

On Simulation and Optimization of Freeway Network Operations

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Curtin University of Technology



Progress from last PSG meeting

- Computer implementation of ramp metering and VSL on the Kwinana freeway traffic flow simulation model
- Further data analysis: traffic prediction

1. Computer implementation of ramp metering and VSL on the Kwinana freeway traffic flow simulation model

The road Network System

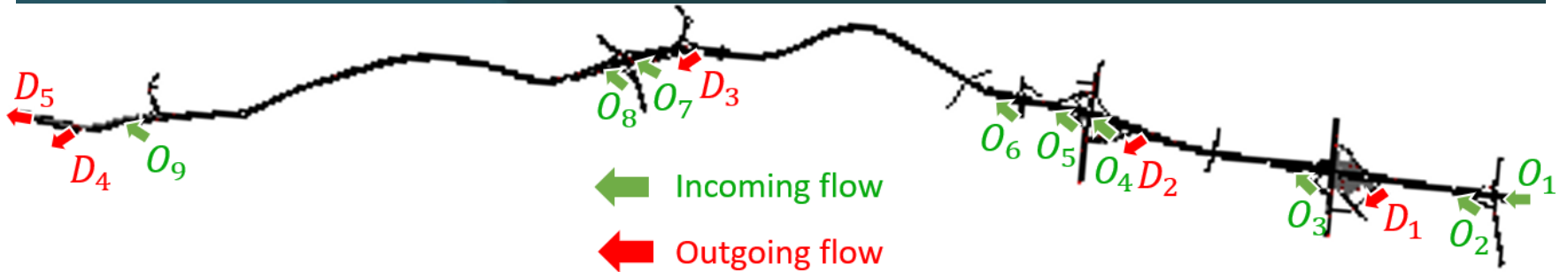


Figure 1

Ramp metering control

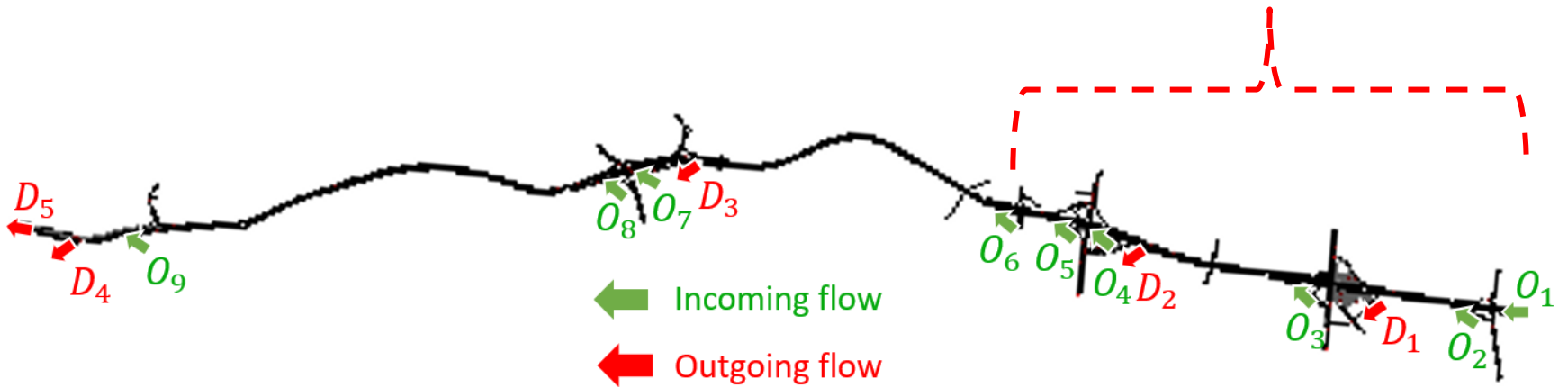
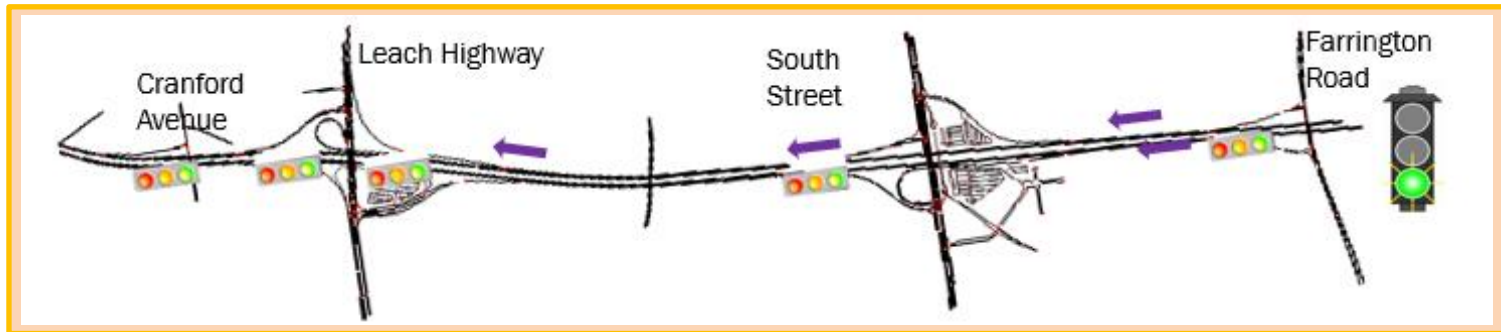


