FREIGHT DATA
STATE AND MEGAREGIONS

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(*Moderator*)

ATRI's Truck-GPS Data for Freight Performance Measurement, Modeling, and Planning

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Acknowledgements

Florida Department of Transportation (FDOT)

American Transportation Research Institute (ATRI)

Current and Former Graduate Students at USF

ATRI's Truck-GPS Data

- ## The ATRI-FPM initiative beginning in 2001

  - *Satellite data from trucking companies who use GPS to monitor their fleet*

  - *Big Data – Currently near 100 million data points per day*

- ## What is in (or known about) the data?

  - *GPS data for a large number of trucks*

  - *Spatial and temporal coordinates for every GPS data point*

Unique Truck ID	Time/Date Stamp	Latitude	Longitude	Heading	Speed
12232123	05-03-2011 01:55:55	33.915932	-84.494760	North	25

  - *Predominantly FHWA class 8 or above (tractor-trailers 5-axles or more)*

- ## What is not in the data?

  - *Commodity transported, full-load/half-load, # axles, travel purpose or other details of individual trucks*

- ## Non-Disclosure agreements in place with USF

TRANSPORTATION DATA SYMPOSIUM

FDOT

Freight Performance Measurement

Legend

FL_2010_Draft PM

——	0 - 25
——	25 - 35
——	35 - 45
——	45 - 55
——	55 +

PM peak period truck speeds on every mile of Florida's SIS highways

Convert GPS Data into Truck Trips

- *Algorithms to convert raw GPS data into a database of truck trips*

- *Database of over 2 Million truck trips derived from over 145 Million GPS records*

- *1.27 Million trips starting and/or ending in Florida*

	# GPS records (Millions)	# Trucks (Thousands)	# Trips starting and/or ending in Florida (Thousands)
March 2010	39.0	61.7	340
April 2010	35.7	58.7	320
May 2010	35.1	45.6	306
June 2010	35.2	45.4	305
Total	145 Million GPS records		1.27 Million truck trips

- *Information available for each trip: Trip start & end times, distance, travel time, Origin and Destination TAZs based on FL statewide model*
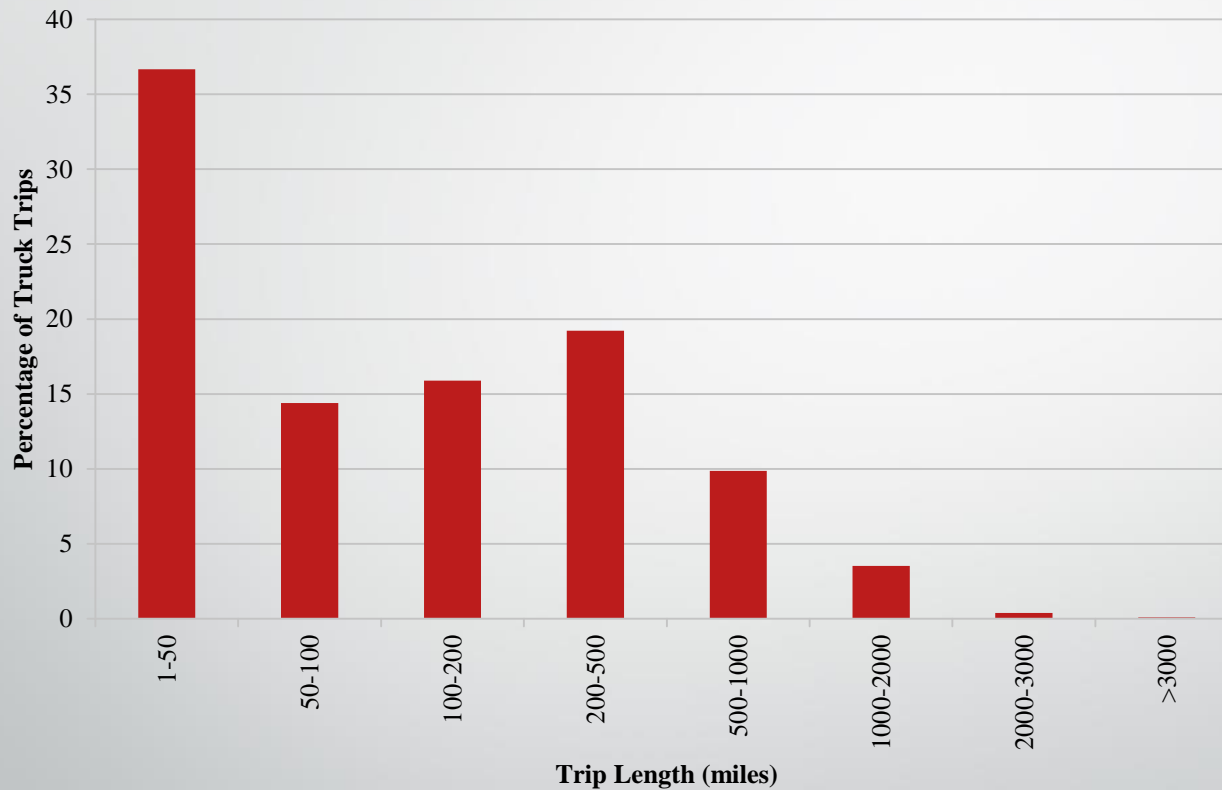
Truck OD Travel Time Measurement:
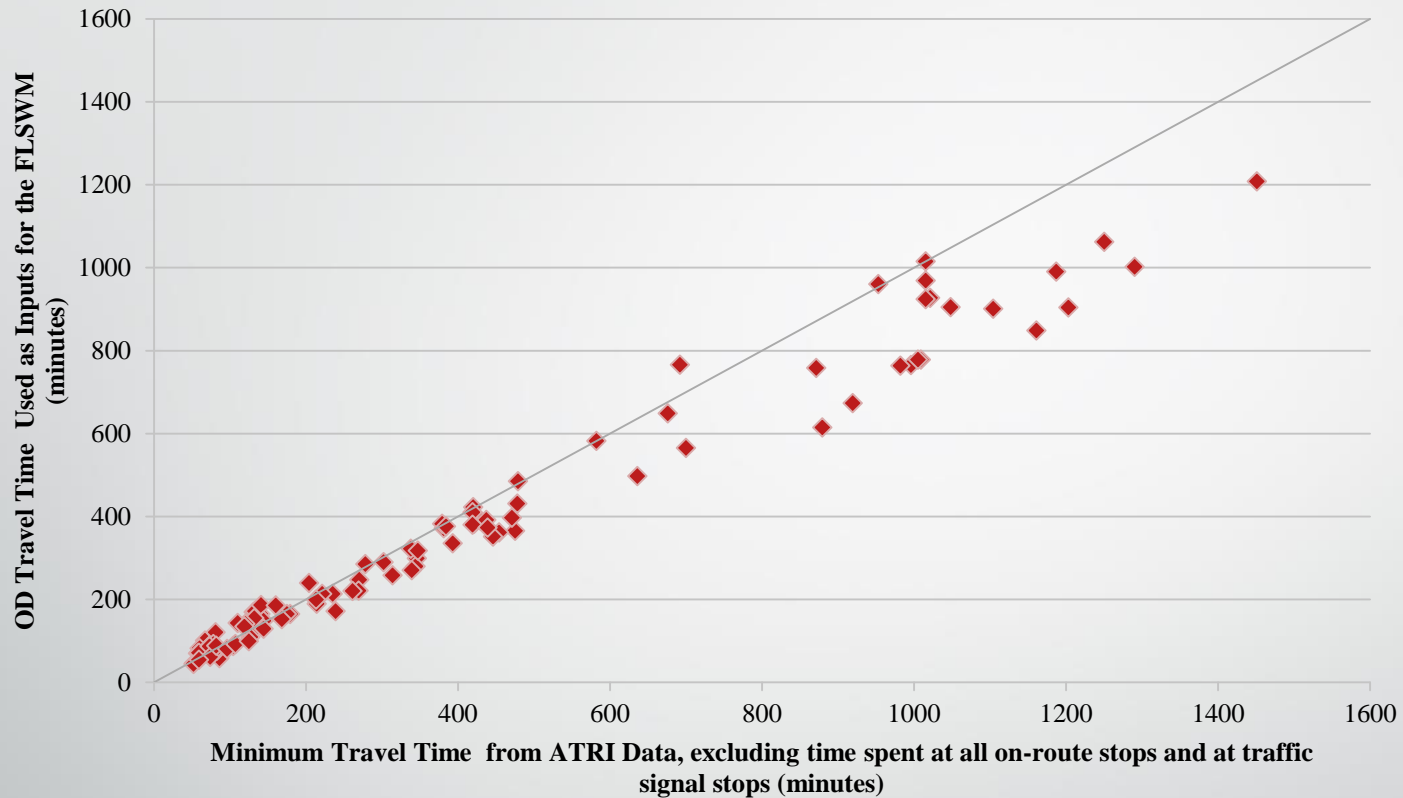
OD travel times used in FL-statewide model (FLSWM) are smaller than those measured using ATRI data, primarily because FLSWM travel times are based on passenger car travel times.

