# Extracting Freight Corridor Performance from Weigh-in-Motion Data


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# Objectives

- Retrospectively study truck transponder data in key corridors to determine the feasibility of producing freight corridor performance measures.
- Demonstrate other freight performance measures


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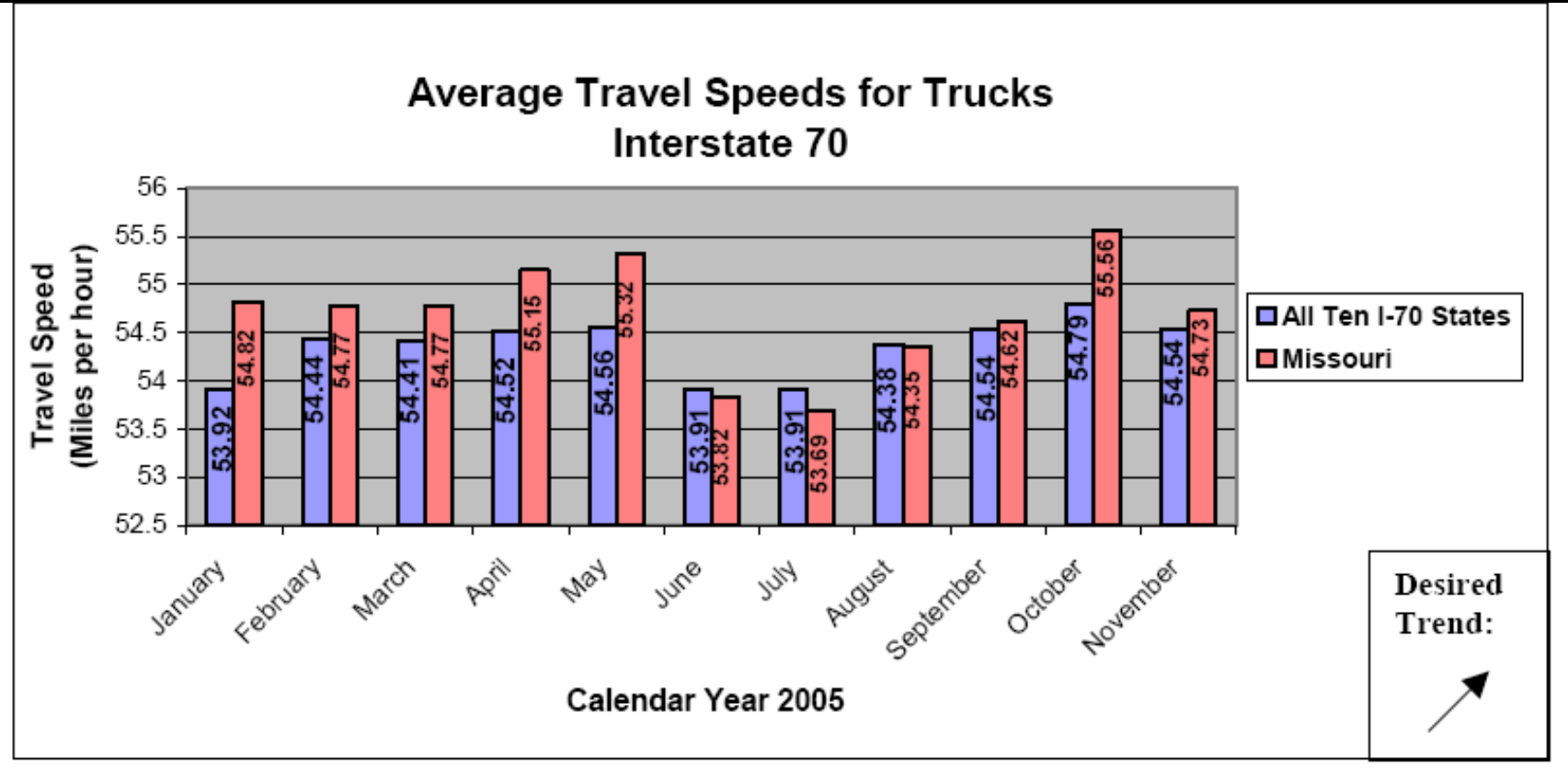
# Motivation

*Using Federal Highway Administration (FHWA) / American Transportation Research Institute (ATRI) proprietary truck satellite data.*

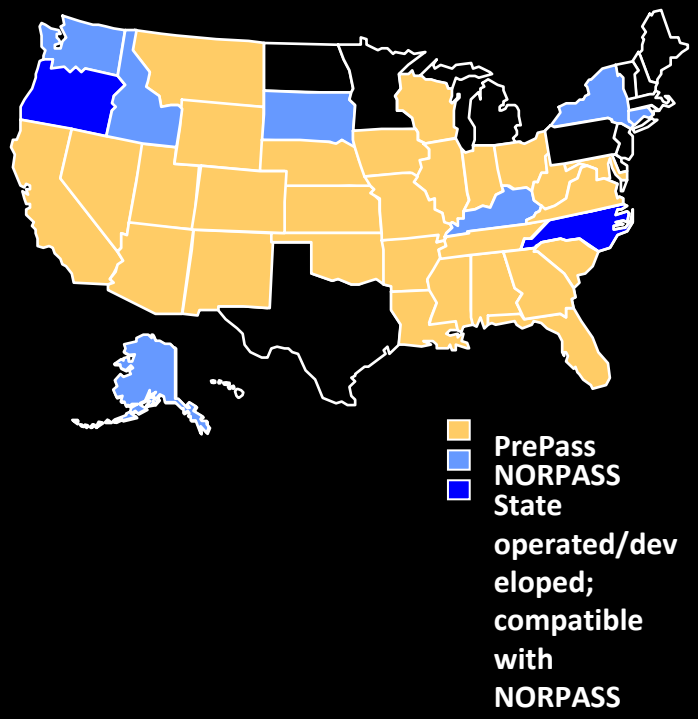


# Data Almanac

- 22 reporting WIM sites in Oregon
  - All upstream of fixed weigh stations
  - All are CVISN sites
- PSU WIM Data Archive
  - Part of our PORTAL project
  - April 2005 – May 2010
    - 44,000,000 + trucks
  - Data quality
    - Intermittent data outages and problems
    - Focus of other research project

# Oregon Weigh-in-Motion

- Axle weights
- Gross vehicle weight
- Axle spacing
- Vehicle class
- Bumper-to-bumper length
- Speed (point)
- Unique transponder numbers




*J. Lane, Briefing to American Association of State Highway and Transportation Officials (AASHTO), 22 February 2008*
freight.transportation.org/doc/hwy/dc08/scoht_**cvisn**.ppt