Figure 2

Variable Speed limit control

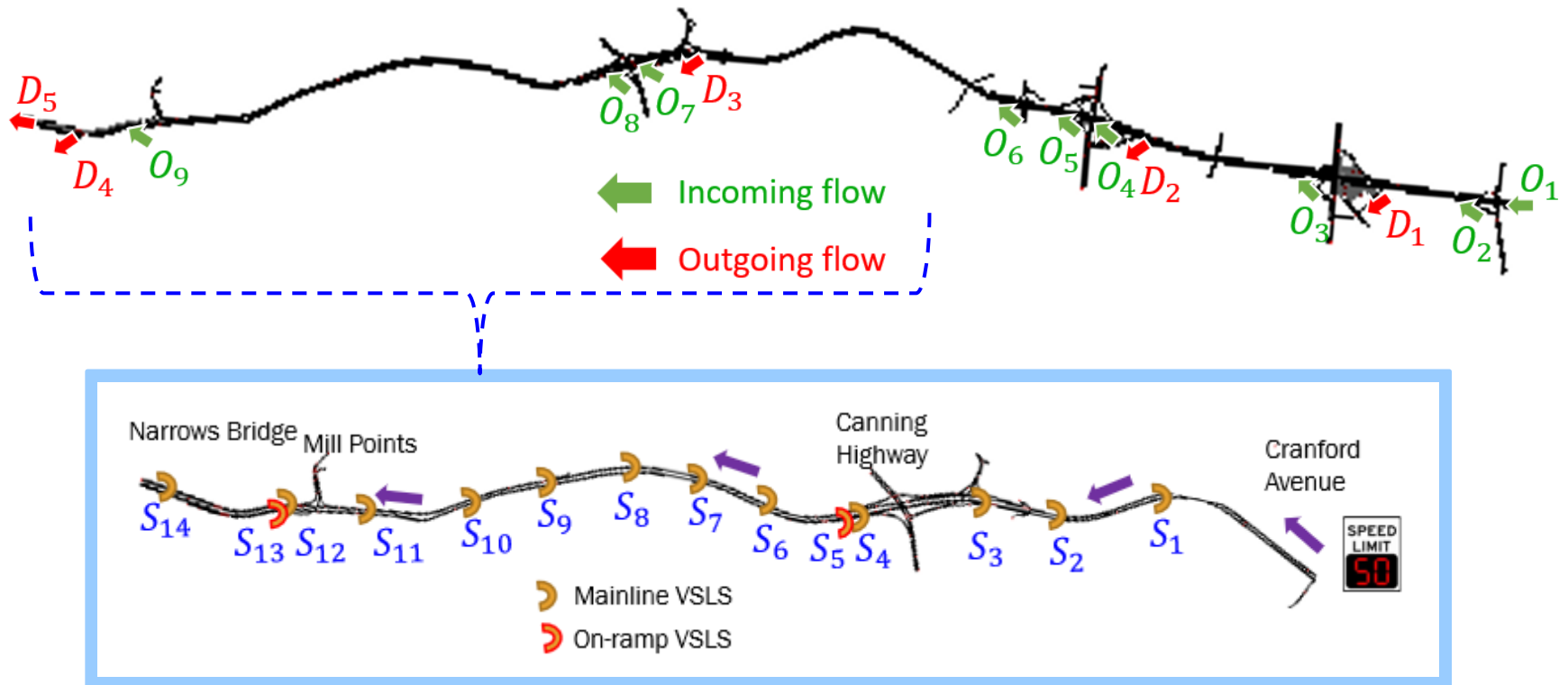


Figure 3

Single Induction Loop Detectors