ATRI data can be used to generate better truck travel time information for FLSWM
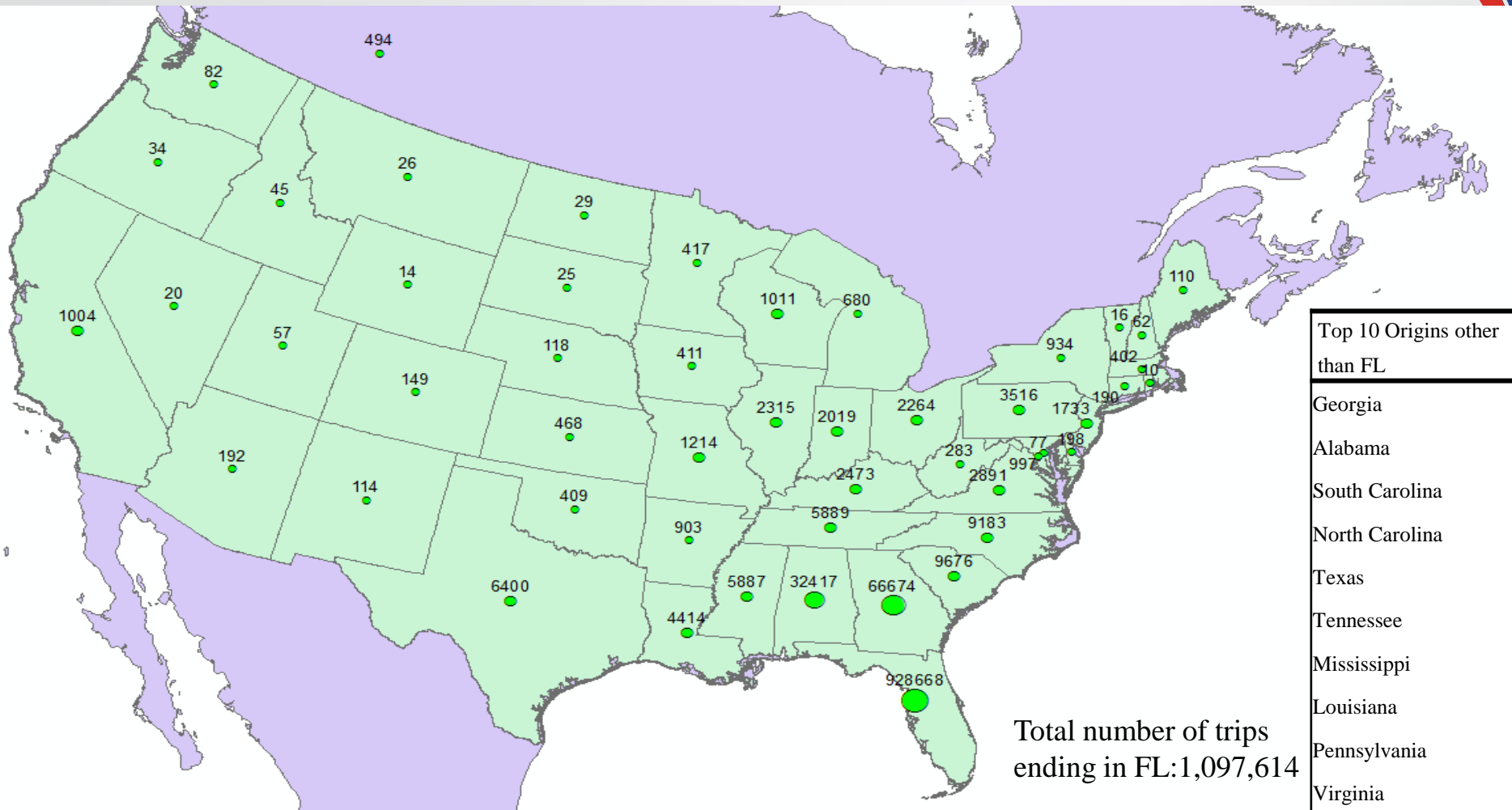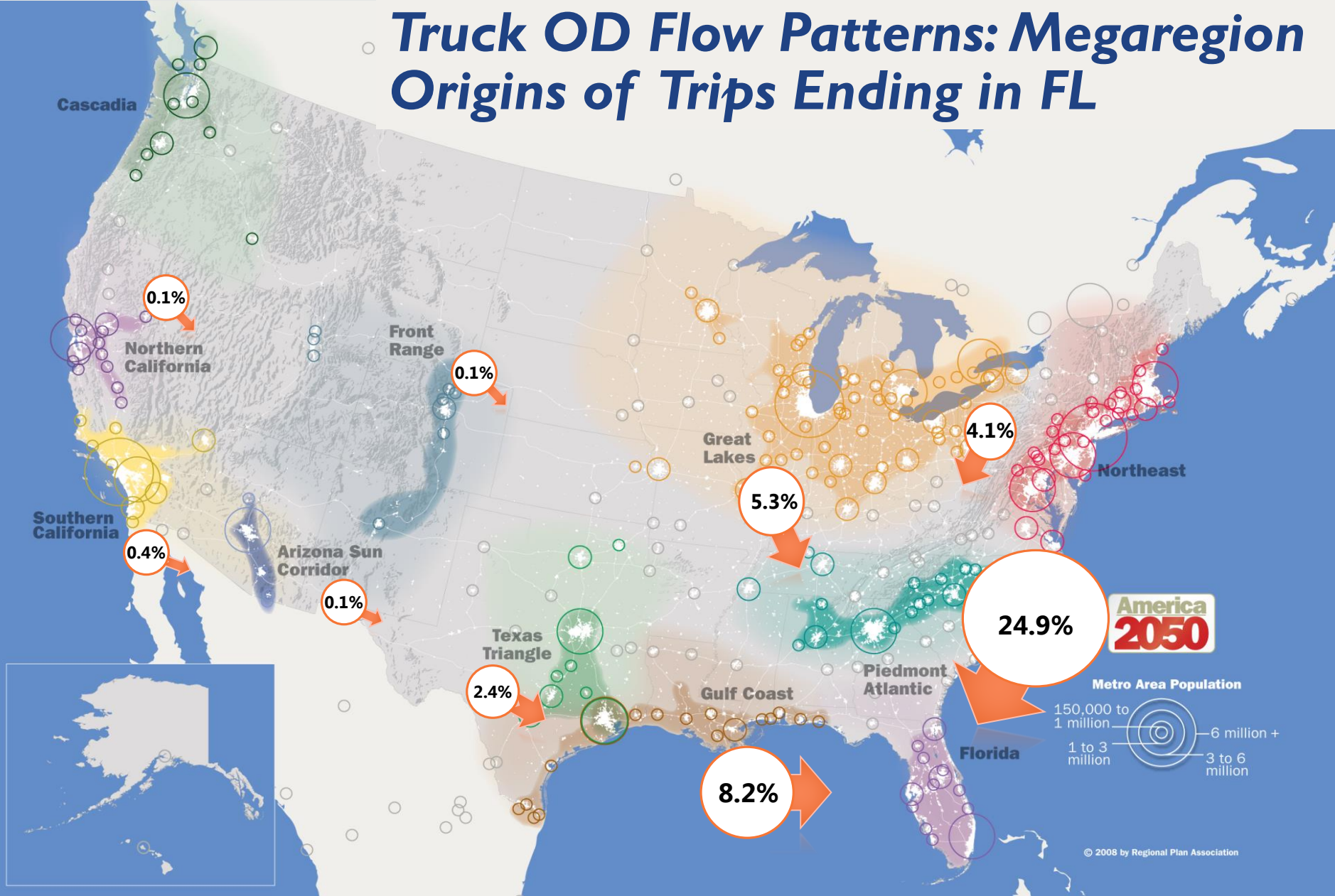
Trip Length Distribution