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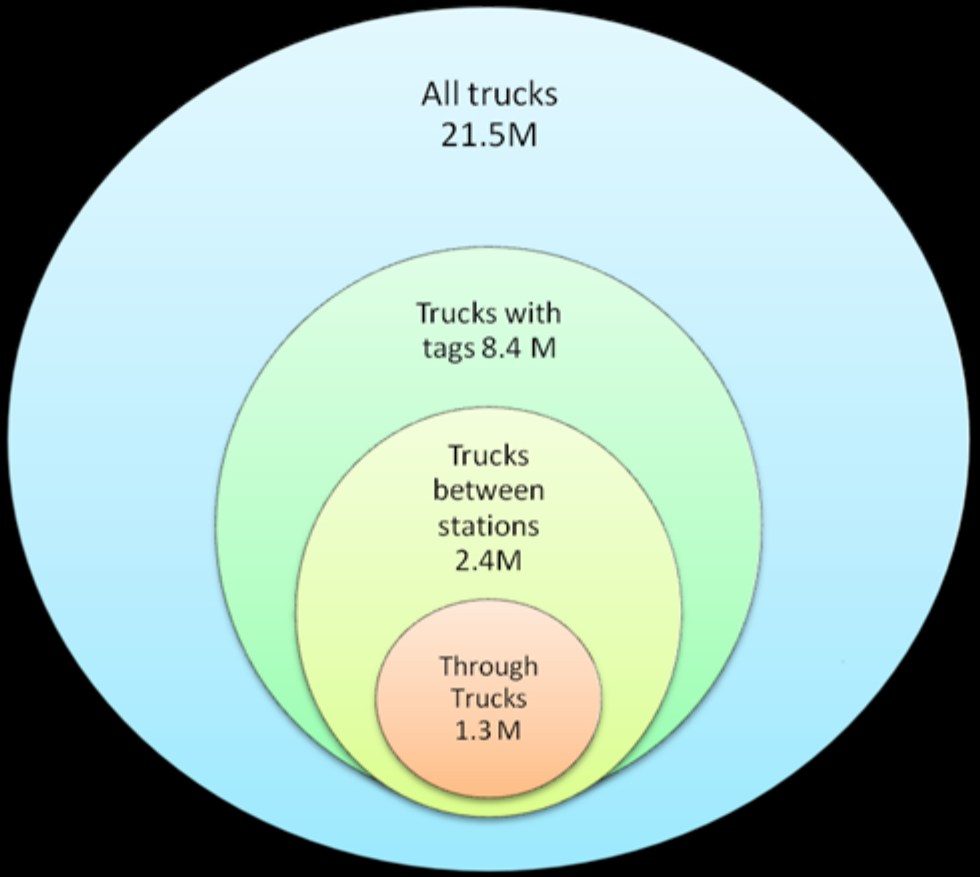
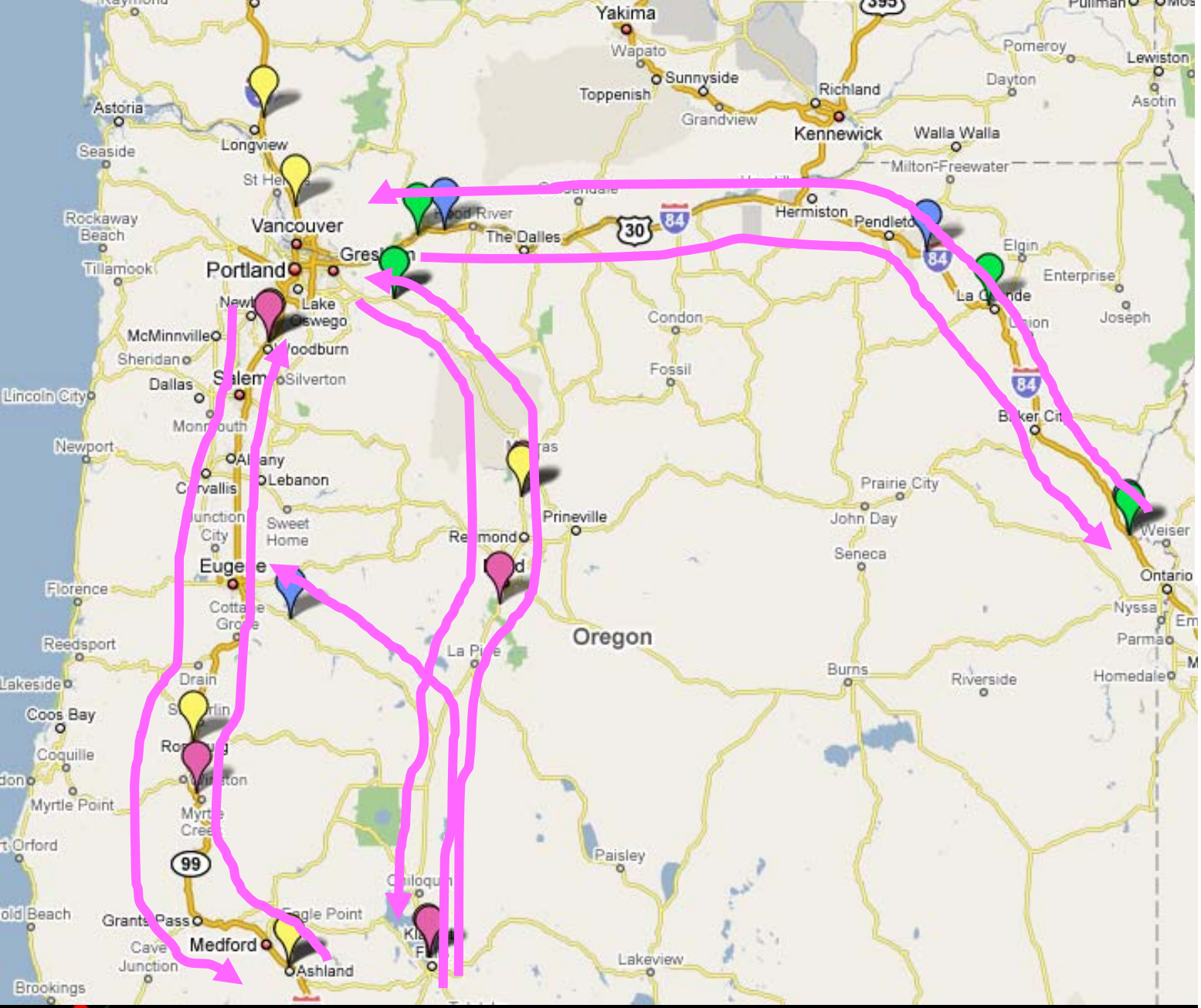
# Estimating Corridor Performance

- 2007-2008 WIM data
- Matching transponders
- Filtering through trucks
- Results