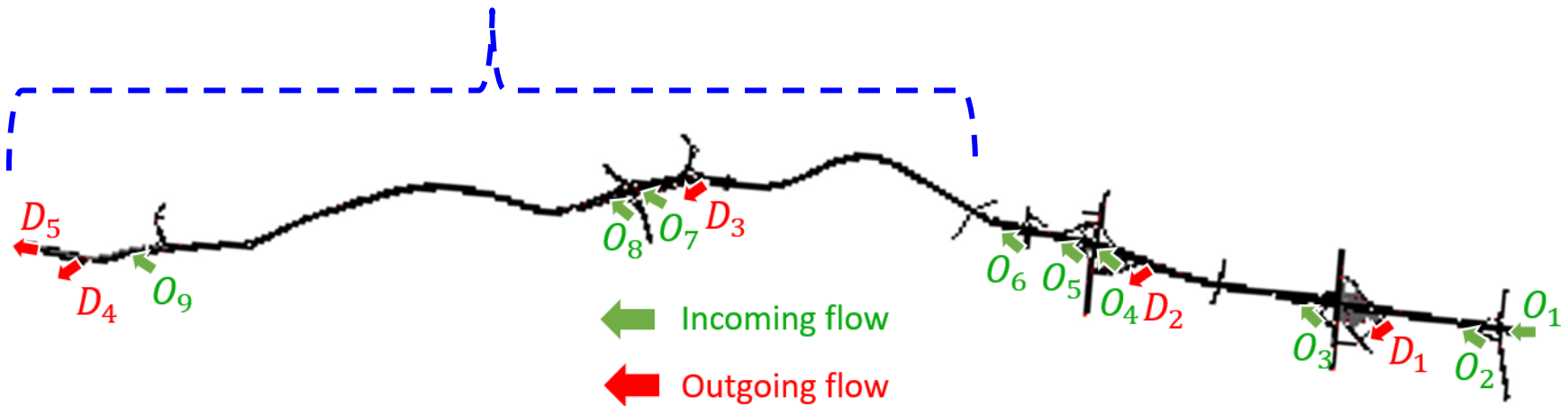
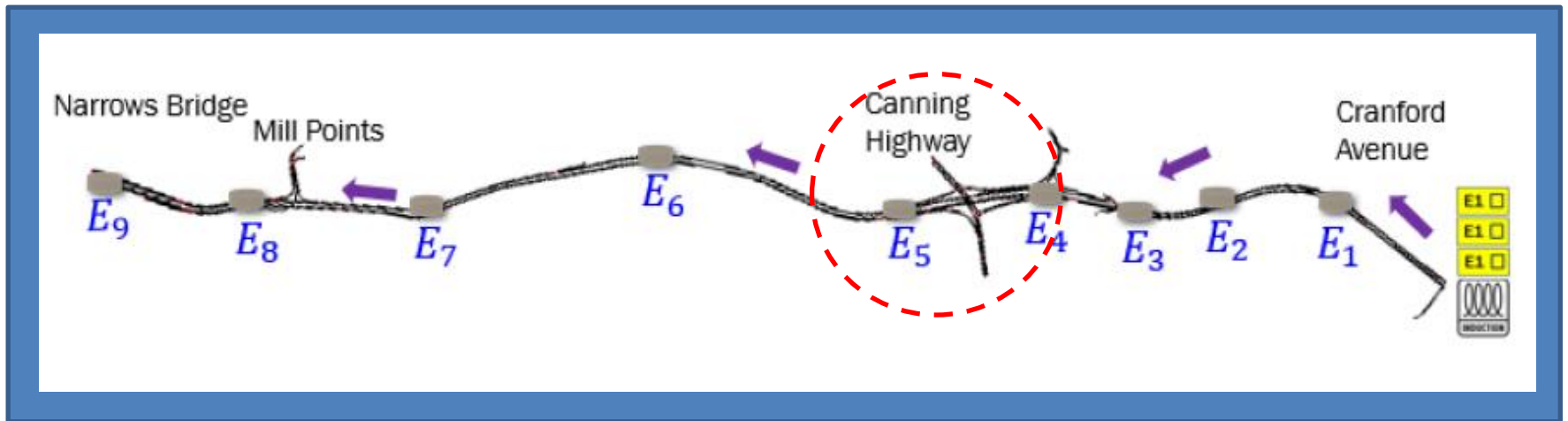
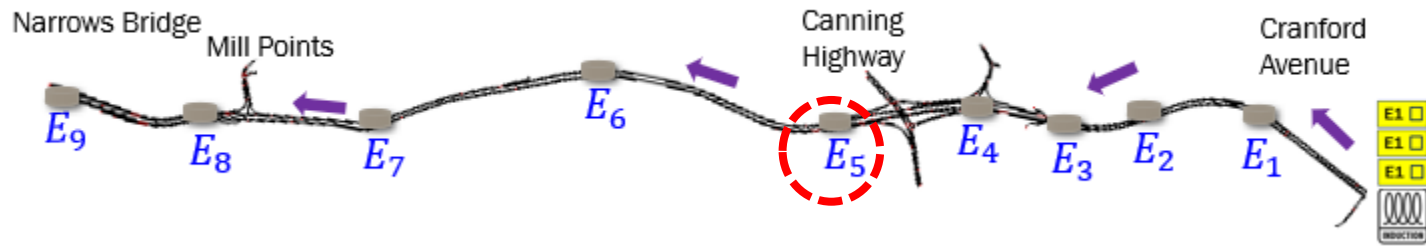
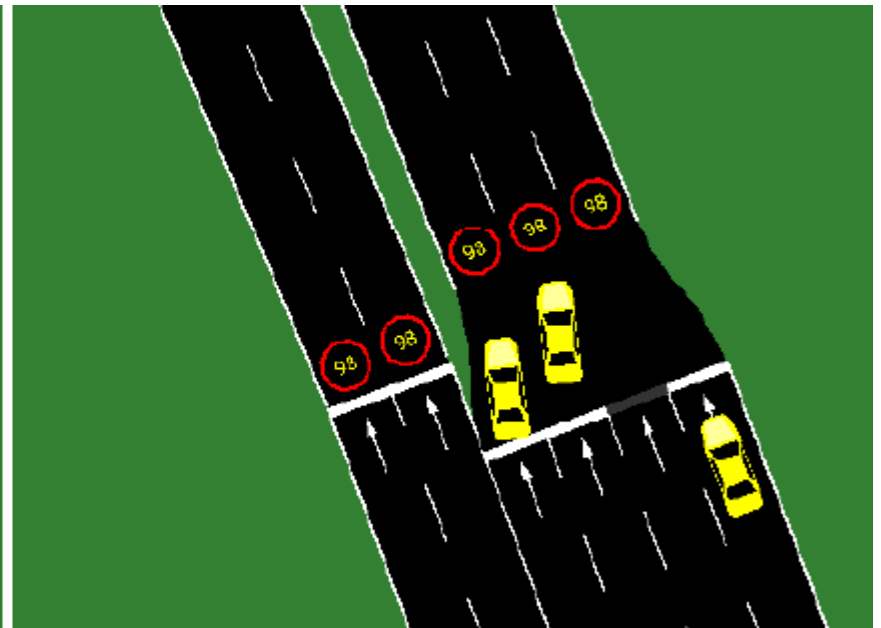


