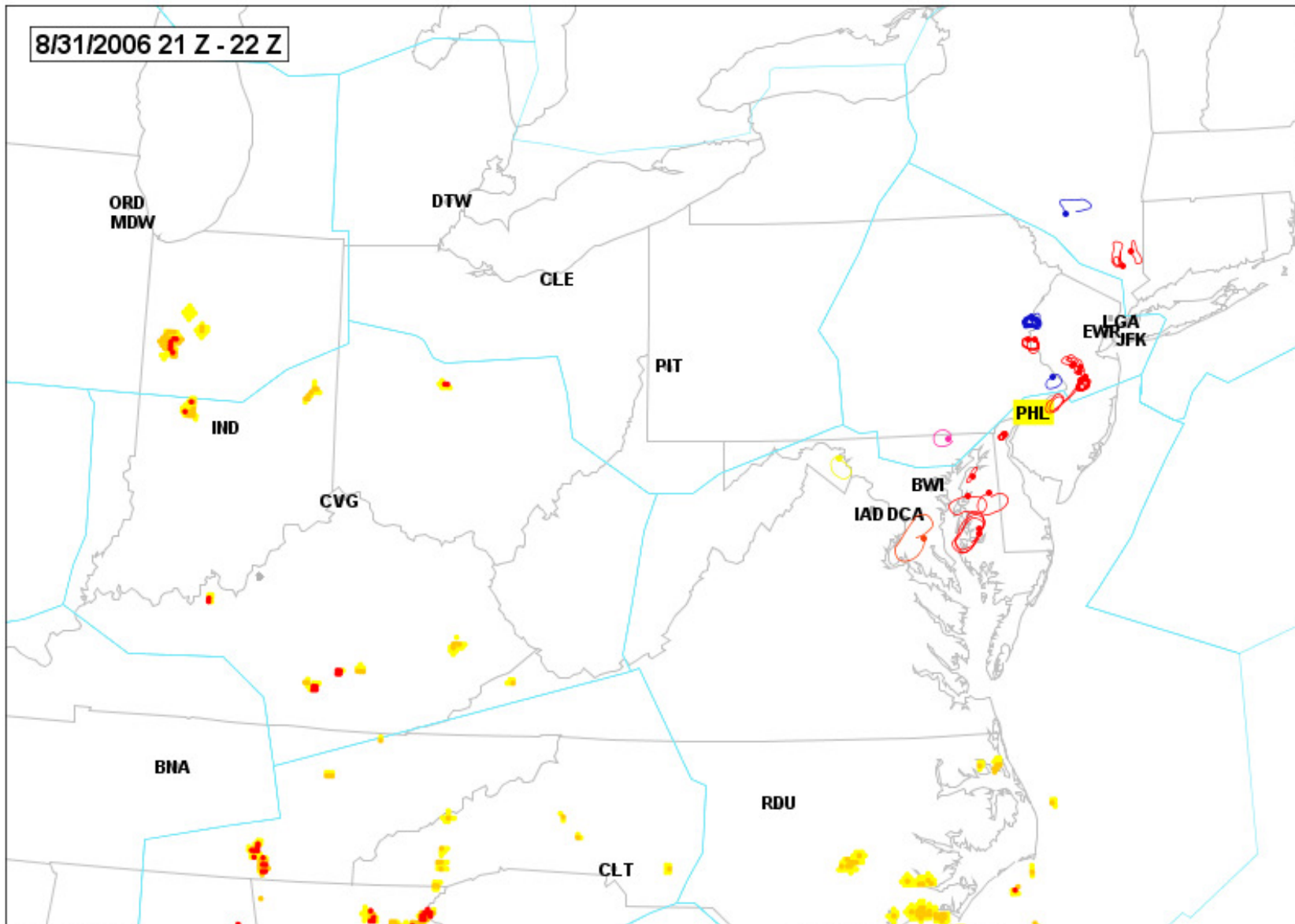
Colored by Destination

- EWR (19)
- ATL (13)
- PBI (7)
- FLL (2)
- LGA (2)
- PHX (2)
- DCA (1)
- HOU (1)
- MIA (1)
- RDU (1)