2, Emigrant Hill, WB
WIM station

13, Juniper Butte, SB
WIM Station

19, Juniper Butte, NB
WIM Station

17, Klamath Falls POE, NB
WIM station

7, Ashland POE, NB
WIM station

8, Booth Ranch, NB
WIM station

15, Wilbur, SB
WIM station

14, Lowell, WB
WIM station

18, Bend, NB
WIM station

6, Olds Ferry, EB
WIM station

1, Farewell Bend, WB
WIM station

10, Woodburn POE, SB
WIM station

11, Brightwood, EB
WIM station

4, Cascade Locks POE, EB
WIM station

3, Wyeth, WB
WIM station

5, LaGrande, EB
WIM station

16, Ashland, SB

20, Klamath Falls, SB

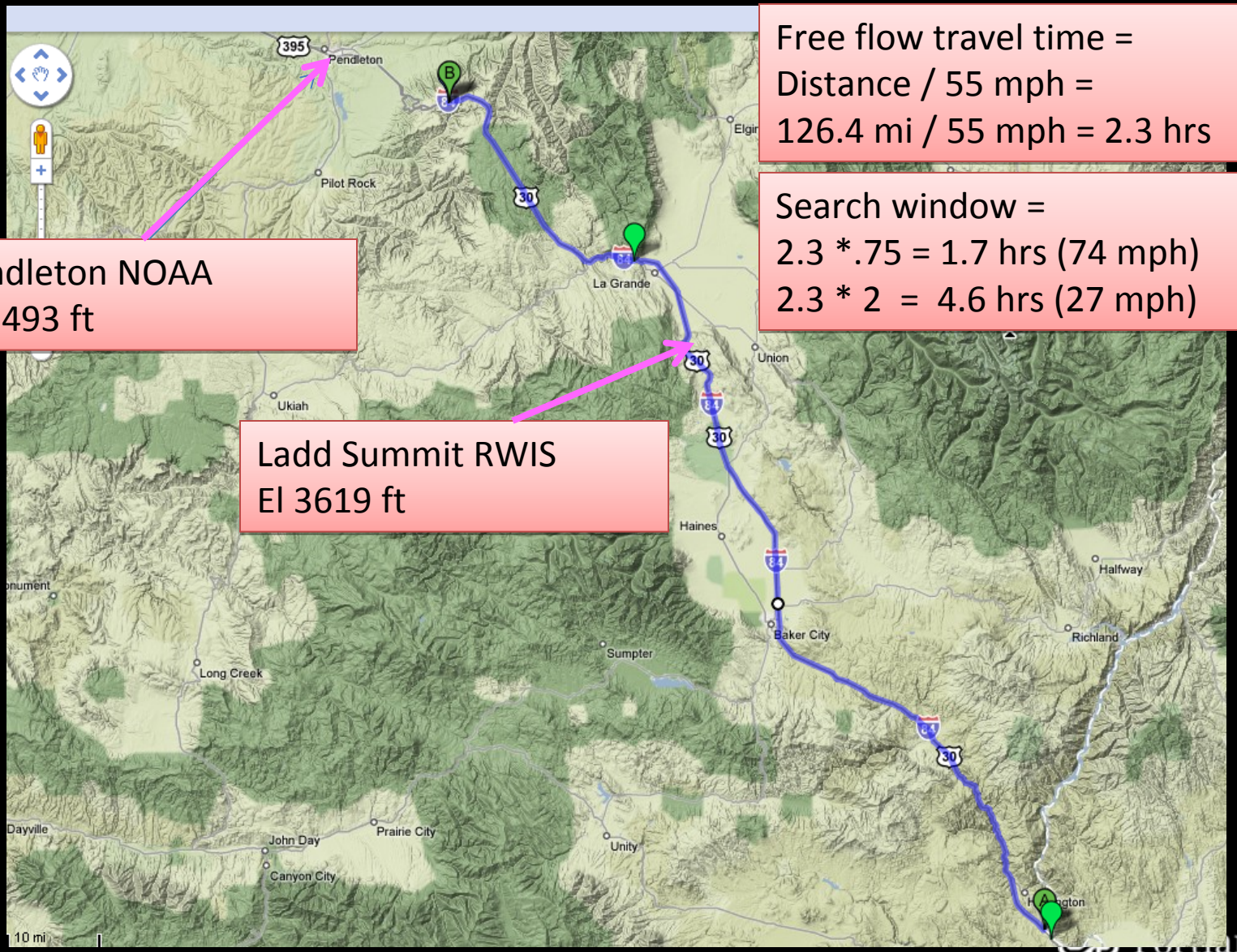
9, Woodburn, NB
WIM Station

12, Brightwood, WB
WIM Station

Ridgefield SB, WA
WIM Station

Kelso SB, WA
WIM Station

# I-84 WB, FWB to EMH



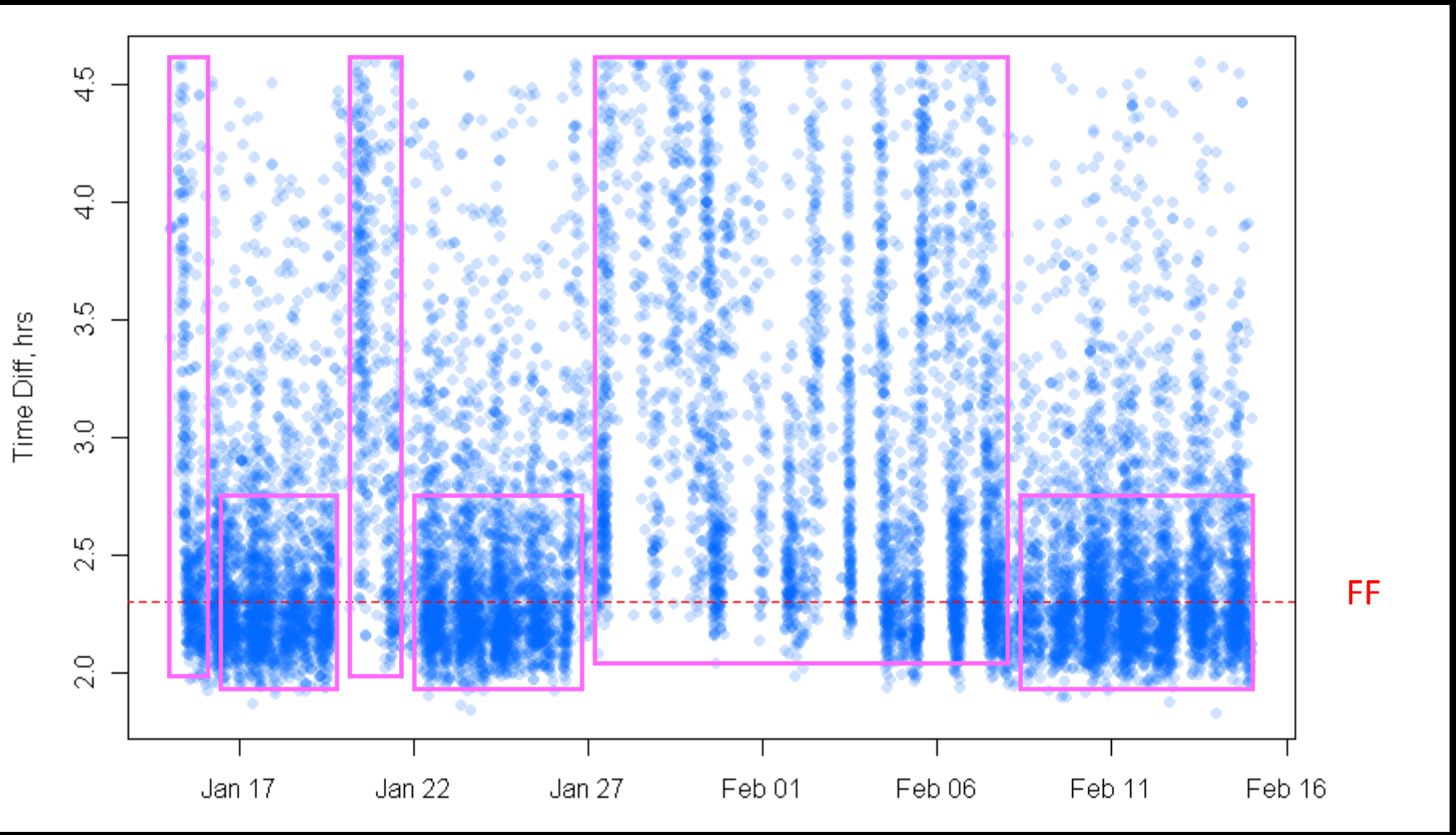

Free flow travel time =
Distance / 55 mph =
126.4 mi / 55 mph = 2.3 hrs

Search window =
2.3 *.75 = 1.7 hrs (74 mph)
2.3 * 2 = 4.6 hrs (27 mph)