Figure 4

Example: VSL



Peak hours



Off-Peak hours

Figure 5

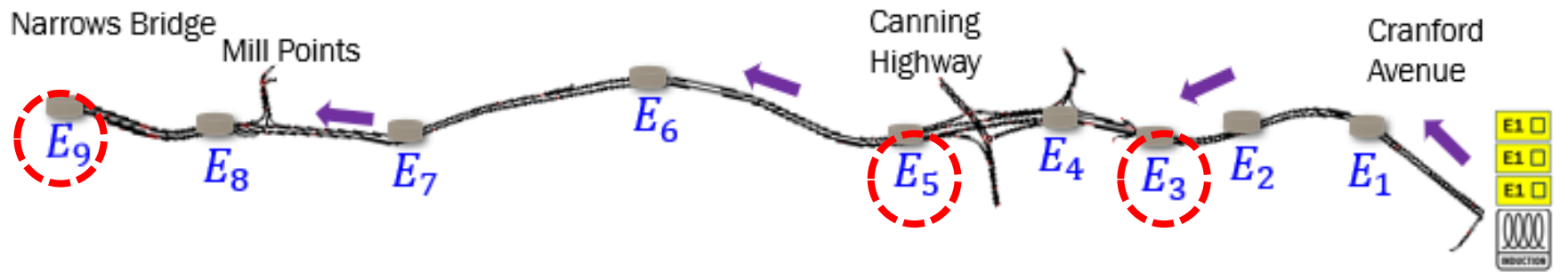