Trip length distribution of 2.7 Million trips derived from 4 Months of ATRI data

Truck OD Flow Patterns: Origin States of Trips Ending in FL
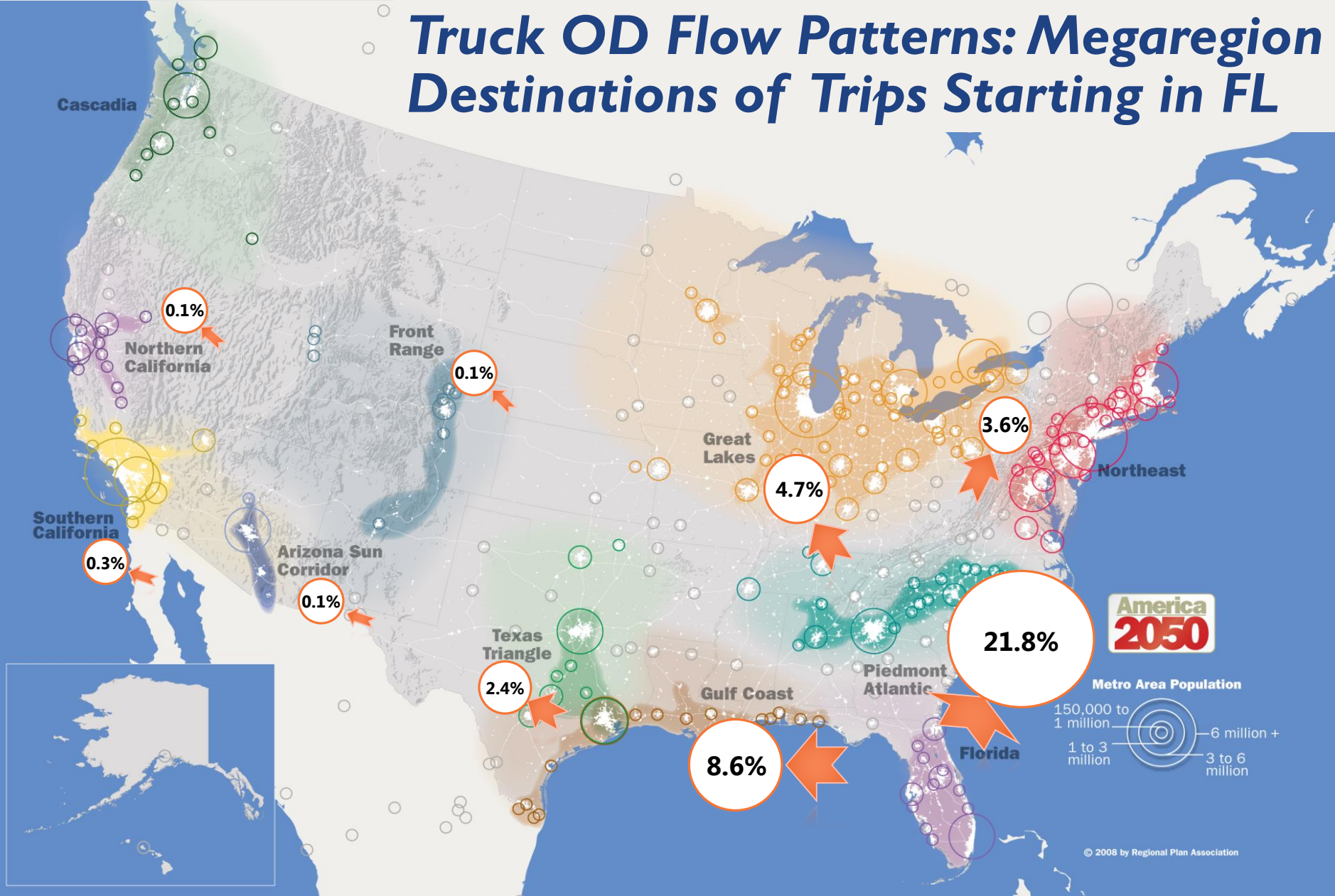

Total number of trips ending in FL: 1,097,614

Top 10 Origins other than FL
Georgia
Alabama
South Carolina
North Carolina
Texas
Tennessee
Mississippi
Louisiana
Pennsylvania
Virginia

Truck OD Flow Patterns: Megaregion Origins of Trips Ending in FL

Cascadia

0.1%

Northern California

Front Range

0.1%

Great Lakes

4.1%

Northeast

5.3%

Southern California

0.4%

Arizona Sun Corridor

0.1%

Texas Triangle

2.4%

Gulf Coast

24.9%

Piedmont Atlantic

Florida

8.2%

America 2050

Metro Area Population

150,000 to 1 million — 6 million +

1 to 3 million — 3 to 6 million

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TRANSPORTATION DATA SYMPOSIUM

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Truck OD Flow Patterns: Destination States of Trips Starting in FL

Top 10 Destinations other than FL
Georgia
Alabama
South Carolina
North Carolina
Mississippi
Texas
Tennessee
Louisiana
Virginia
Pennsylvania