Pendleton NOAA
El 1493 ft

Ladd Summit RWIS
El 3619 ft

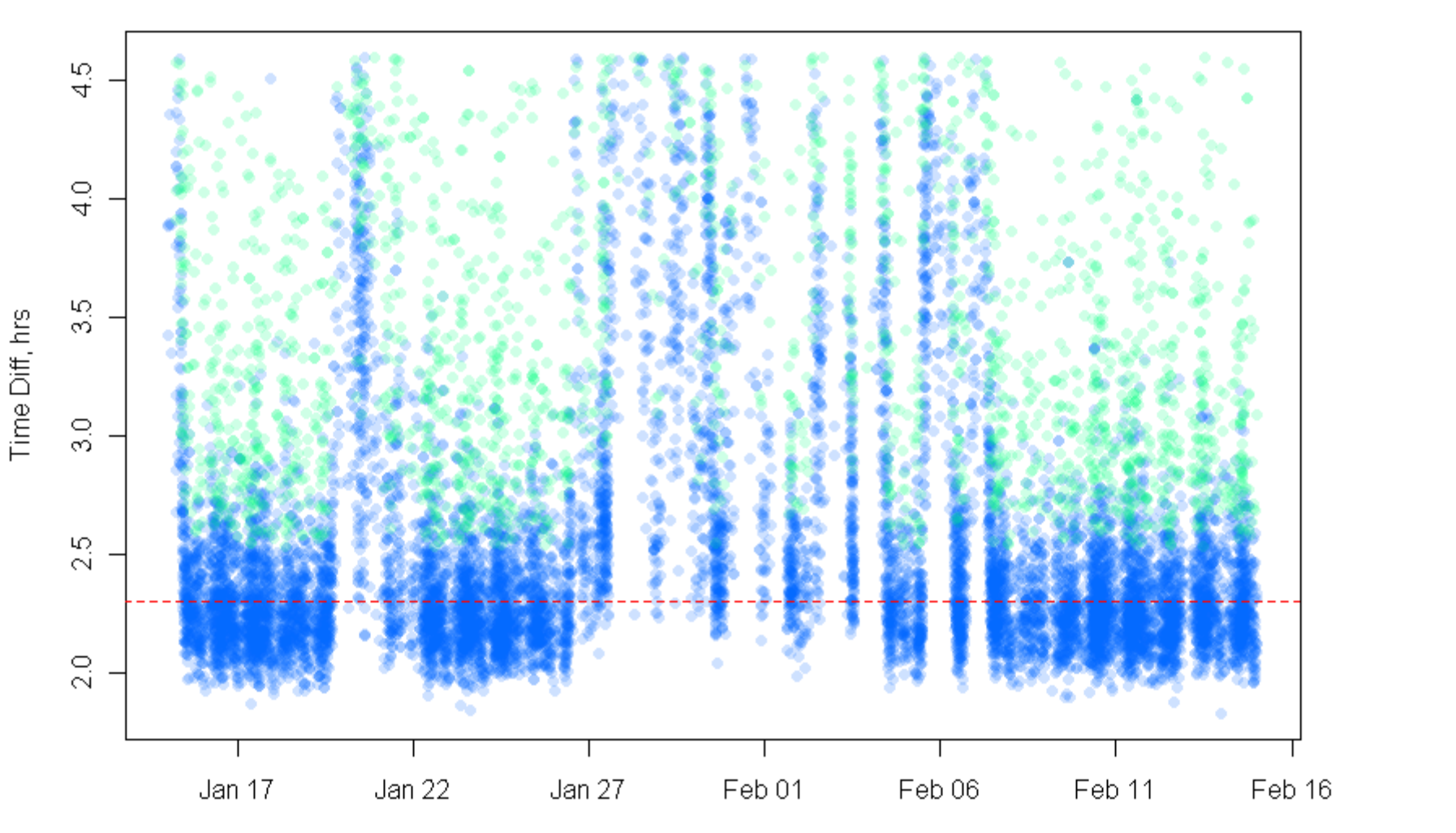
# All Matched Trucks in Time Window



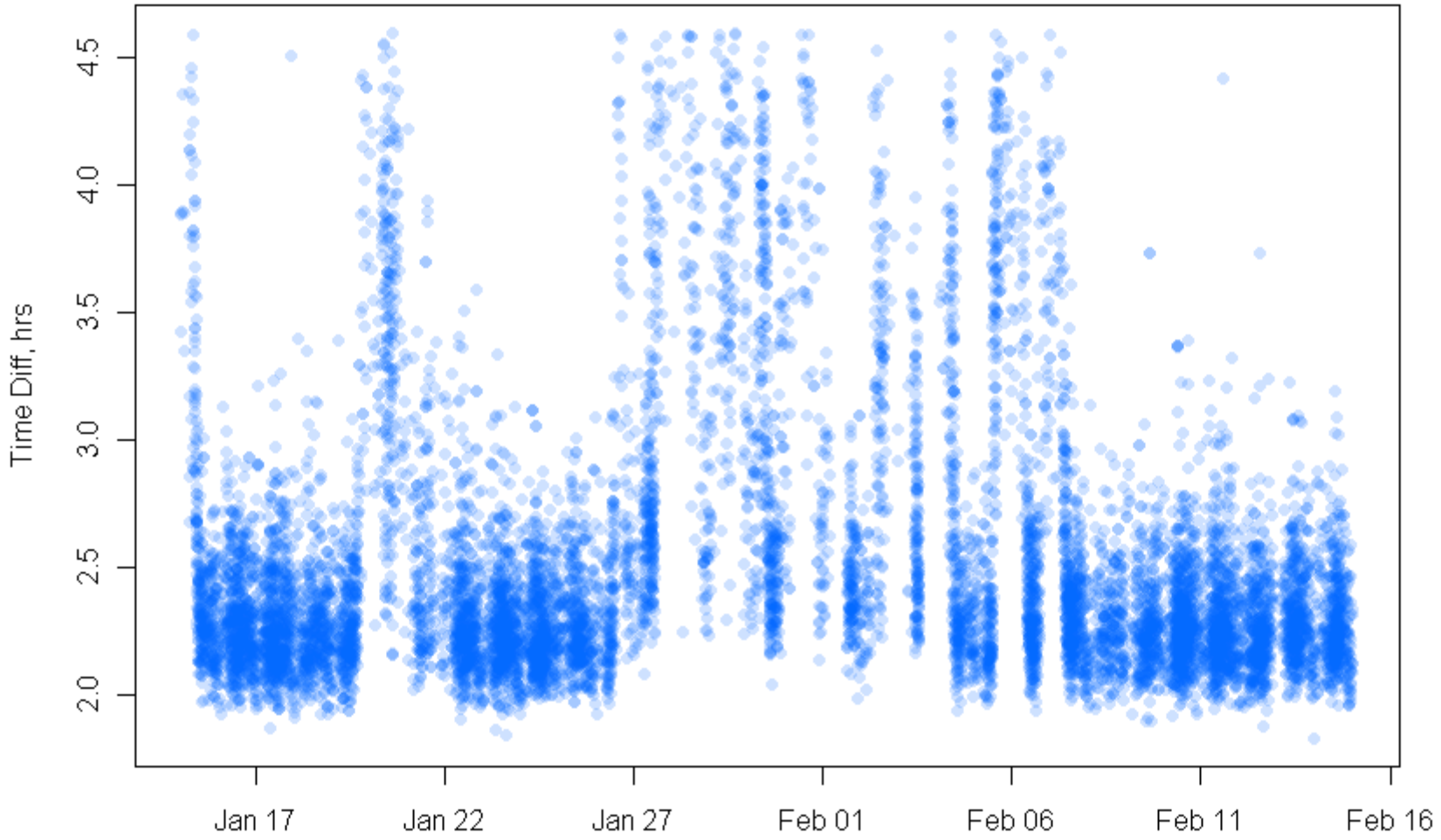
# Filter Algorithm

- For each truck *j* traveling on link *i* determine the estimated travel time, $t_{j,i}$.
  - If the travel time $t_{j,i}$ is less than the free-flow time $ff_{j,i}$ denote this truck as a through truck.
  - If the travel time $t_{j,i}$ is less than the upper travel time $ut_{j,i}$ (defined as an average travel time of 50 mph).
  - Find the median travel time $mt_{j,i}$ in the sample of *X* previous truck observations and compare that to $t_{j,i}$. If $t_{j,i}$ does not exceed $mt_{j,i}$ by a threshold of *Y*, truck *j* is assumed to be a through vehicle.
- If none of the above criteria are met, the $t_{j,i}$ is excluded (i.e., *j* is not a through truck).

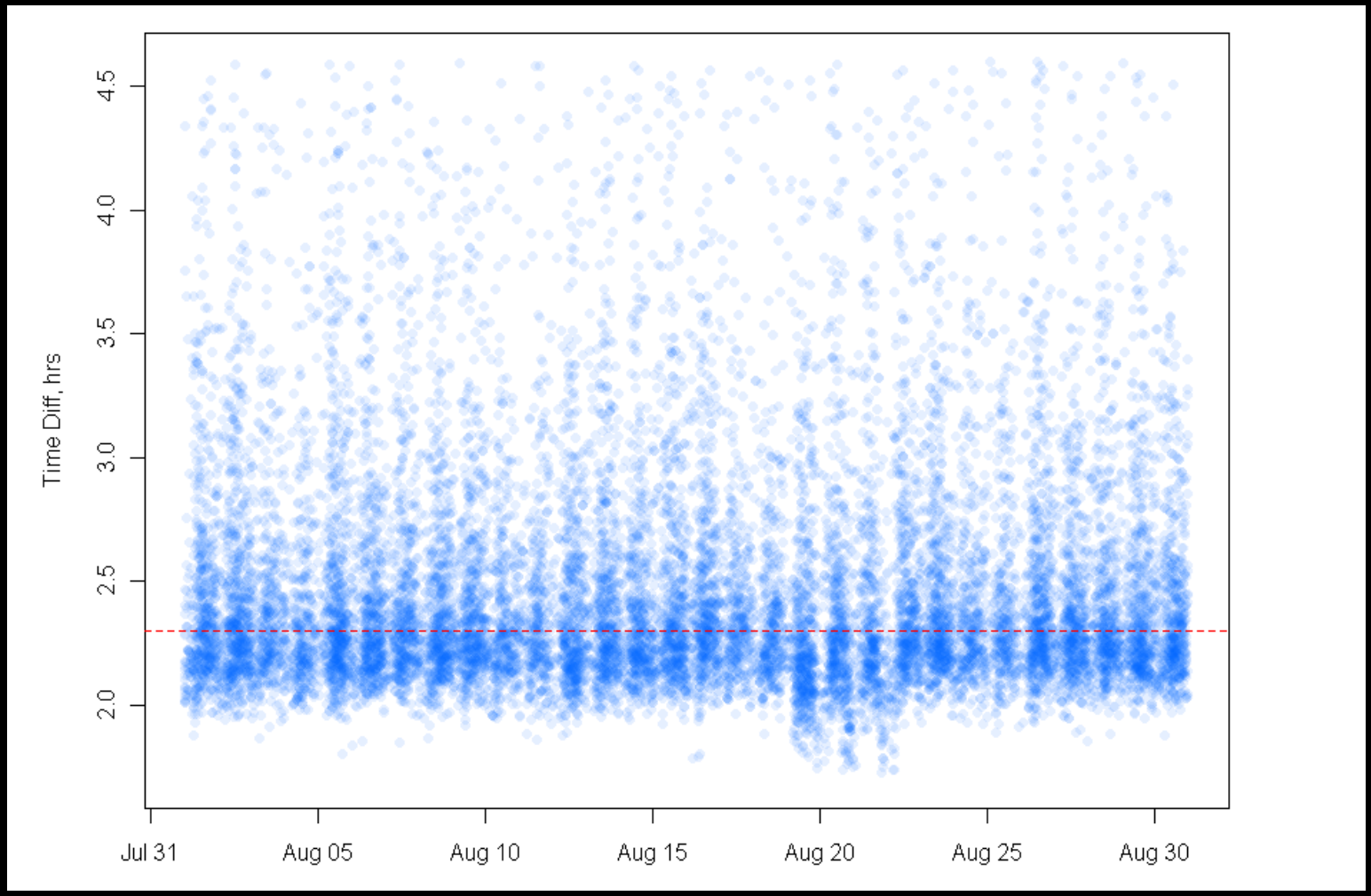
# Filtered Trucks (Green)