Figure 6

Flow and Speed at E3

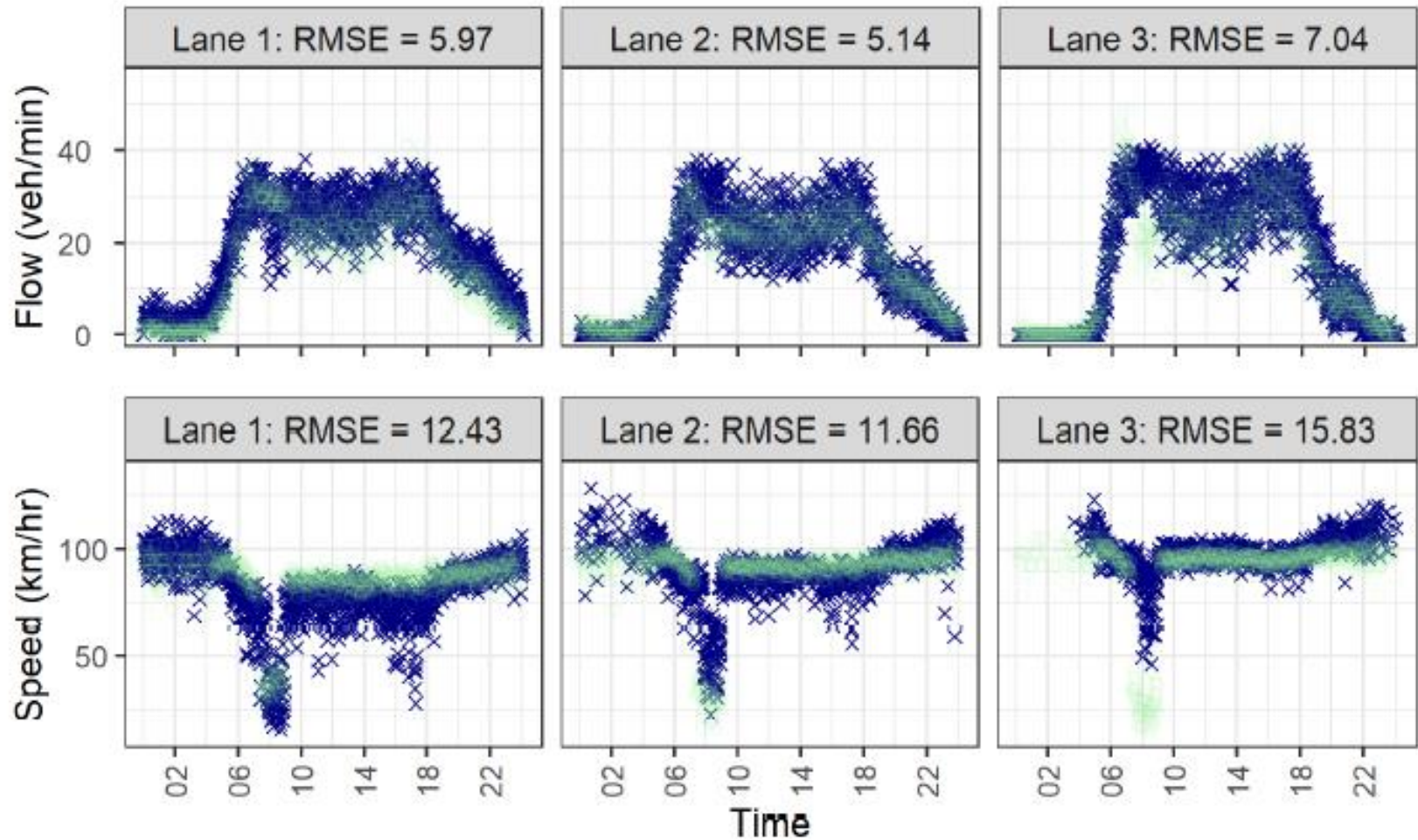