Total number of trips starting in FL: 1,102,873
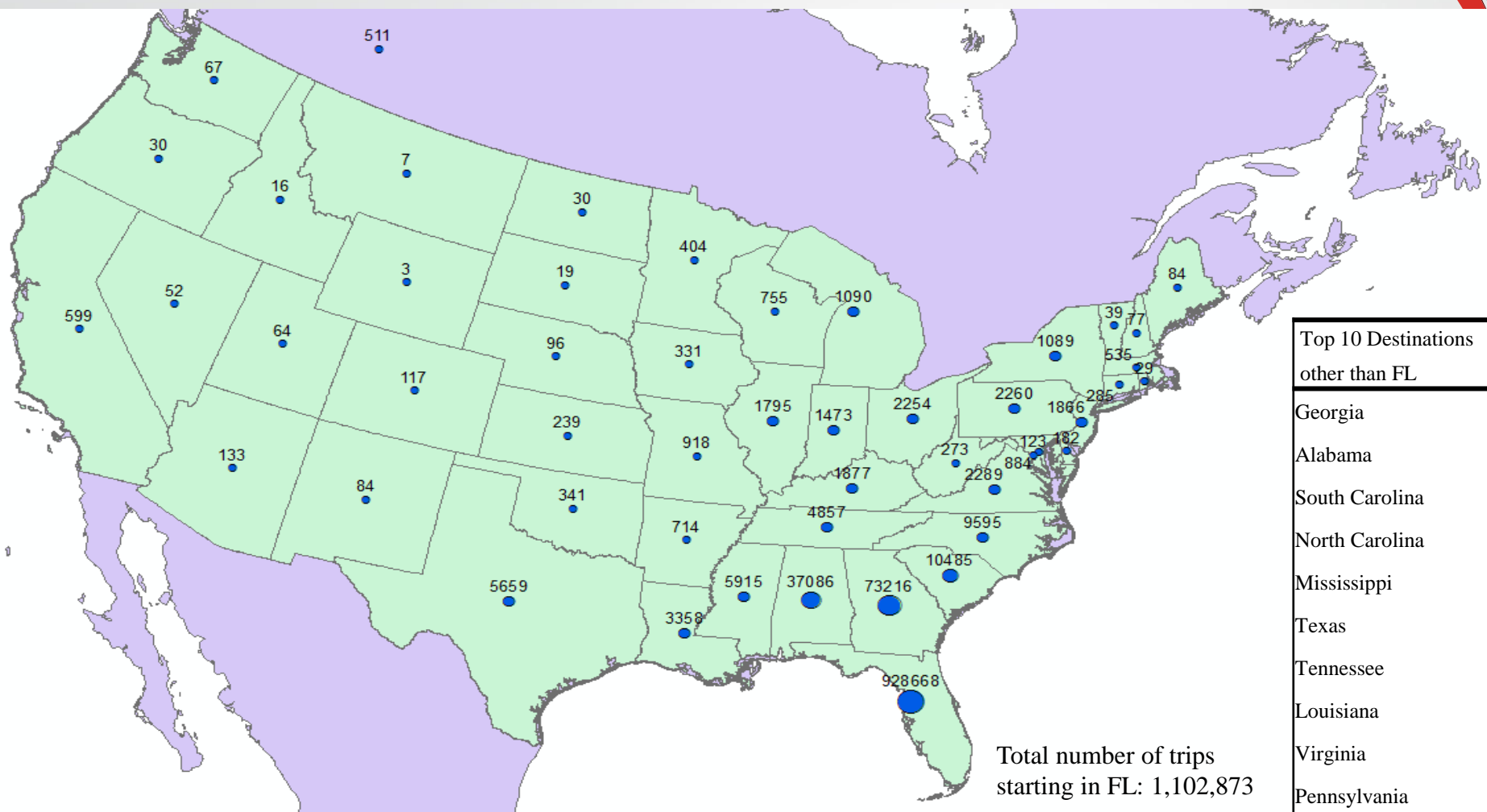
Truck OD Flow Patterns: Megaregion Destinations of Trips Starting in FL

Cascadia

0.1%

Northern California

Front Range

0.1%

3.6%

Great Lakes

4.7%

Northeast

Southern California

0.3%

Arizona Sun Corridor

0.1%

Texas Triangle

2.4%

Gulf Coast

21.8%

Piedmont Atlantic

8.6%

Florida

America 2050

Metro Area Population

150,000 to 1 million — 6 million +

1 to 3 million

3 to 6 million

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TRANSPORTATION DATA SYMPOSIUM

FDOT

How Much Heavy-Truck Traffic in Florida is Covered by the OD Tables from the *ATRI Data?*

Heavy truck (class 9 - 13) counts from TTMS data vs truck counts from ATRI data
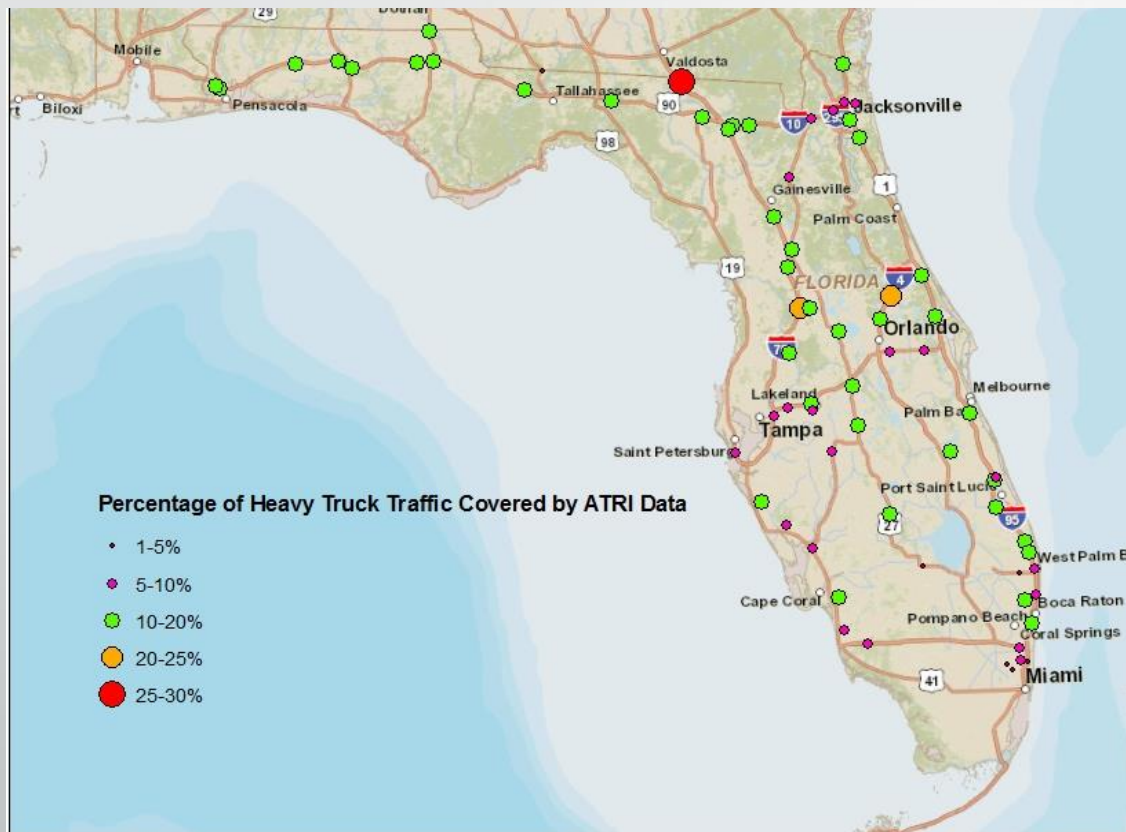May 9-15, 2010

Heavy truck counts from TTMS data vs truck counts from ATRI data (total)