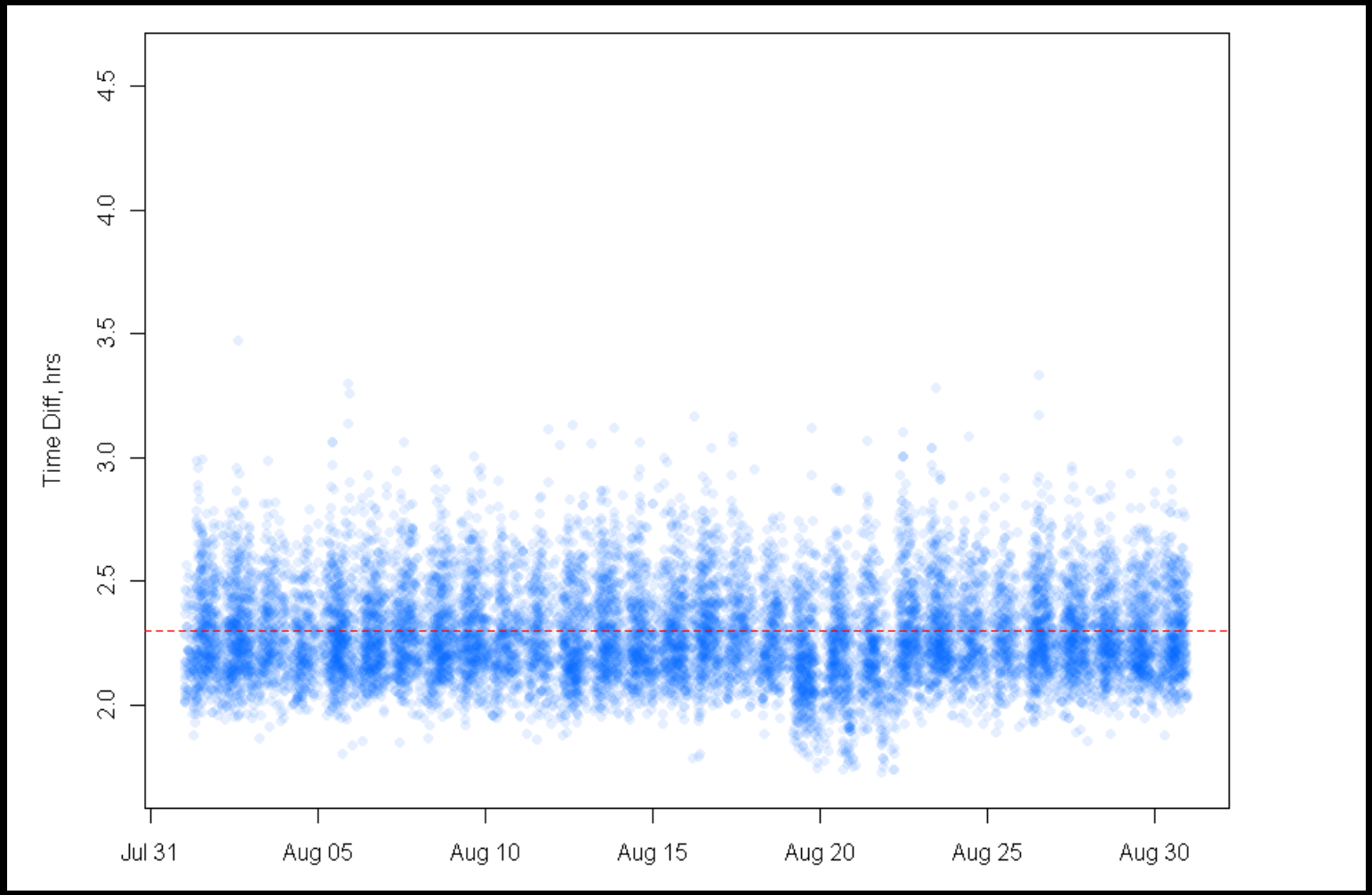
# Through Trucks Only



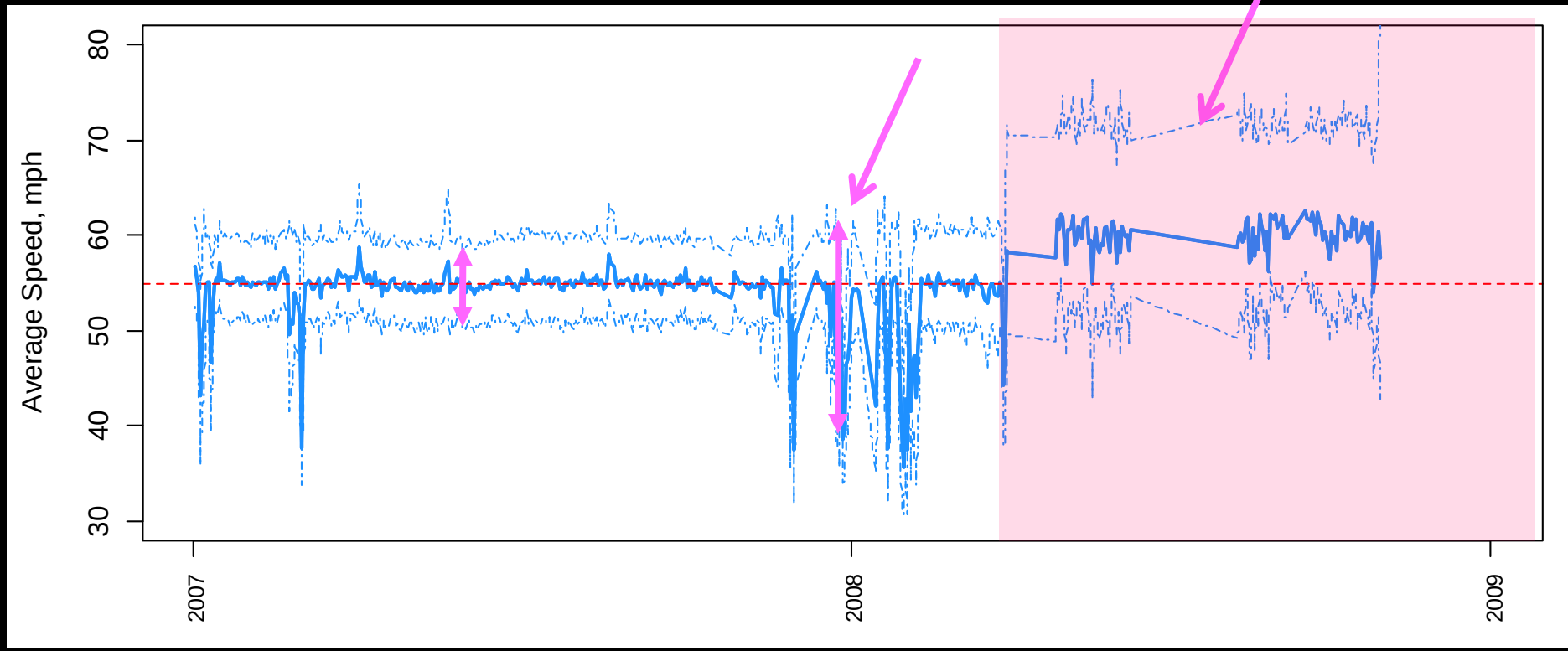
# I-84 WB, FWB to EMH, August 07



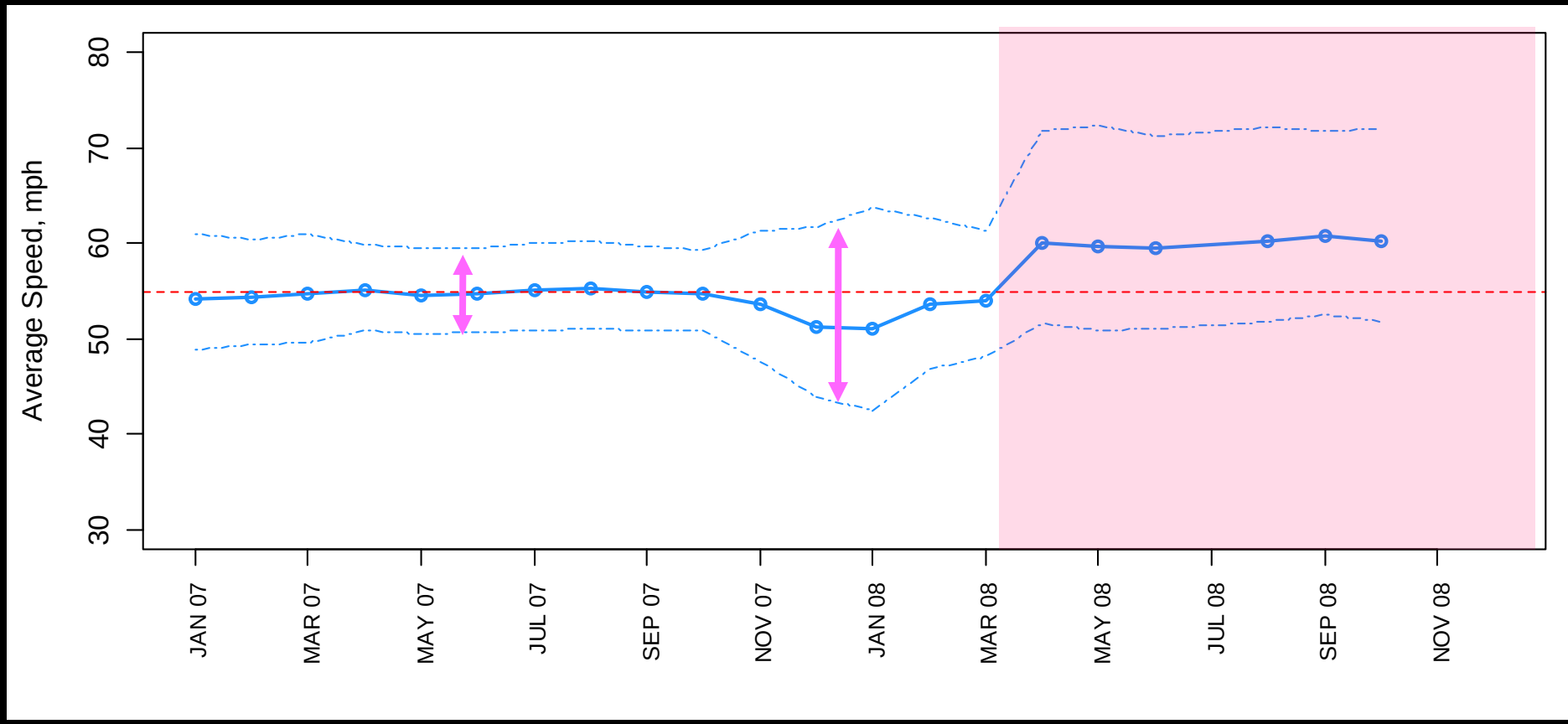