Figure 7

Flow and Speed at E5

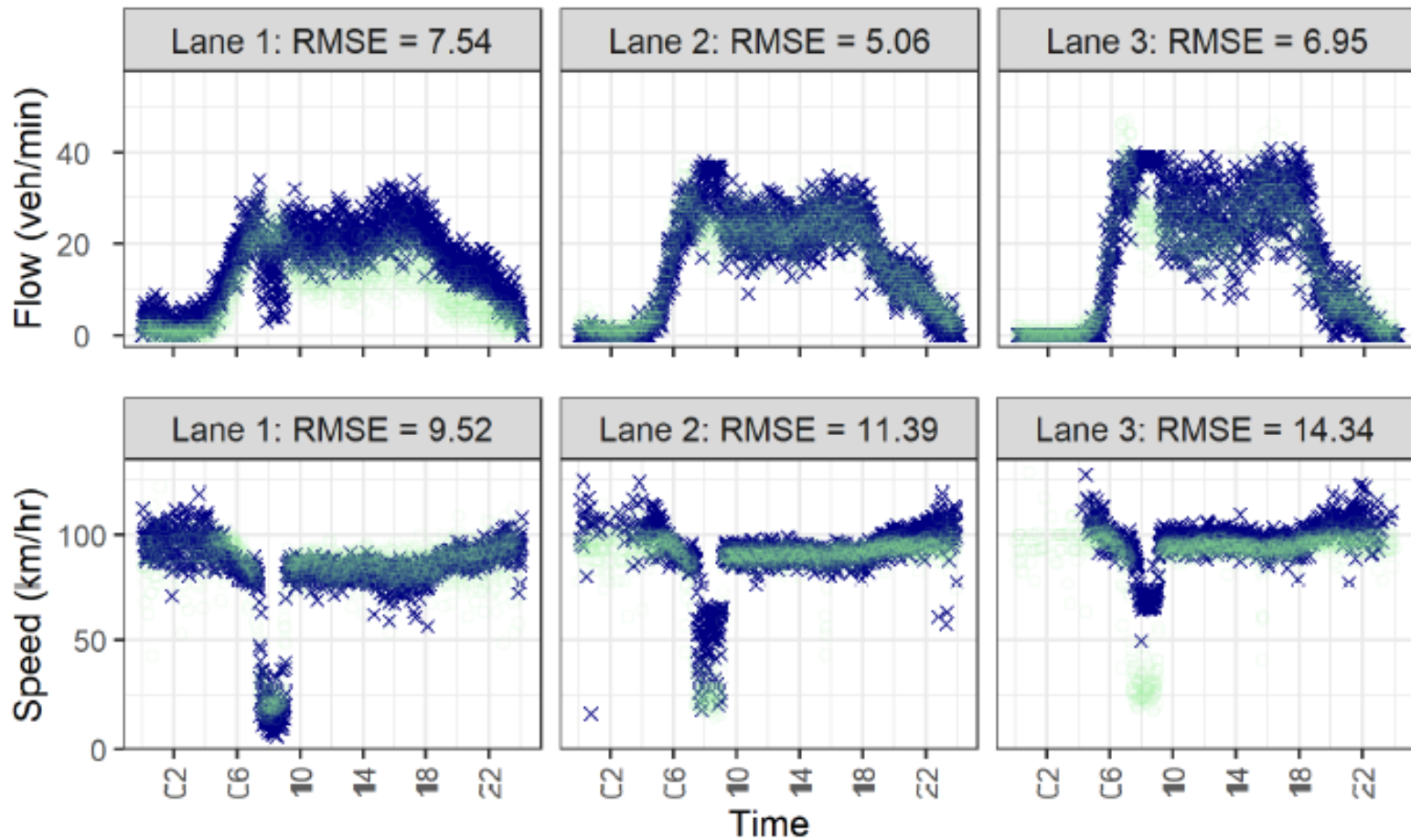


Figure 8