- Heavy truck counts (from TTMS data)
- Truck counts (from ATRI data)
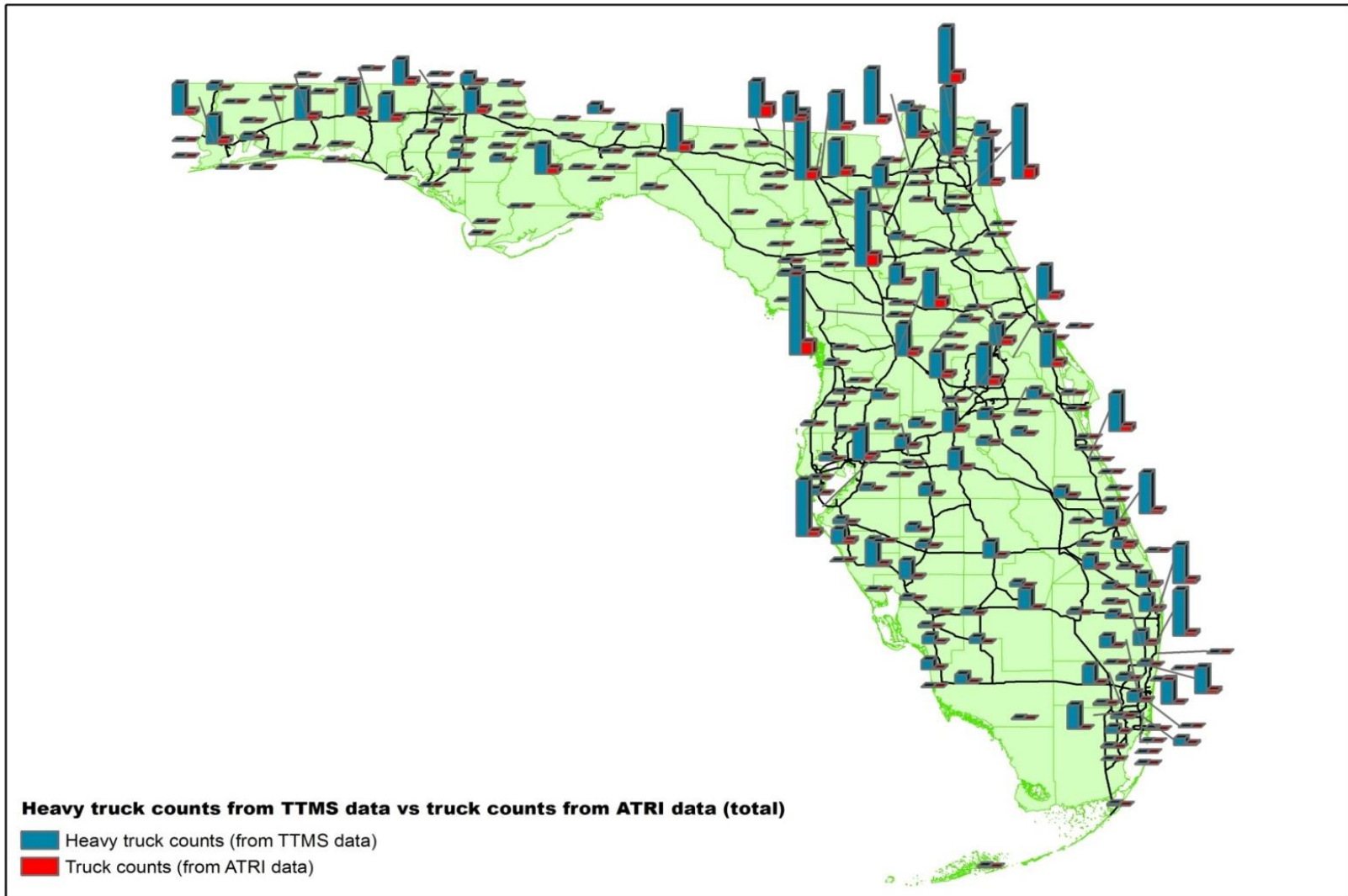
How Much Heavy-Truck Traffic in Florida is Covered by the ATRI Data?

Facility Type	No. of TTMS Traffic Counting stations	Observed TTMS Truck Traffic Volumes	Truck Traffic Volumes in ATRI data	% Coverage assuming ATRI data comprises trucks of class 8-13
Freeways & Expressways	29 (18.1%)	1,063,765 (65.6%)	111,608 (68.3%)	10.5%
Divided Arterials	64 (40.0%)	333,791 (20.6%)	30,472 (18.6%)	9.1%
Undivided Arterials	52 (32.5%)	101,066 (6.2%)	6,969 (4.3%)	6.9%
Collectors	8 (5.0%)	42,164 (2.6%)	5,127 (3.1%)	12.2%
Toll Facilities	7 (4.4%)	80,493 (5.0%)	9,291 (5.7%)	11.5%
Total	160	1,621,279	163,467	10.1%

- *At the aggregate level, ATRI data represents about 10% of heavy truck traffic volumes in Florida*

Geographical Coverage of ATRI data

Percentage of Heavy Truck (Class 8-13) Traffic Volumes Represented by
ATRI Data at different TTMS locations in Florida, during May 9-15, 2010

OD Matrix Estimation of Statewide Truck Flows

- *The OD patterns shown so far are from a **sample** of trips (although it's a large sample)*

- *The ATRI data does not comprise the **census** of all heavy trucks in the state*