ATL: GDP-TSTMS  
PHL: GDP-WIND

ATL: GS-TSTMS OVERHEAD

8/31/2006 21 Z - 22 Z

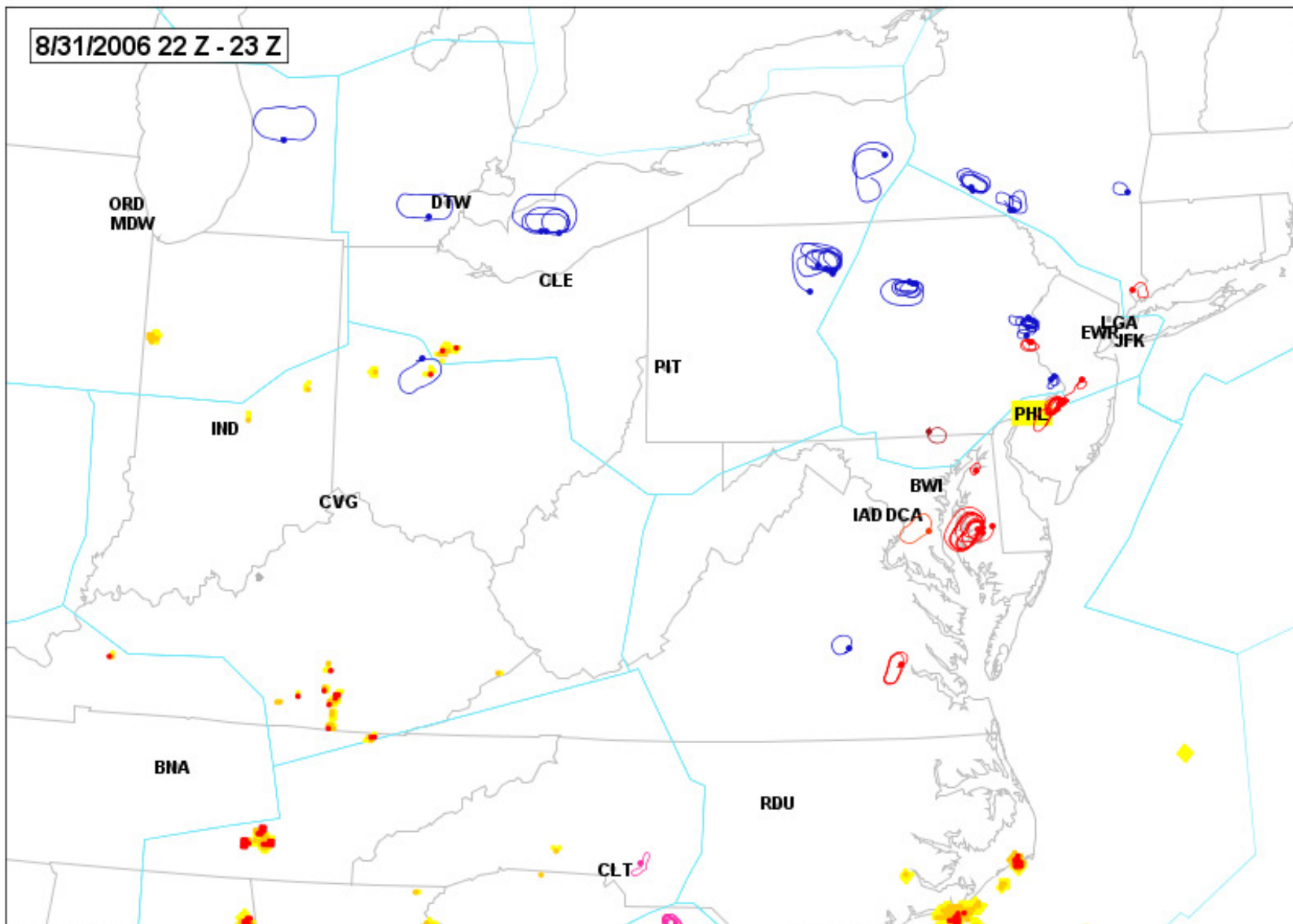


Colored by Destination

ATL: GDP-TSTMS  
PHL: GDP-WIND

ATL: GS-TSTMS OVERHEAD

8/31/2006 22 Z - 23 Z



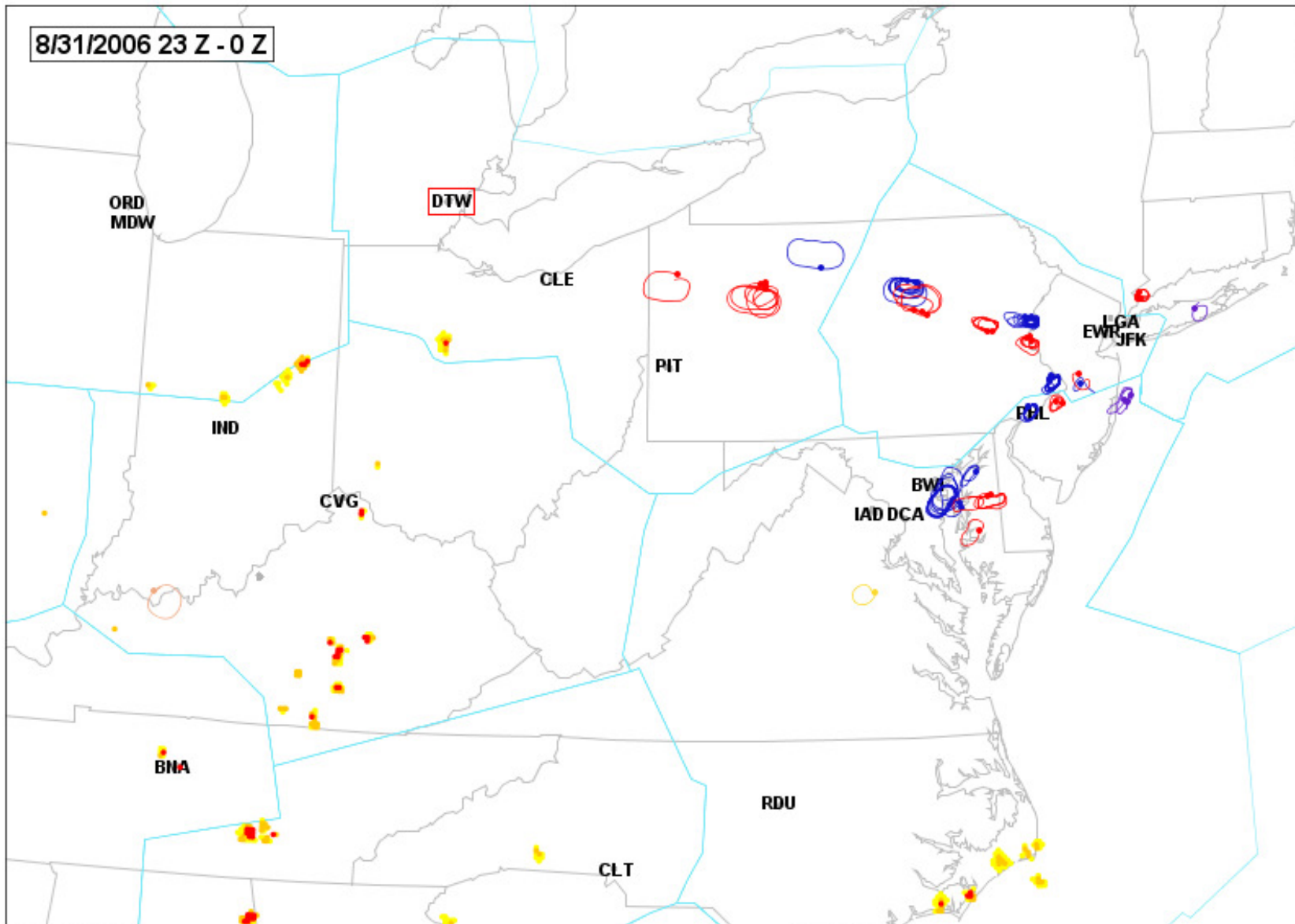
Colored by Destination

- EWR (29)
- DEN (21)
- ATL (18)
- LGA (16)
- CLT (5)
- IAH (1)
- LAX (1)
- PHL (1)

ATL: GDP-TSTMS  
PHL: GDP-WIND

DEN: GS-TSTMS

8/31/2006 23 Z - 0 Z



Colored by Destination

- EWR (25)
- LGA (24)
- ATL (23)
- JFK (4)
- DEN (2)
- LAS (2)
- FLL (1)
- IAD (1)
- IAH (1)

ATL: GDP-TSTMS

DEN: GS-TSTMS  
DTW: GS-COMPACTED DEMAND



## New York: Change in Operations from 2004 (January-June)

	<i>2005</i>	<i>2006</i>	<i>2007</i>
→ JFK	14%	16%	44%
EWR	0%	2%	1%
LGA	1%	1%	-1%
TEB	-2%	-11%	-9%
HPN	-1%	-2%	4%
Total	3%	2%	8%

Source: OPSNET

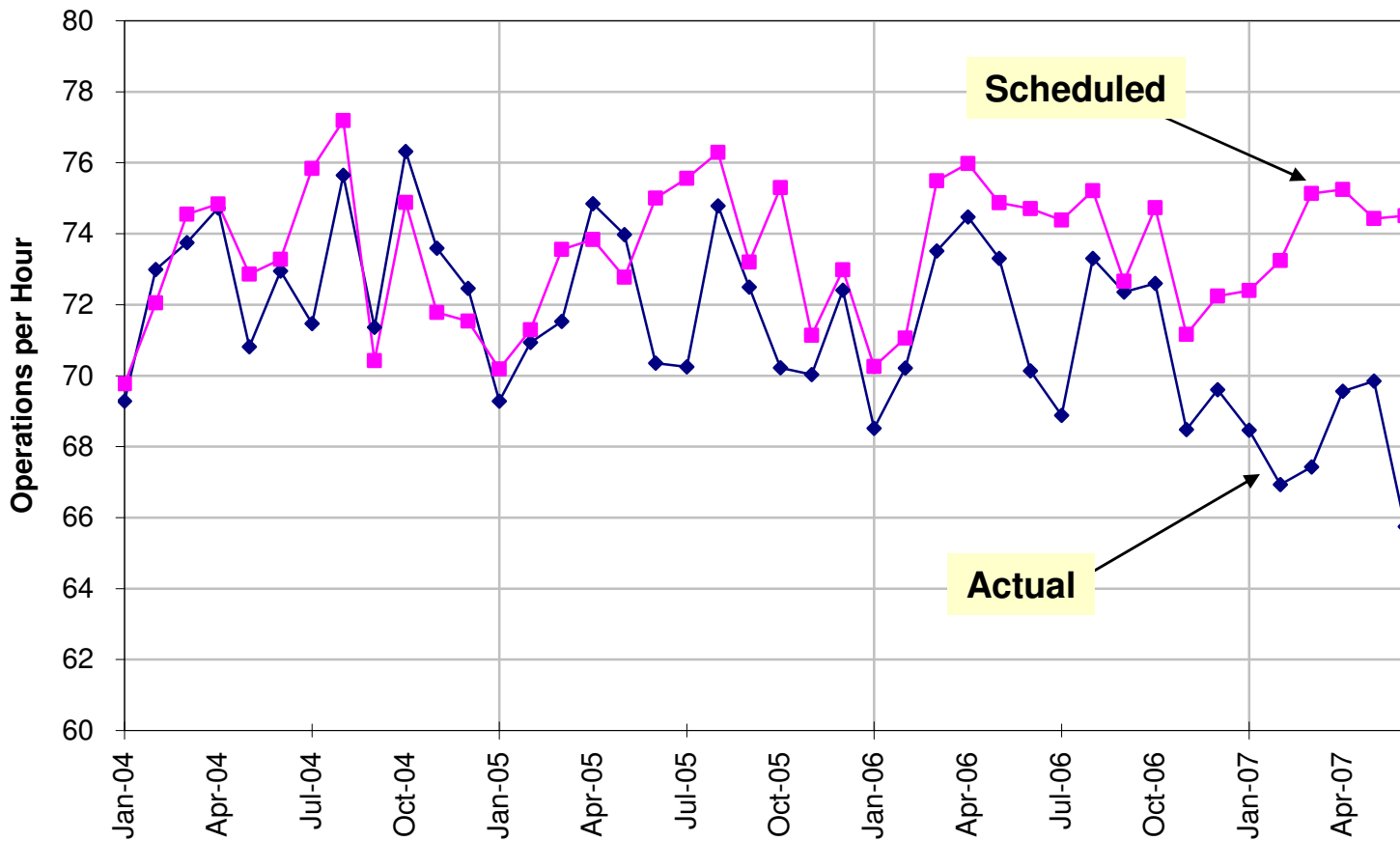
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# Capacity has Fallen at EWR