Flow and Speed at E9

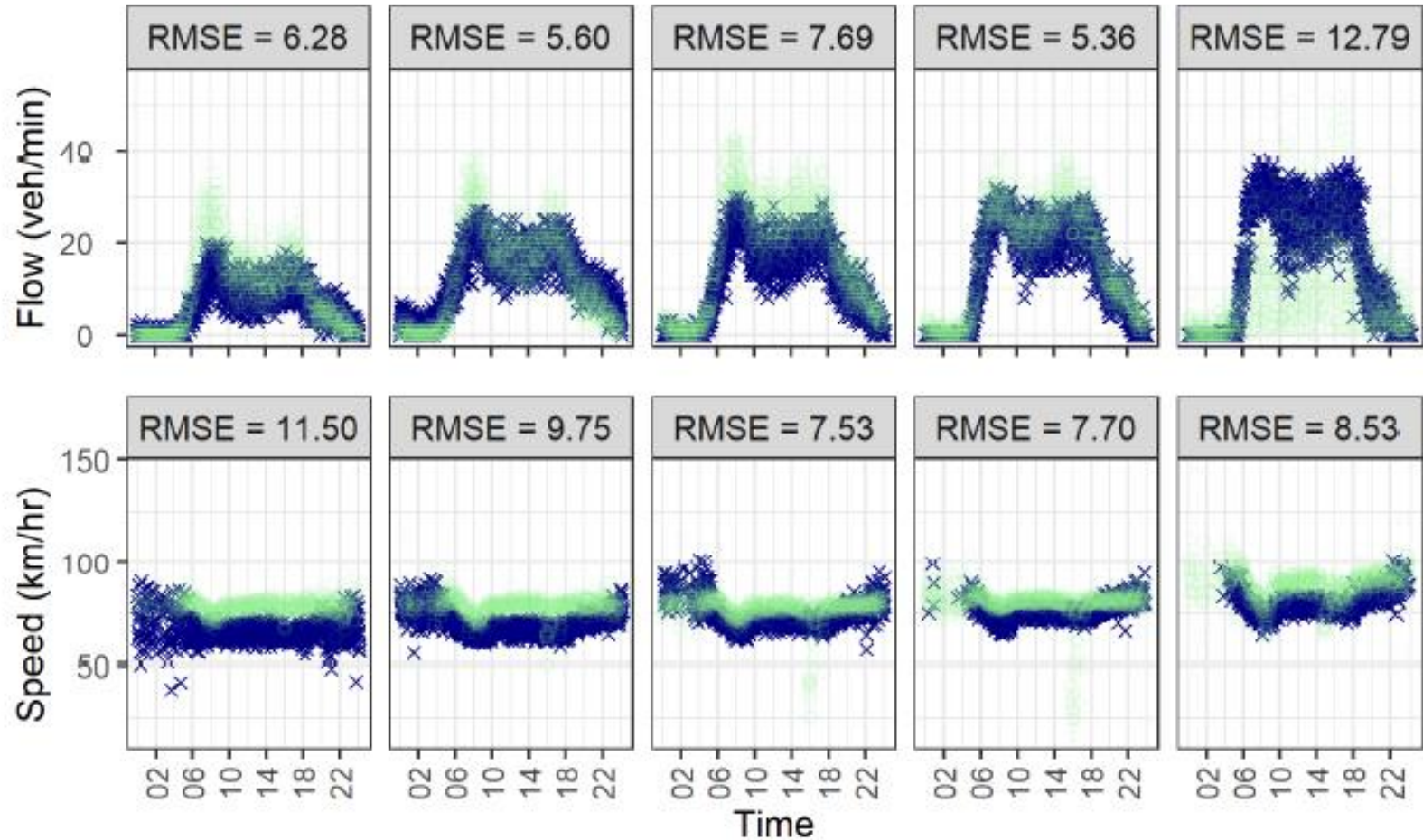


Figure 9