# I-84 WB, FWB to EMH, Aug 07



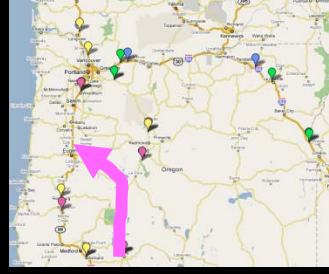
# I-84WB, Average Link Speed, by Day

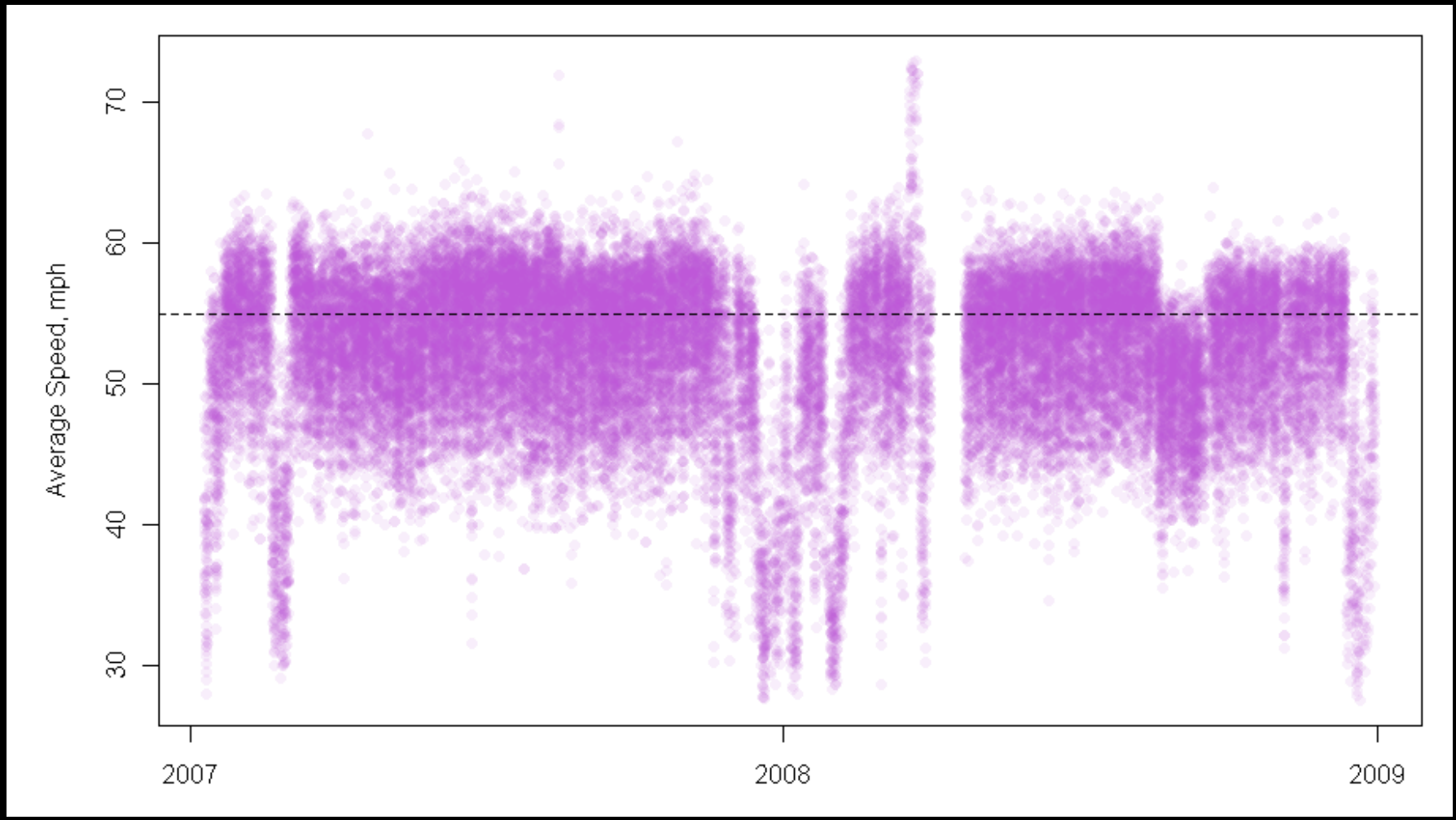


# Average Link Speed, by month



# US-97 NB, KFP to LWL