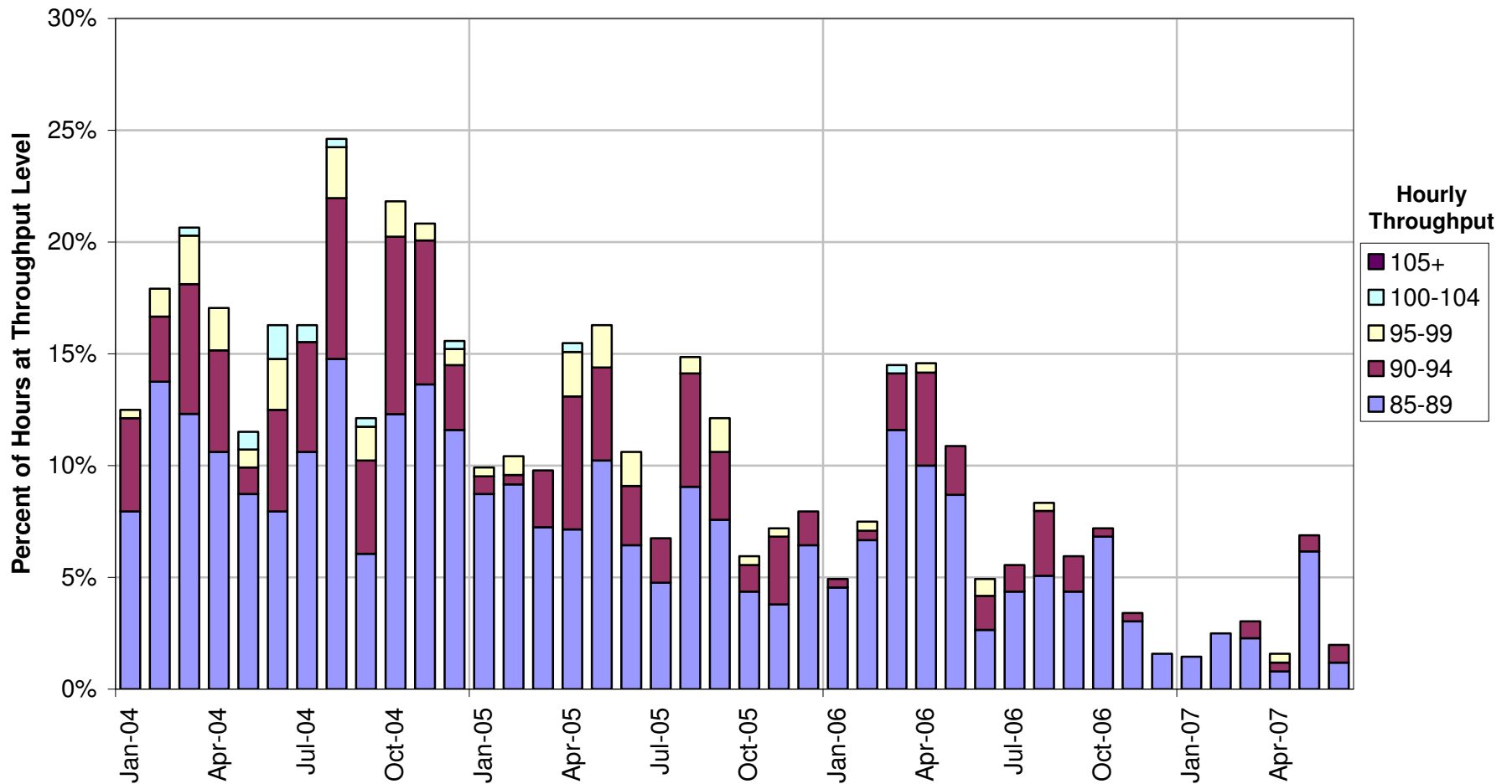
EWR: Average Hourly Operations, 8 AM - 8 PM, Weekdays (ASPM)





# EWR Now Rarely Delivers More Than 85 Flights Per Hour

EWR Actual Throughput, 8 AM - 8 PM, Weekdays



Source: ASPM

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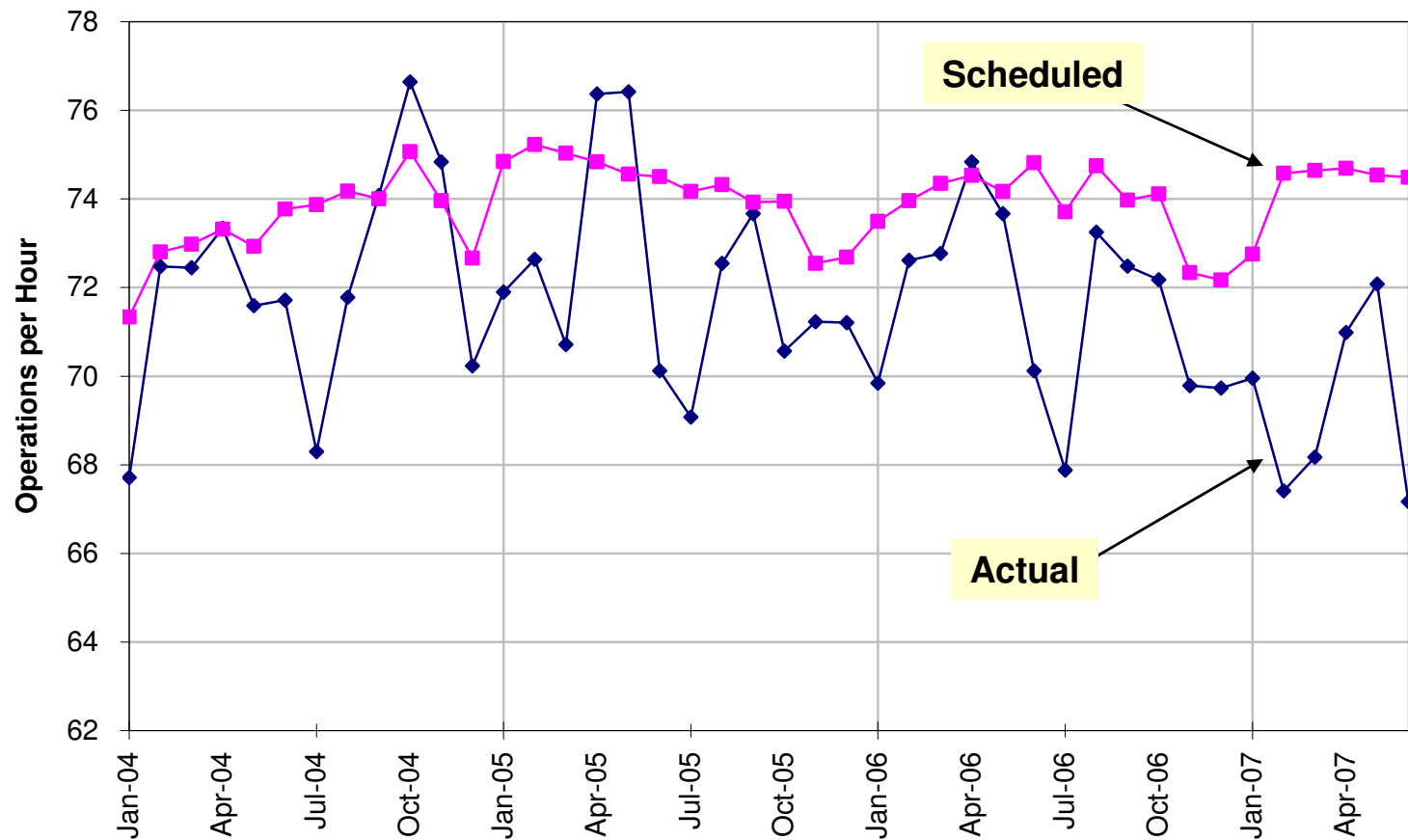
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# Capacity has Fallen at LGA