- *Perform OD Matrix Estimation (ODME) to...*

  "Inflate" the **sample** OD table to a **census** (i.e., full) OD table such that, when loaded onto the network, the resulting flows match with observed truck traffic counts at different locations.
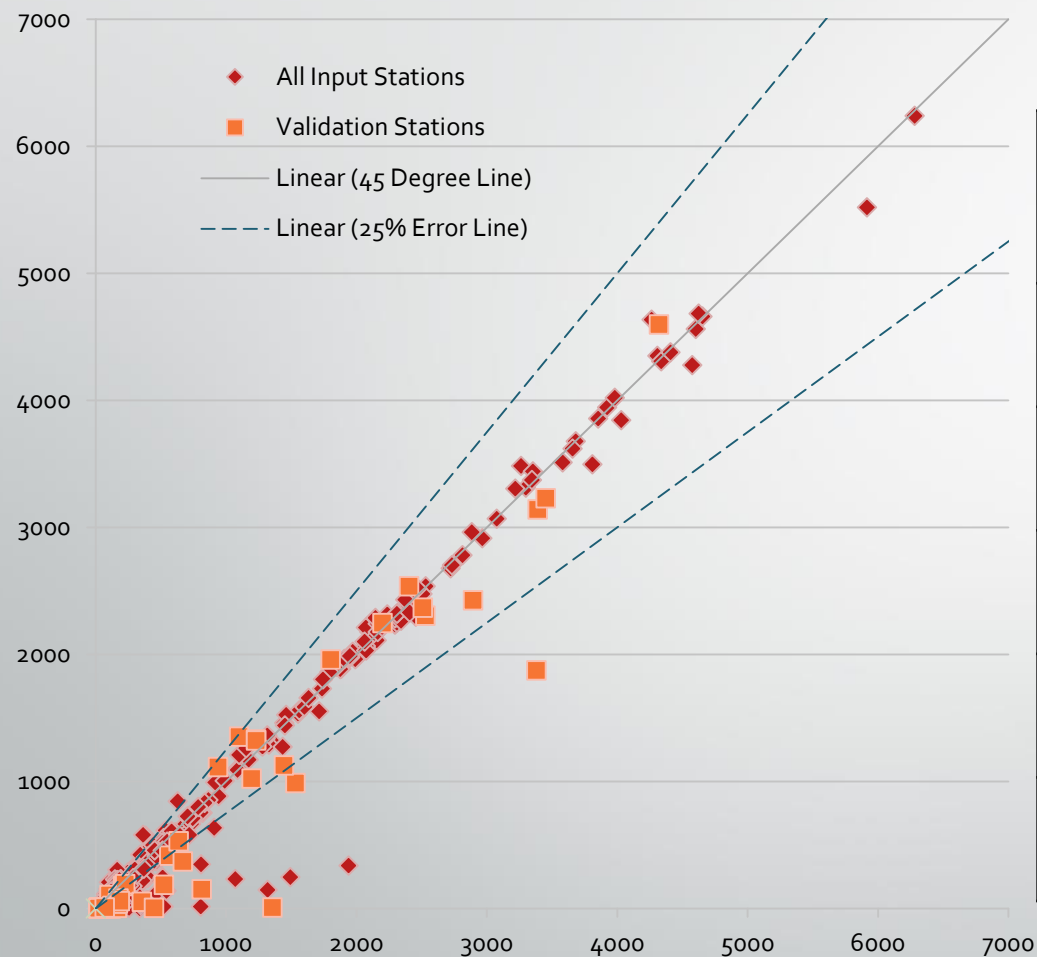
Truck Traffic Count Locations Used for *ODME*
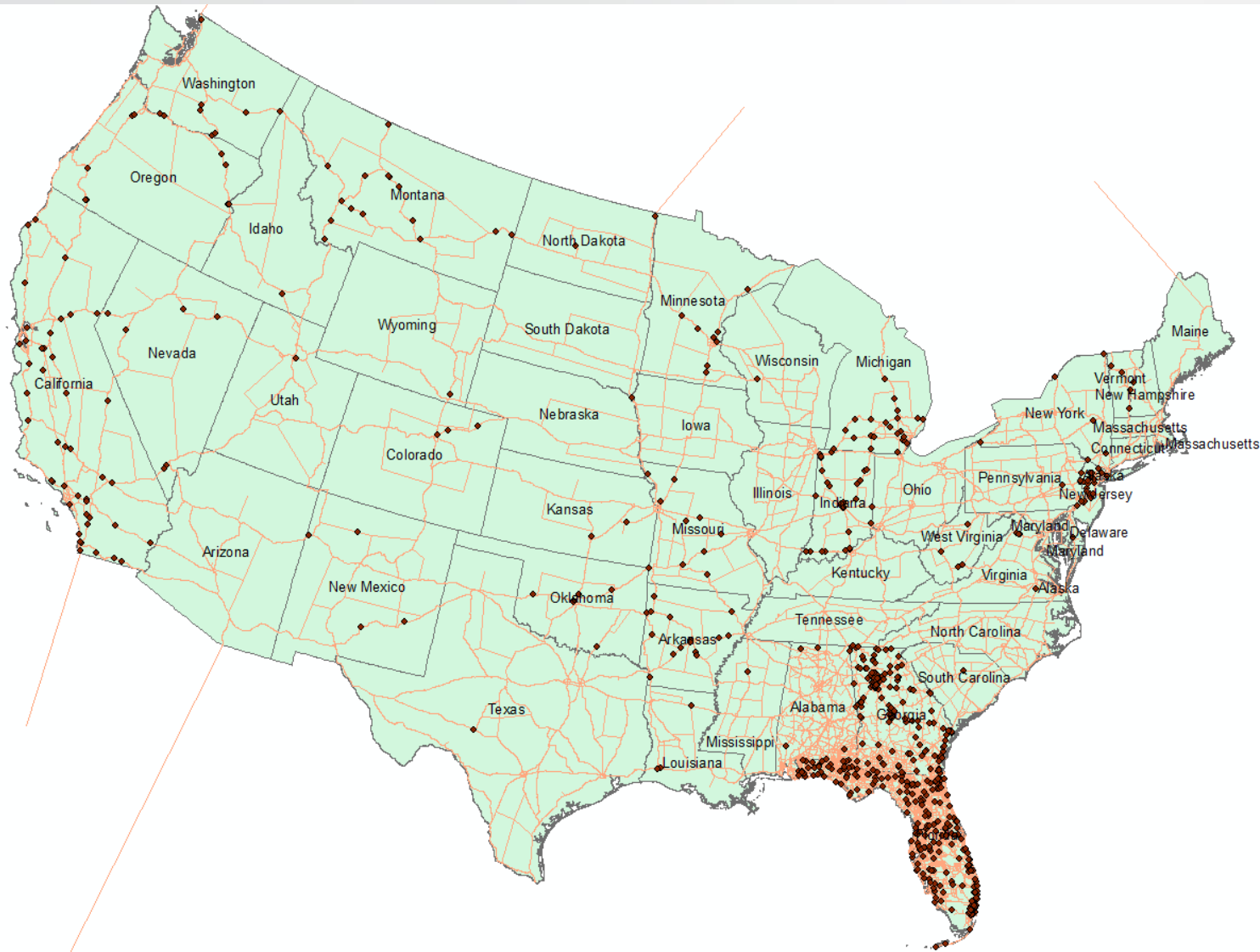
State	# sites
FL	413
GA	270
CA	55
IN	55
MI	32
AR	30
NJ	30
MO	17
MT	17
OR	13
NV	12
OK	12
WA	10
MN	11
WV	8
AL	8
.	.
.	.
.	.
Total	1048