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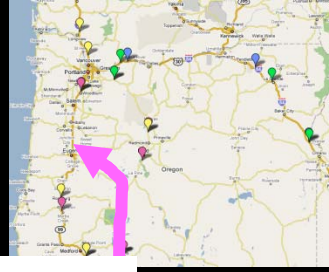
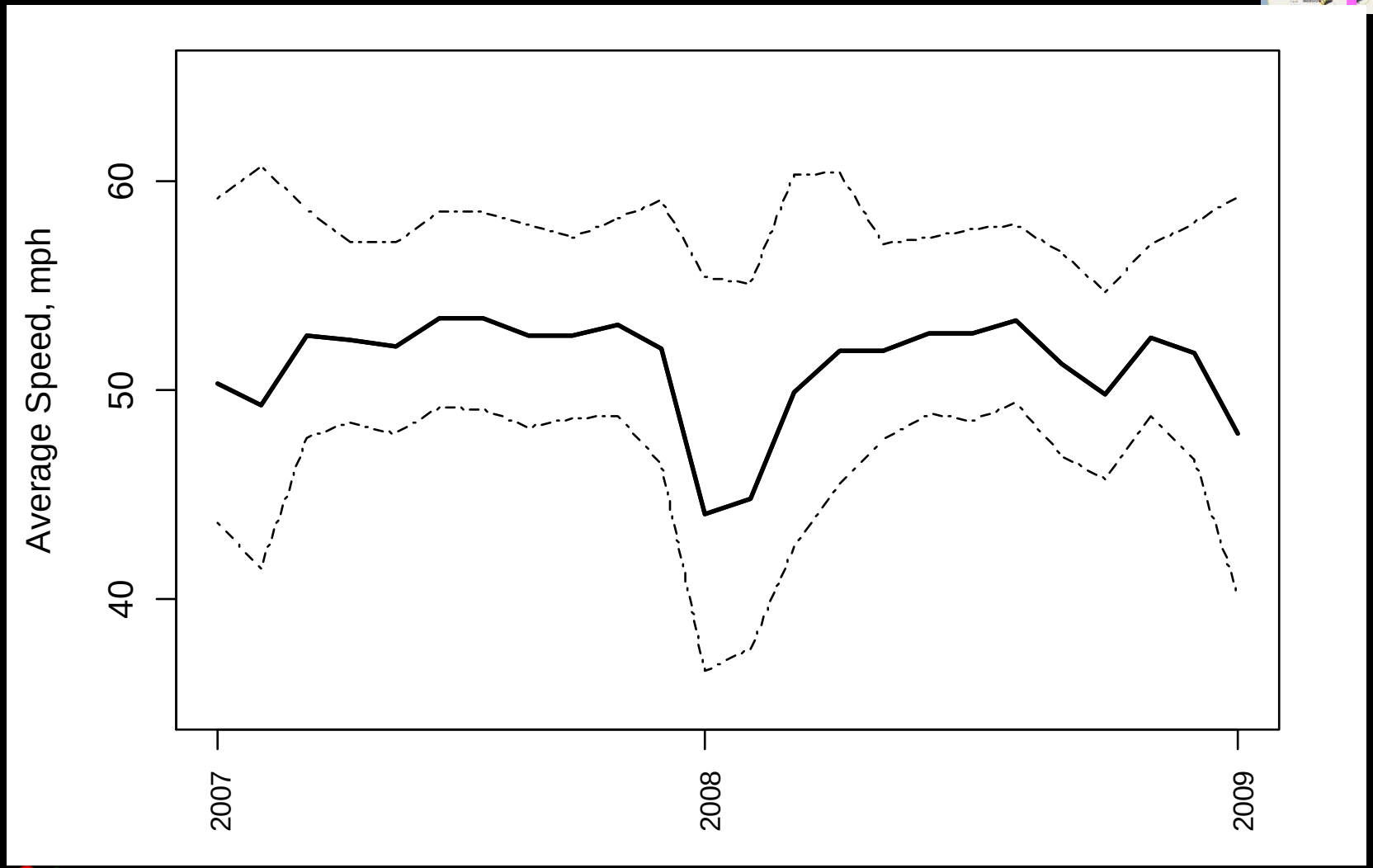
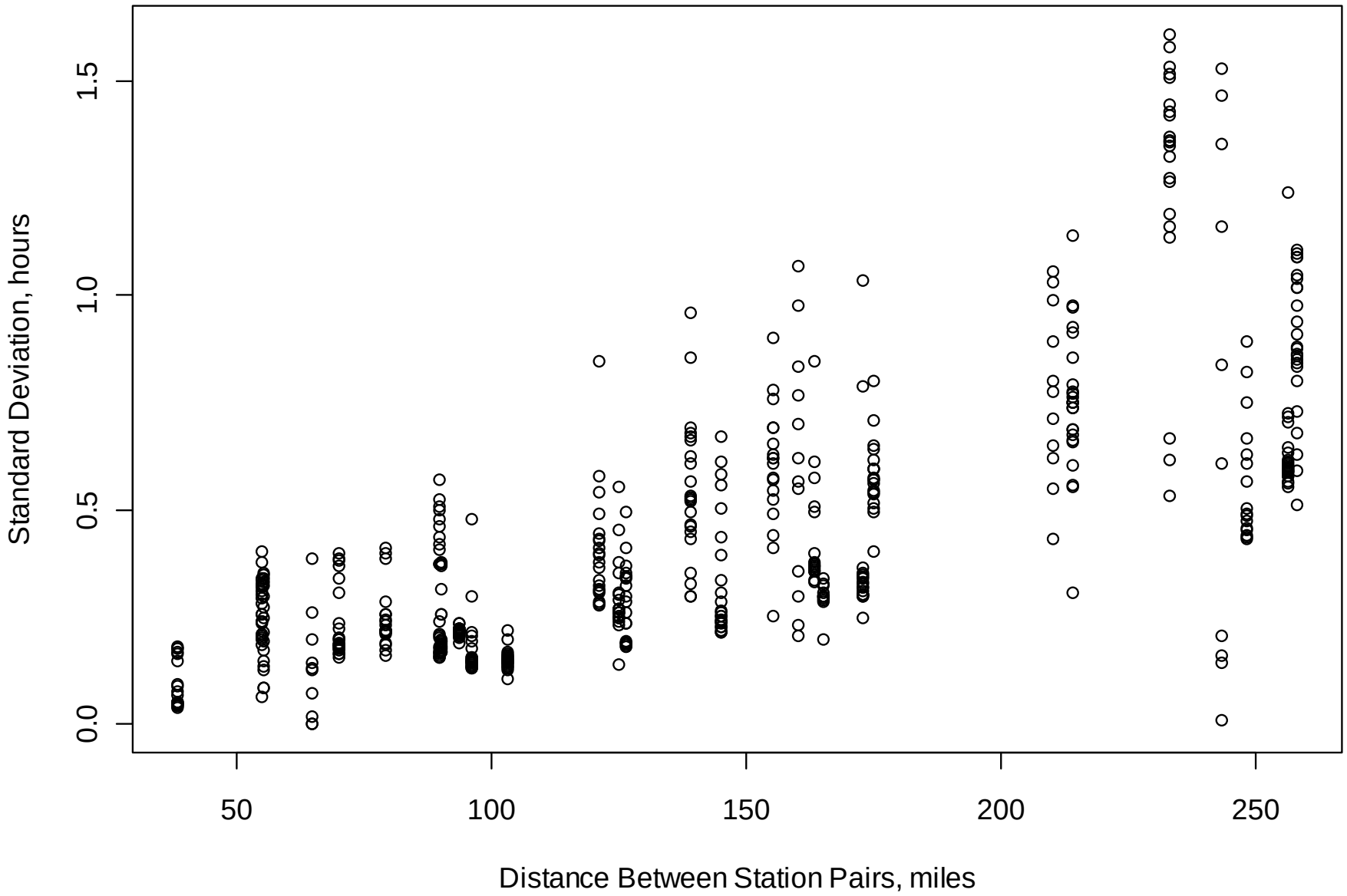
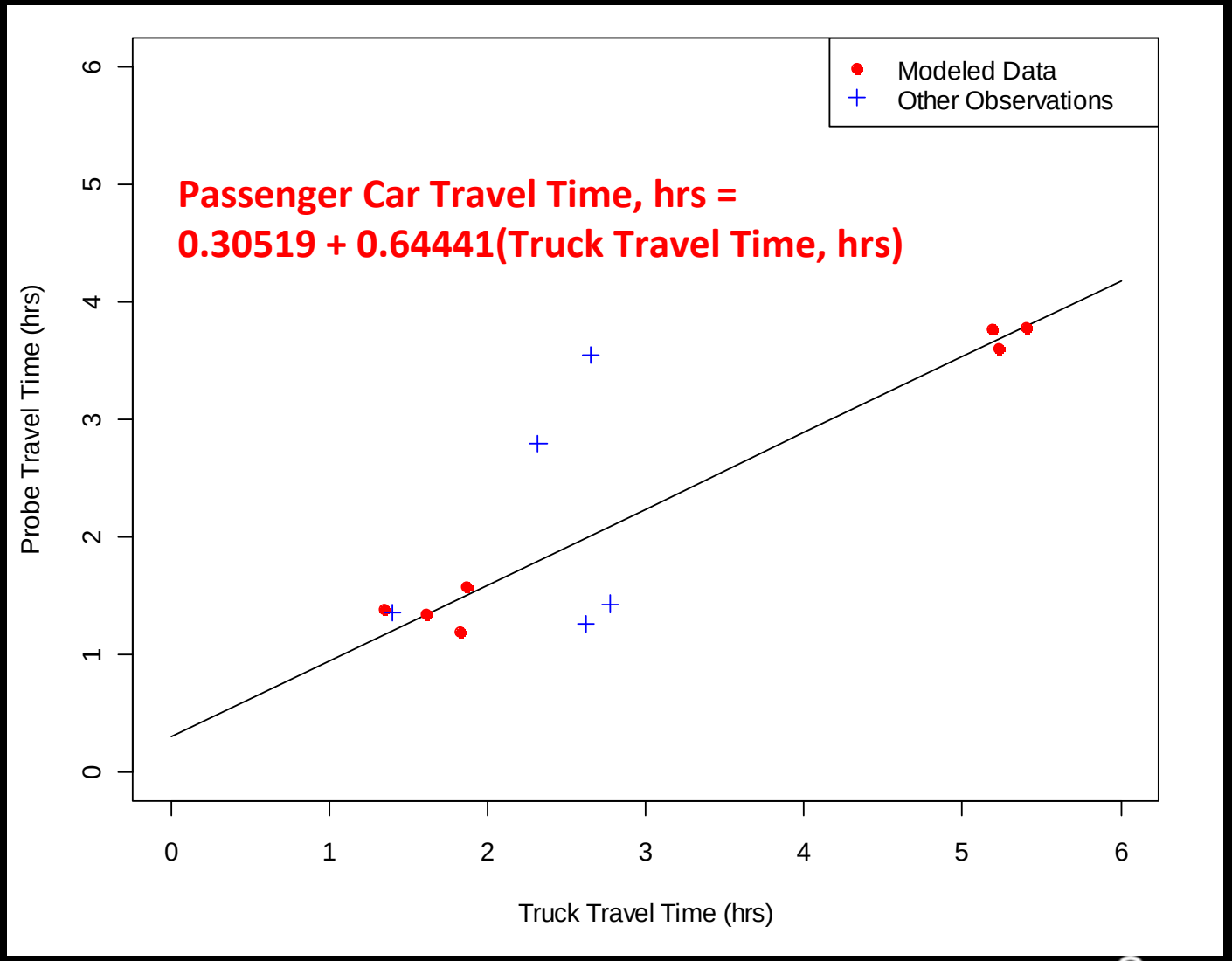