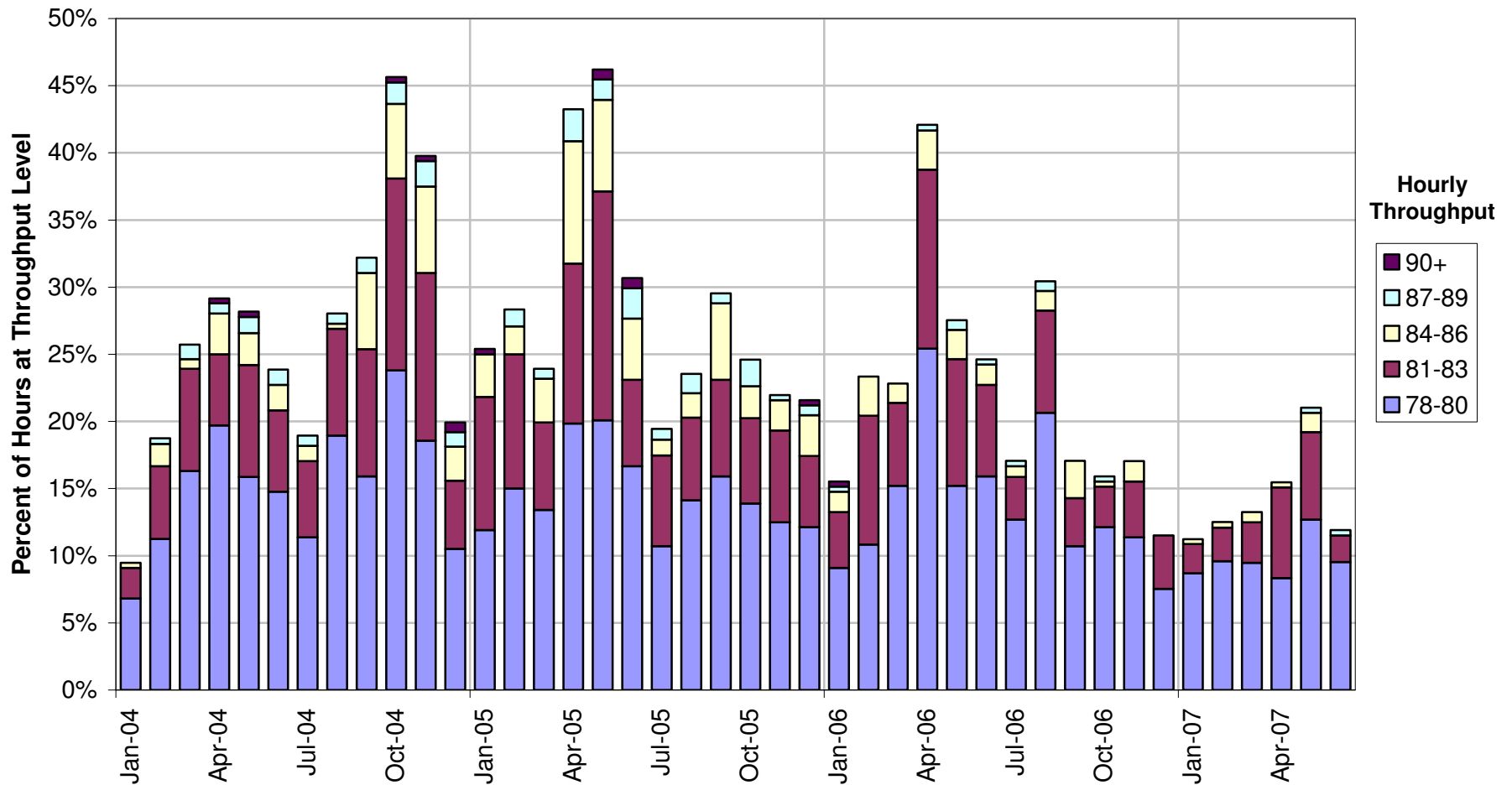
LGA: Average Hourly Operations, 8 AM - 8 PM (ASPM)





# Decrease in LGA Peak Throughput

LGA Actual Throughput, 8 AM - 8 PM, Weekdays



Source: ASPM

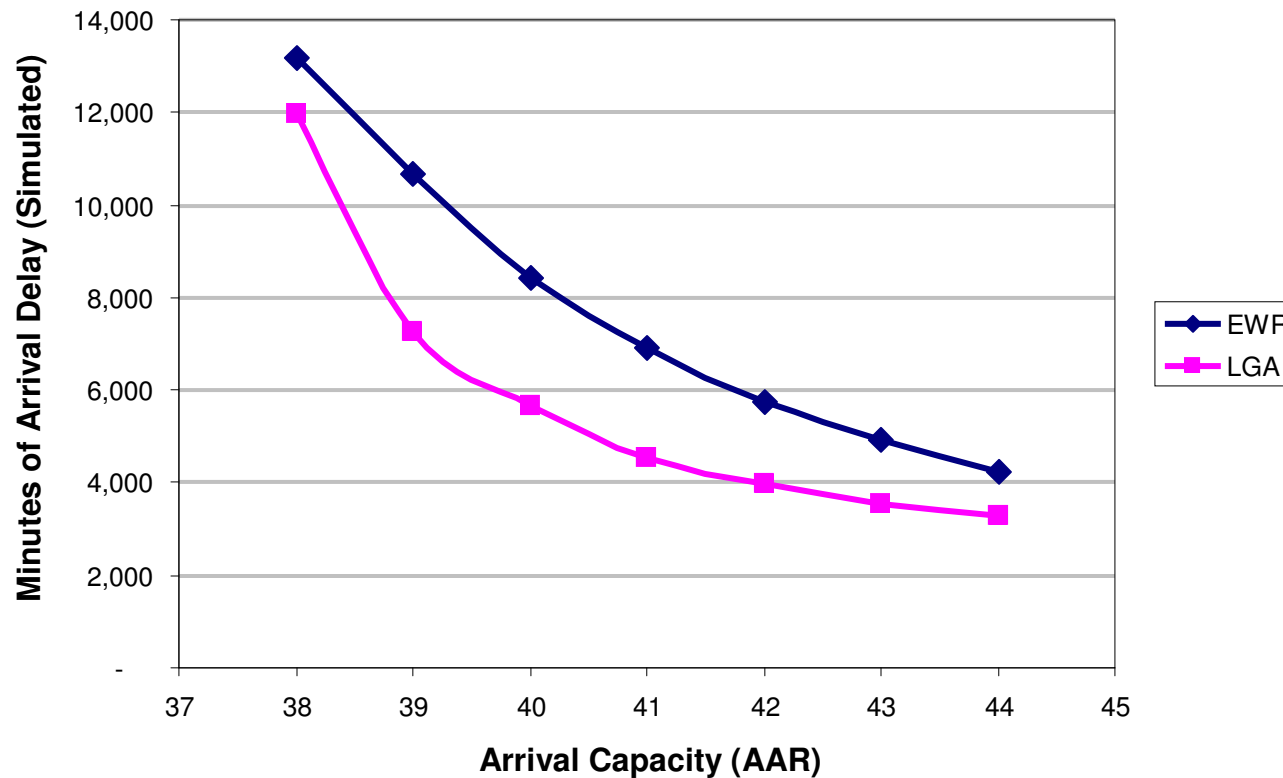
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# Delays Grow Rapidly as Capacity Decreases