Estimated vs. Observed Truck Volumes in FL

Observed Truck Counts	RMSE (No. of Input Stations)	RMSE (No. of validation Stations)
2-100	71% (64)	105% (11)
100-500	47% (167)	70% (20)
500-1000	30% (38)	
1000-7000	11% (96)	25% (17)
Total	**20% (365)**	**38% (48)**

Chart legend:
- All Input Stations
- Validation Stations
- Linear (45 Degree Line)
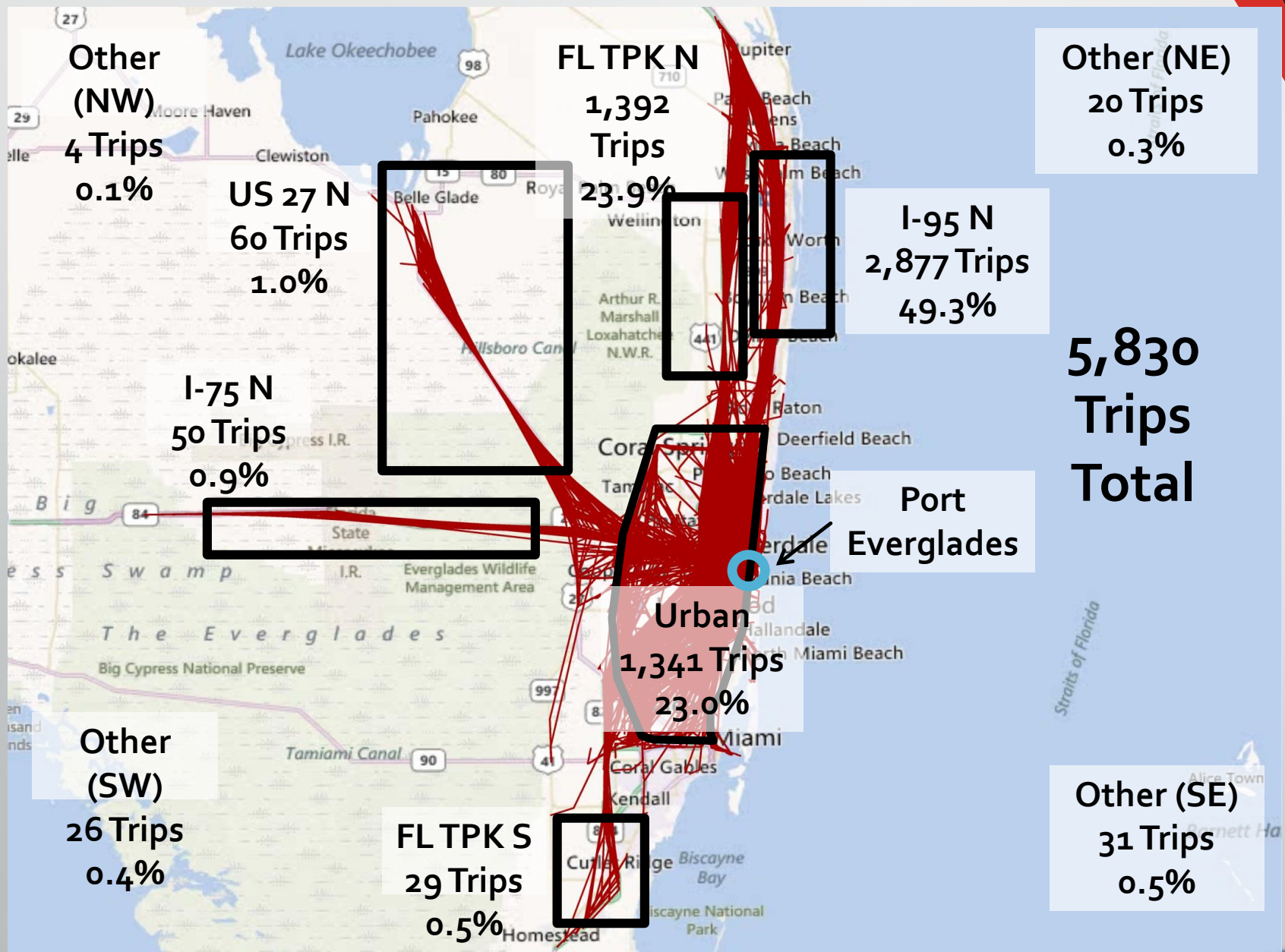- Linear (25% Error Line)

Analysis of Truck Flows from Port Everglades

Port Everglades

Thoughts for Way Forward

- **There is an opportunity to use the data to extract truck travel patterns within a region**

  - *A small but useful portion of trucks in the data are smaller trucks, which are more likely to be local delivery and distribution trucks*

  - *ATRI's estimate: 11% of their database are trucks of class 7 or lower, 6% are straight trucks or box-trucks*

- **Combining the "truck flows" derived from ATRI data with the "commodity flows" derived from Transearch and other data sources**

  - *To bring together the strengths of both data sources*

  - *To derive truck flows for different industries/commodities*

THANK YOU!

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Up Next:

Text Polling!