Standard Deviation, hours
0.0
0.5
1.0
1.5
50
100
150
200
250
Distance Between Station Pairs, miles

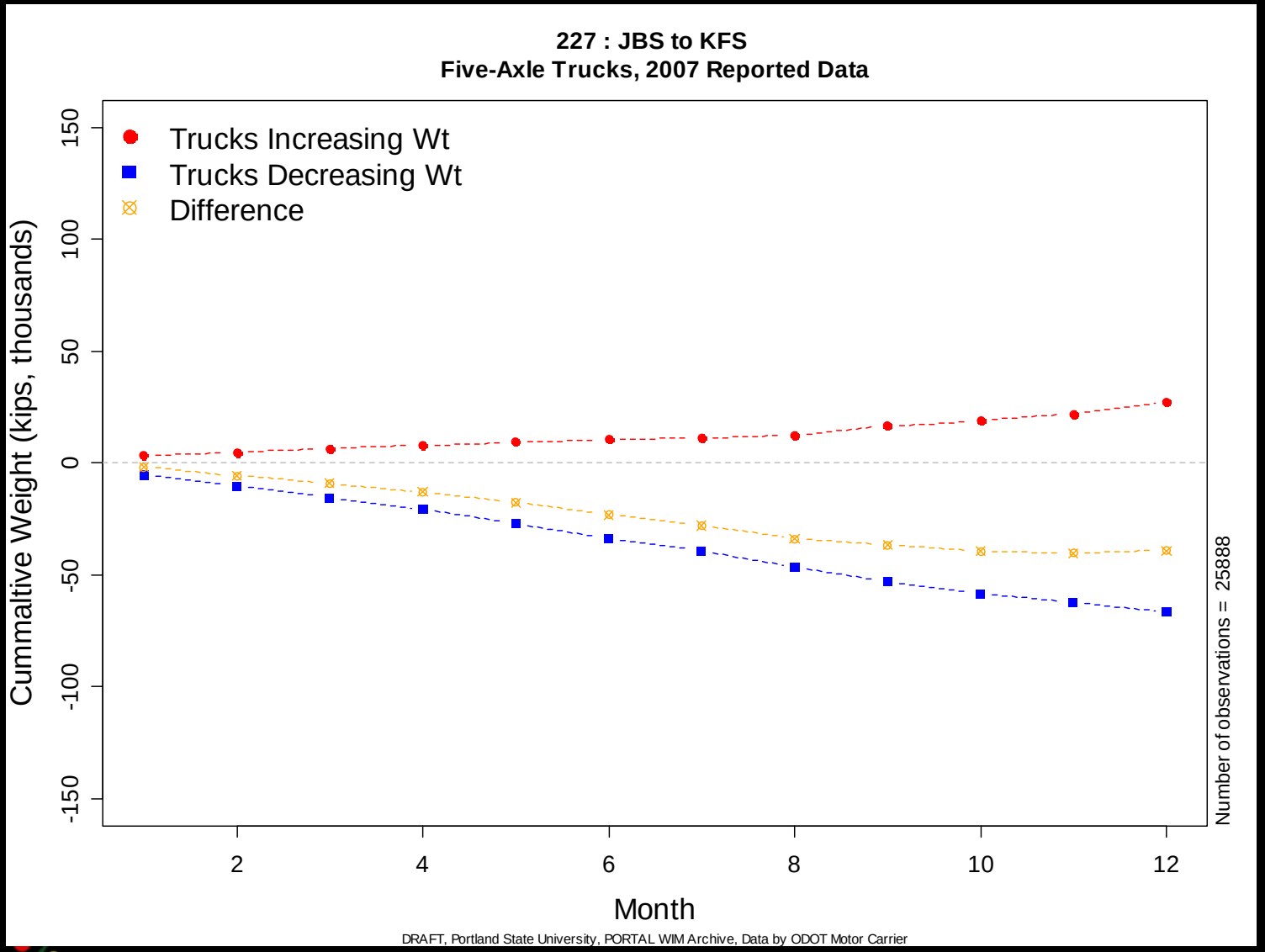
# Comparison to Probes (Vehicles)



# Other Freight Performance Measures

- Using the matched trucks
  - Estimated Freight Activity on Corridor
  - Freight Patterns
  - Ton Miles
  - Emissions
- Assume trucks with transponders are the same as those without

# Freight Activity

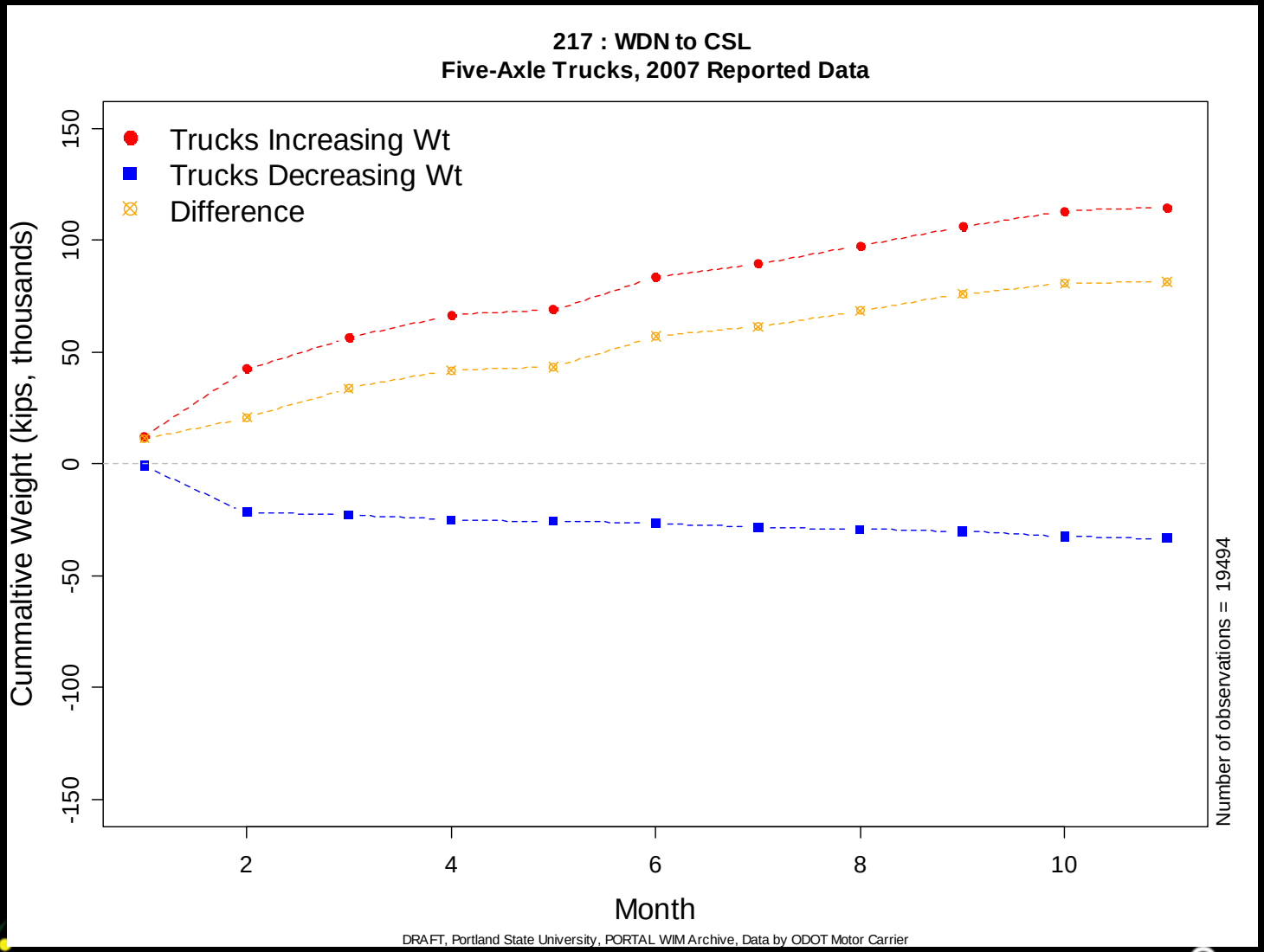



Production

About 1600 more truckloads consumed

Consumption

# Freight Activity




Production

About 3200 more truckloads produced

Consumption

# Conclusions and Next Steps

- Average speed measures useful
  - More tag reading stations would be helpful
  - Integration with probe-based samples?
- Developing automated method to load data and quantify data quality
- *Ongoing* - Weight-spacing signature matching
- *Ongoing* - Estimate O-D flows

# Acknowledgments


- Oregon Transportation Research and Education Consortium
- Oregon Department of Transportation
  - Amanda Pietz, Dave Fifer, Don Crownower, Amy Mastraccio, Becky Knudsen, Michael Buffalino
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# Questions?

Thank You!

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