Simulated Minutes of Delay Using Feb 15, 2007 Schedule





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# Simulation Results for JFK

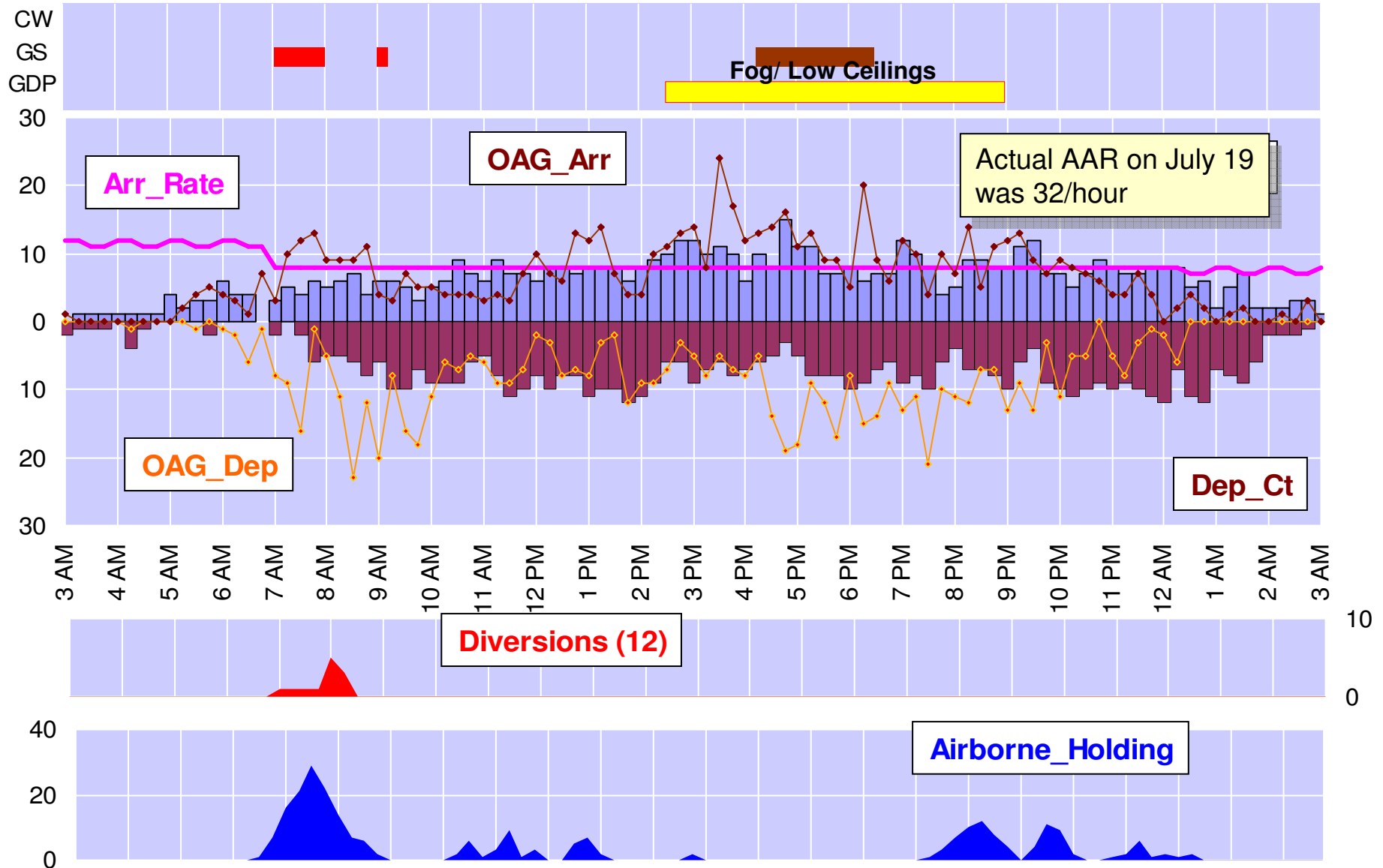
*Ken Wright  
20 July 2007*

# JFK: Thursday, Jul 19, 2007

Delays	Departure	Arrival	TMS
389	240	28	119

**% Ops delayed = 33%**

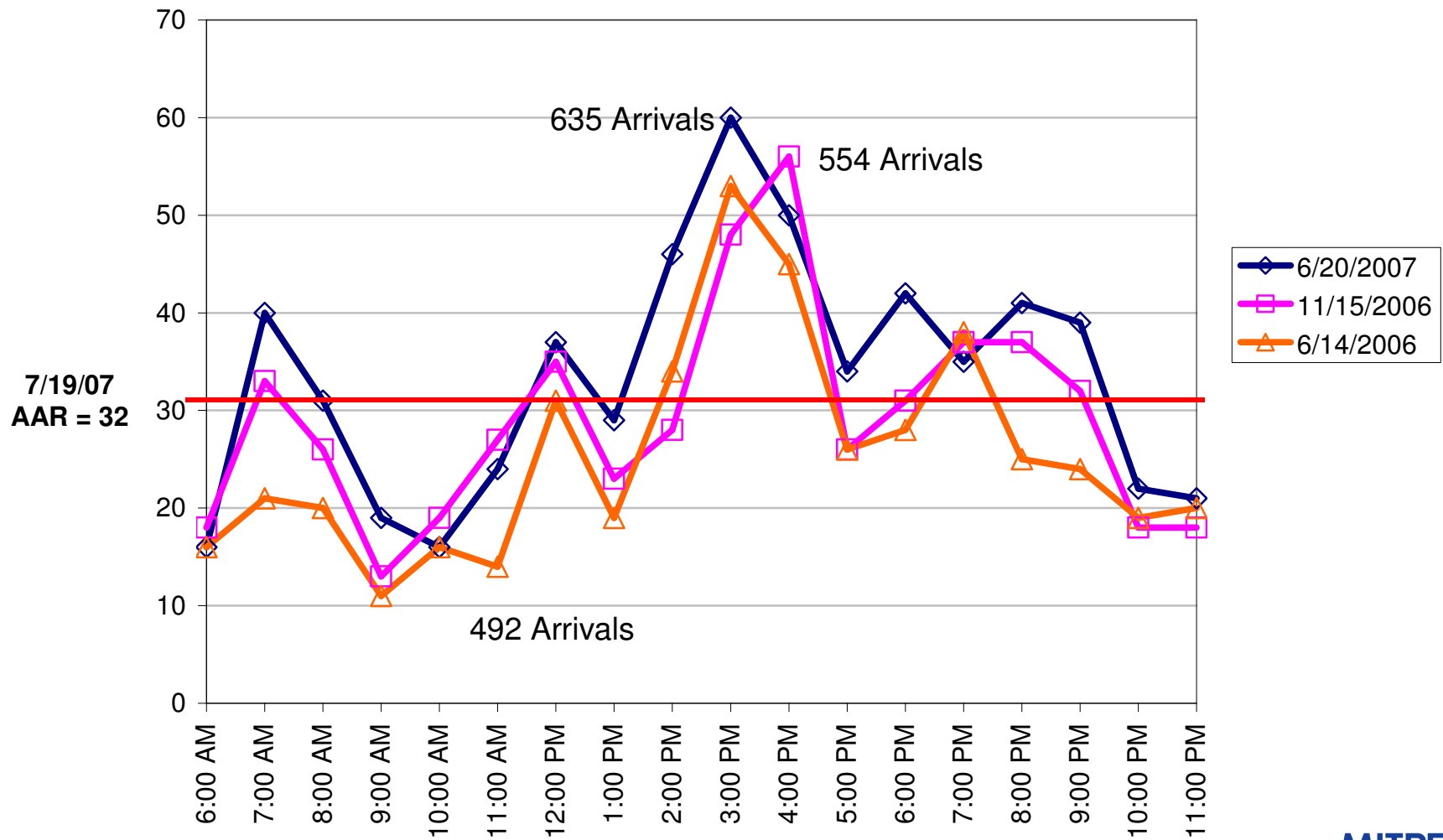
**Average delay = 71 minutes**





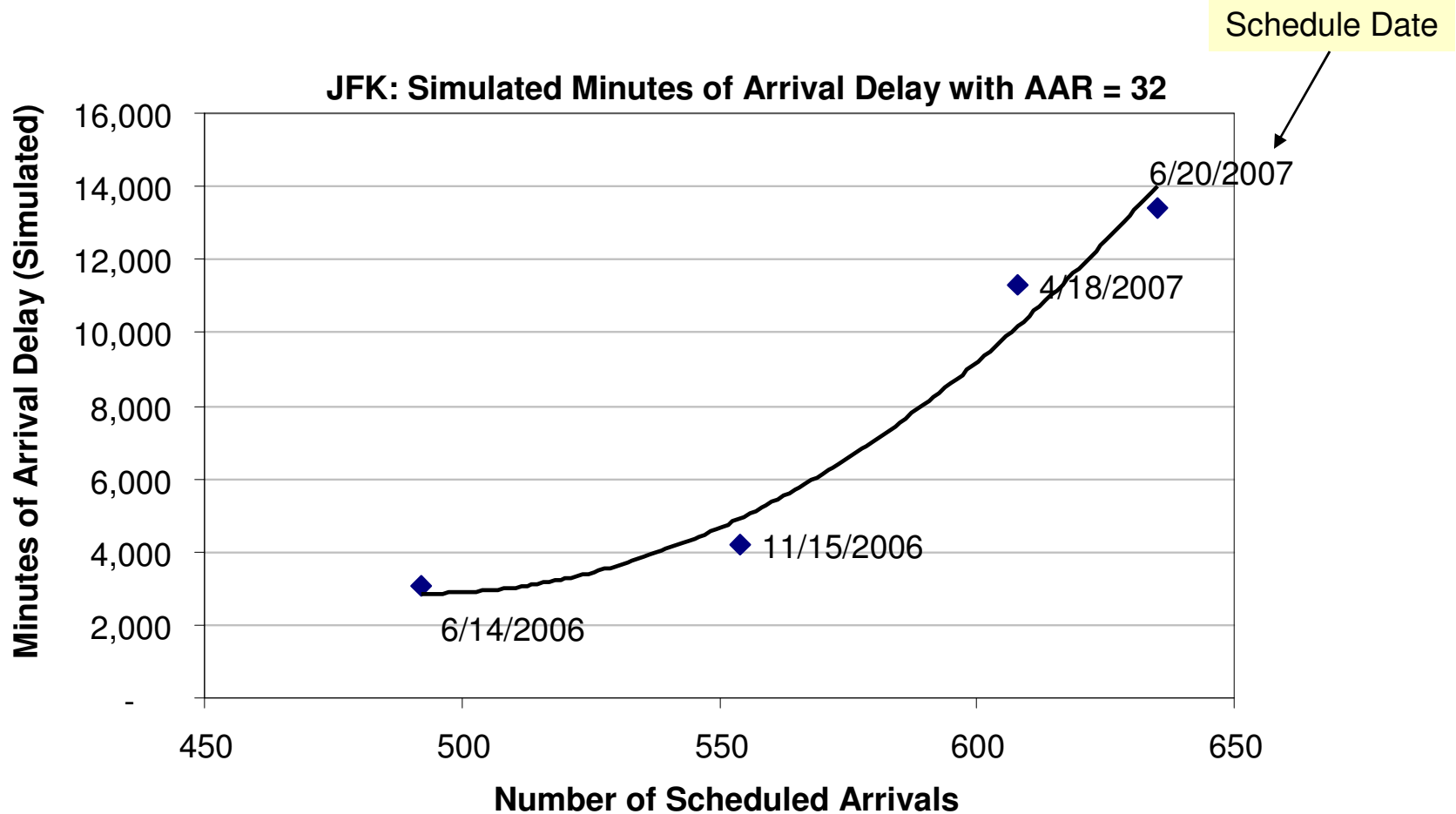
# JFK Hourly Scheduled Arrivals

JFK Scheduled Arrivals (OAG)





# JFK Simulated Minutes of Arrival Delay on a Bad-Weather Day





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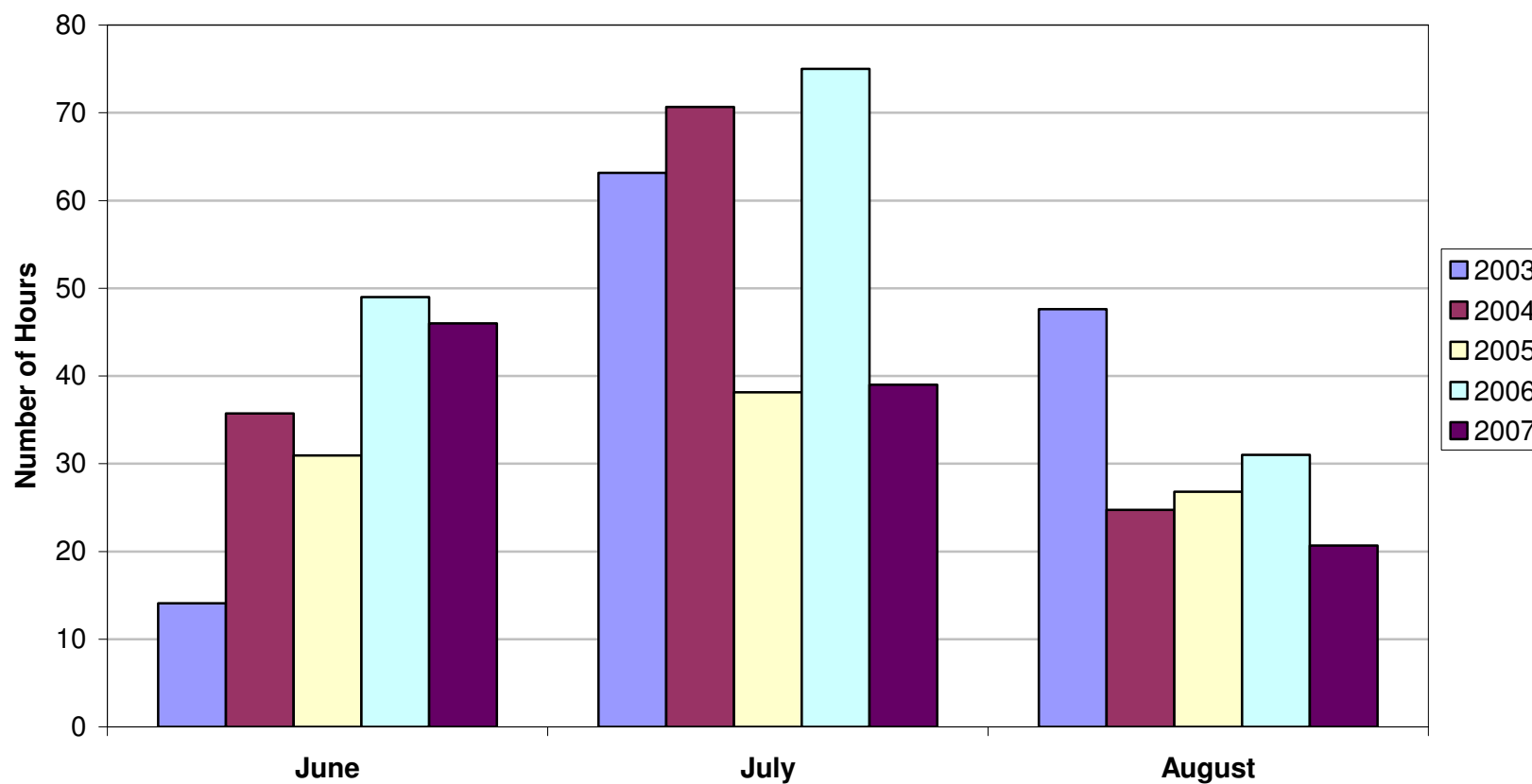
# Optional: Convective Weather June-August 2007





# New York Weather Thunderstorms

Hours Having Level 3+ Thunderstorms at EWR, LGA or JFK



Source: MITRE NCWD

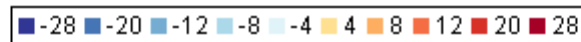
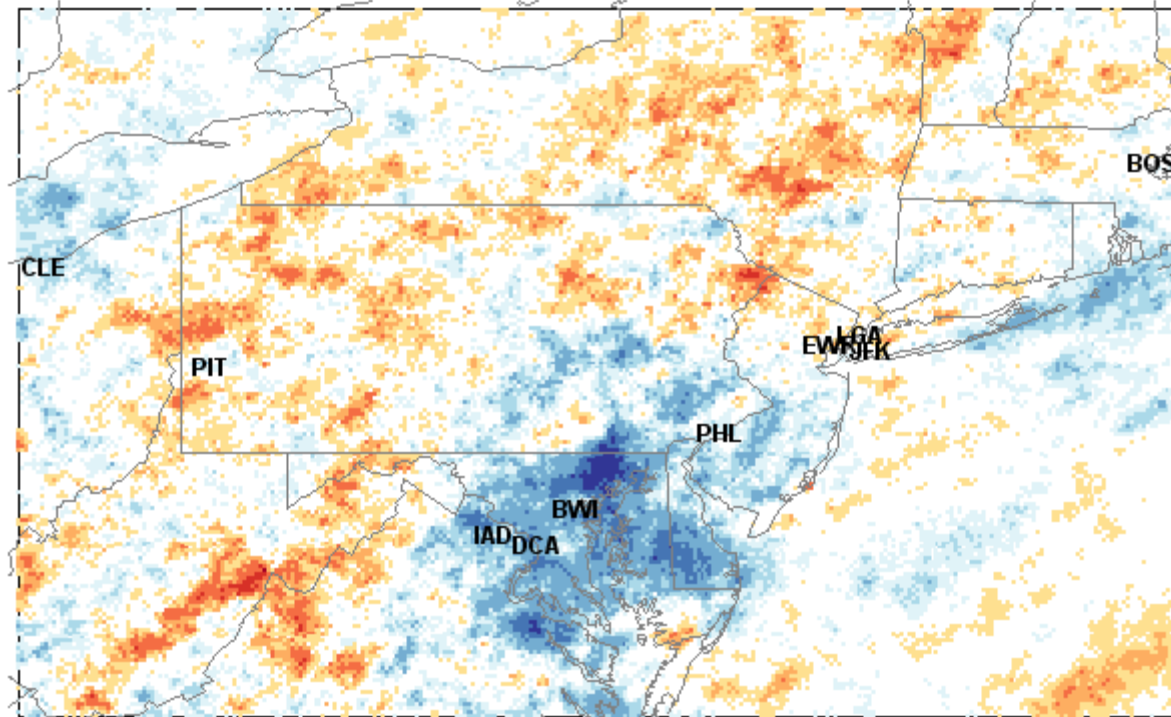
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# Convective Weather Comparison June 2006 & 2007

June 2007 Minus June 2006: Hours Having Thunderstorm Intensity 3+

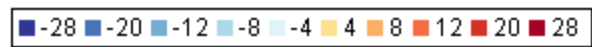
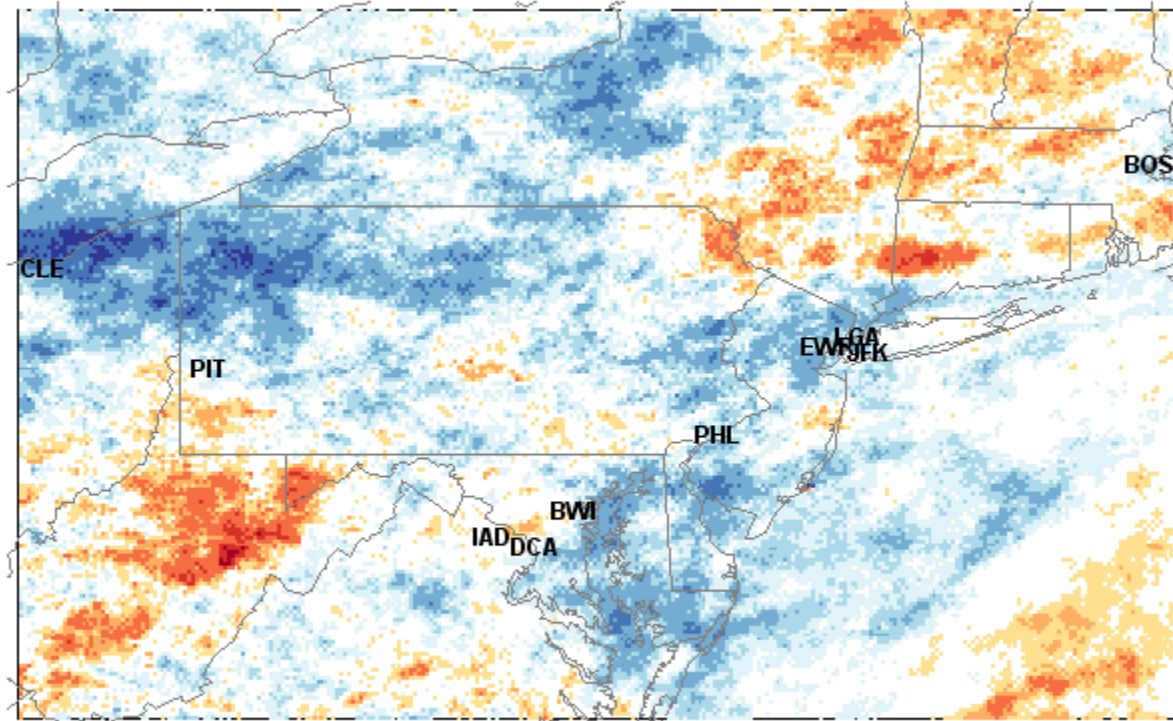


**Brown** areas had more storms in 2007; **Blue** areas had fewer



# Convective Weather Comparison July 2006 & 2007

July 2007 Minus July 2006: Hours Having Thunderstorm Intensity 3+



**Brown** areas had more storms in 2007; **Blue** areas had fewer

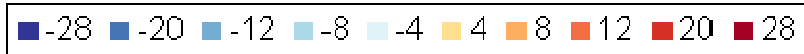
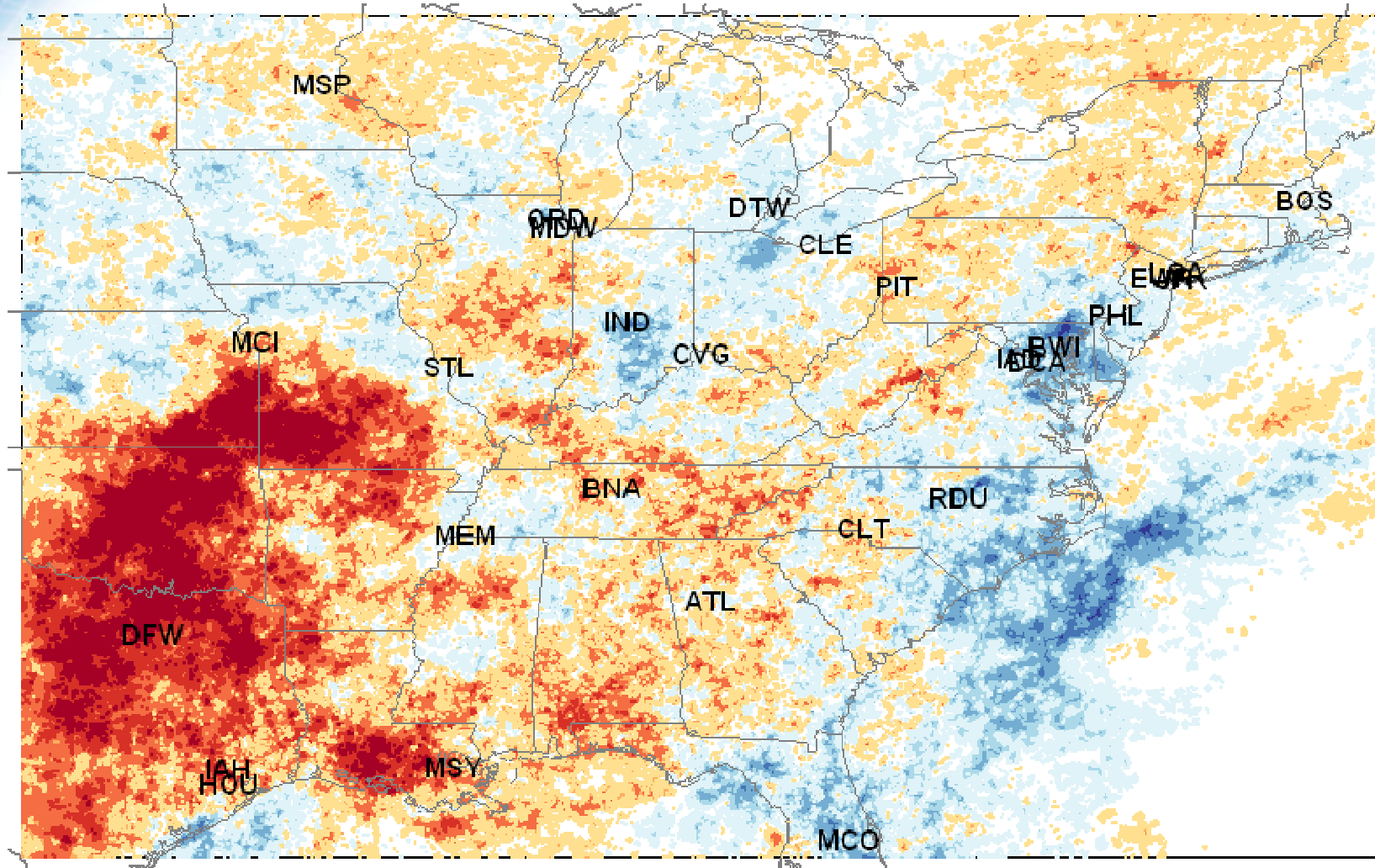
Source: MITRE NCWD

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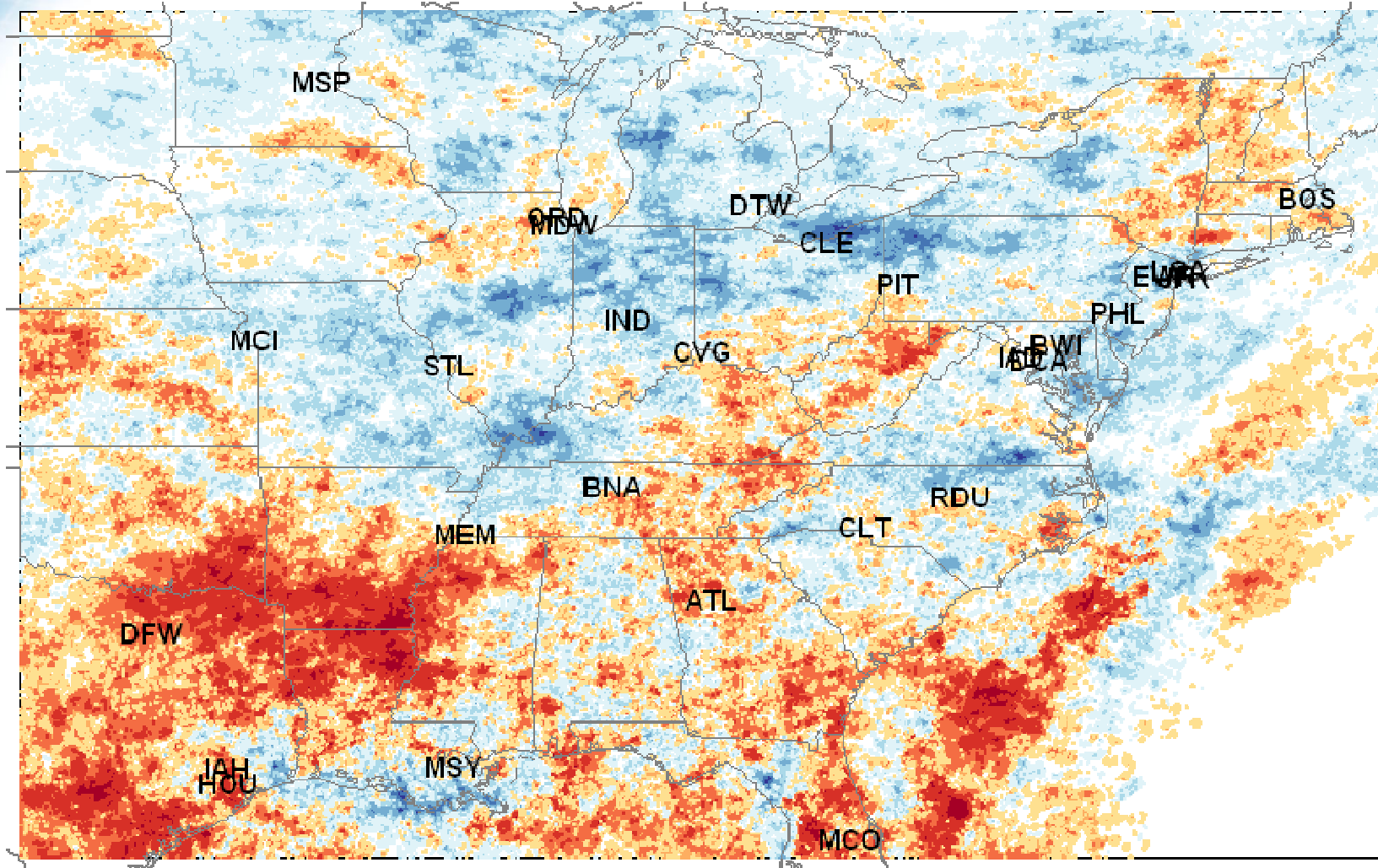
## June 2007 Minus June 2006: Hours Having Thunderstorm Intensity 3+



**Brown** areas had more storms in 2007; **Blue** areas had fewer



## July 2007 Minus July 2006: Hours Having Thunderstorm Intensity 3+



**Brown** areas had more storms in 2007; **Blue** areas had fewer

Source: MITRE NCWD

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## Aug 2007 Minus Aug 2006: Hours Having Thunderstorm Intensity 3+