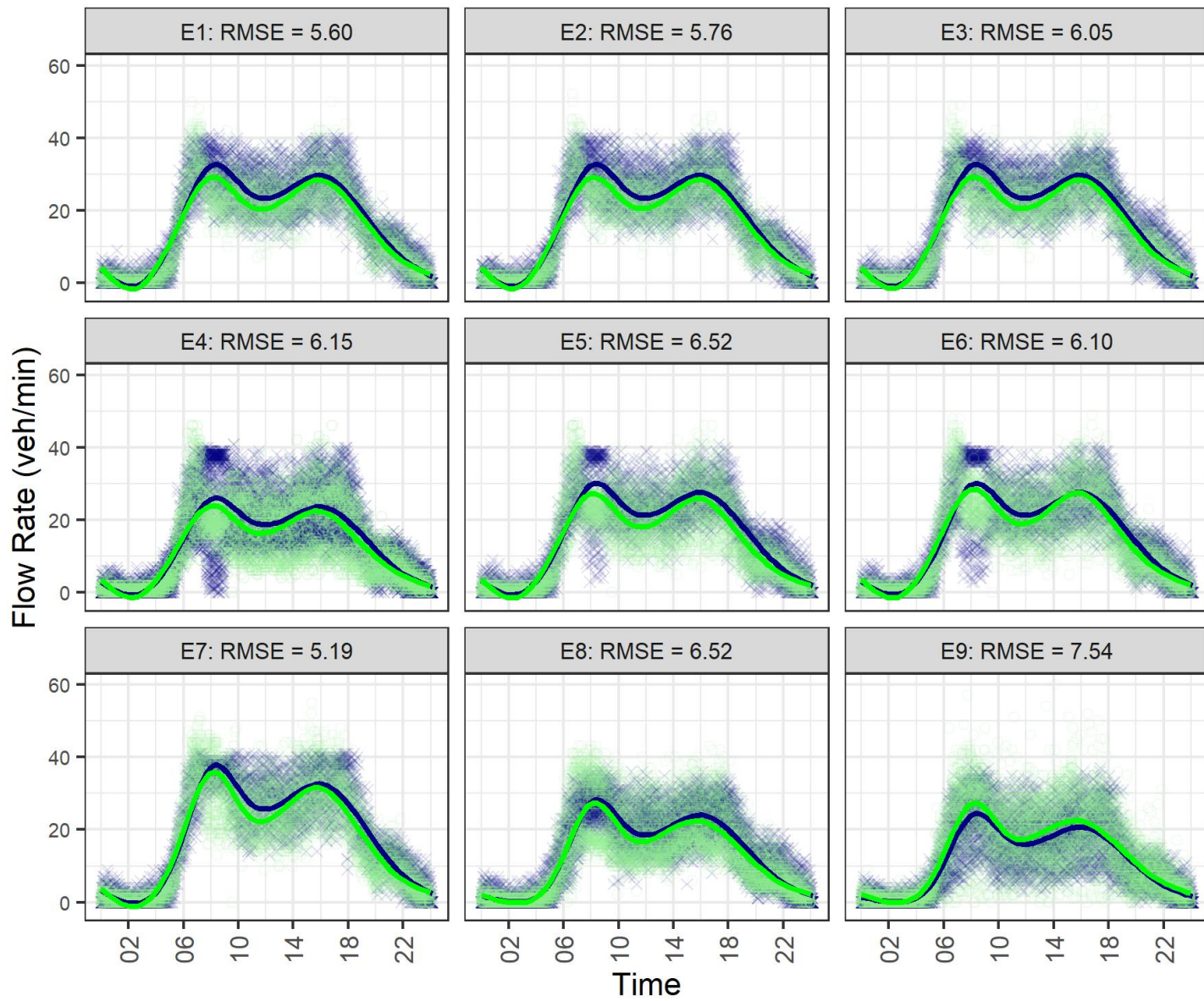


Figure 10

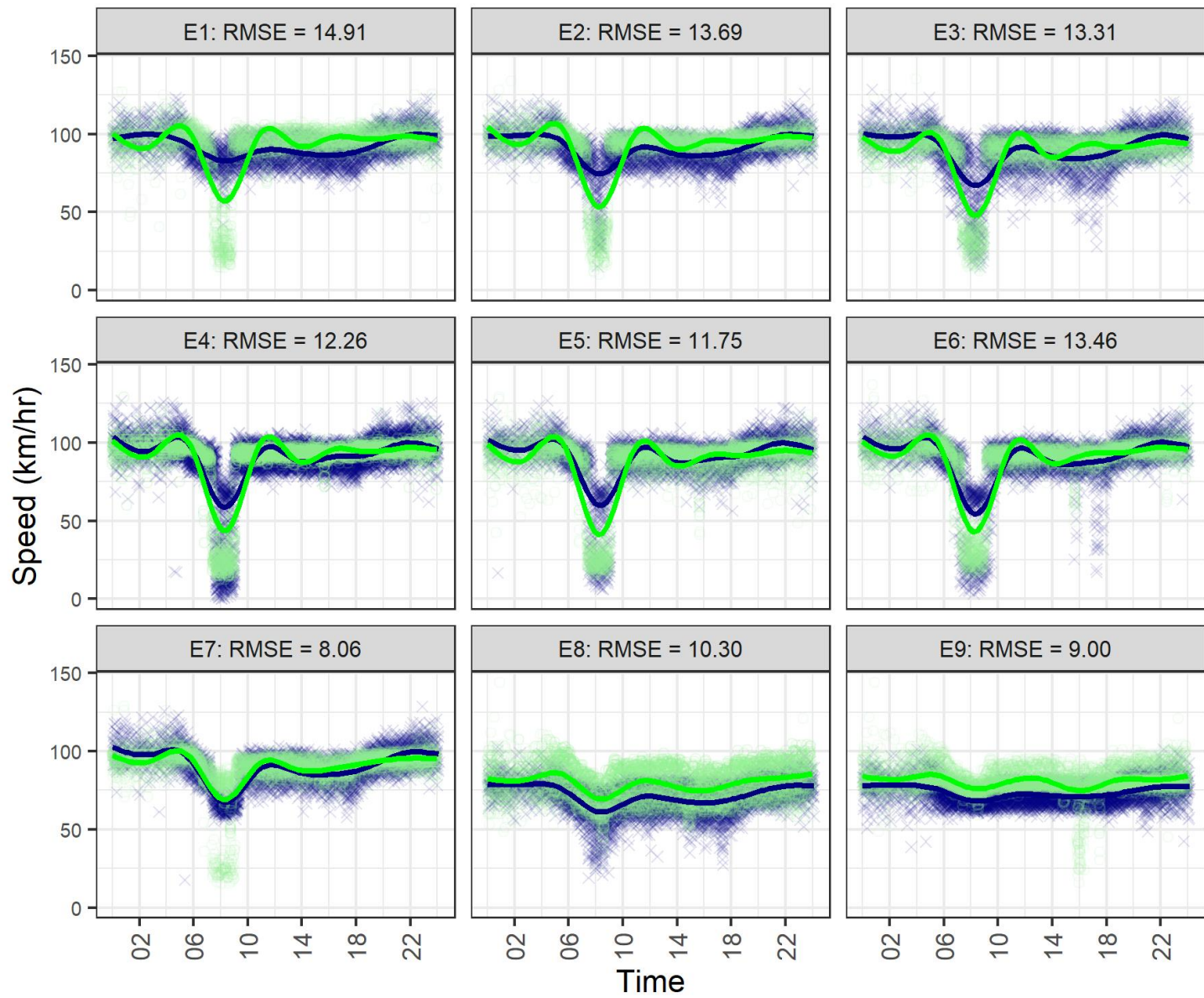


Figure 11

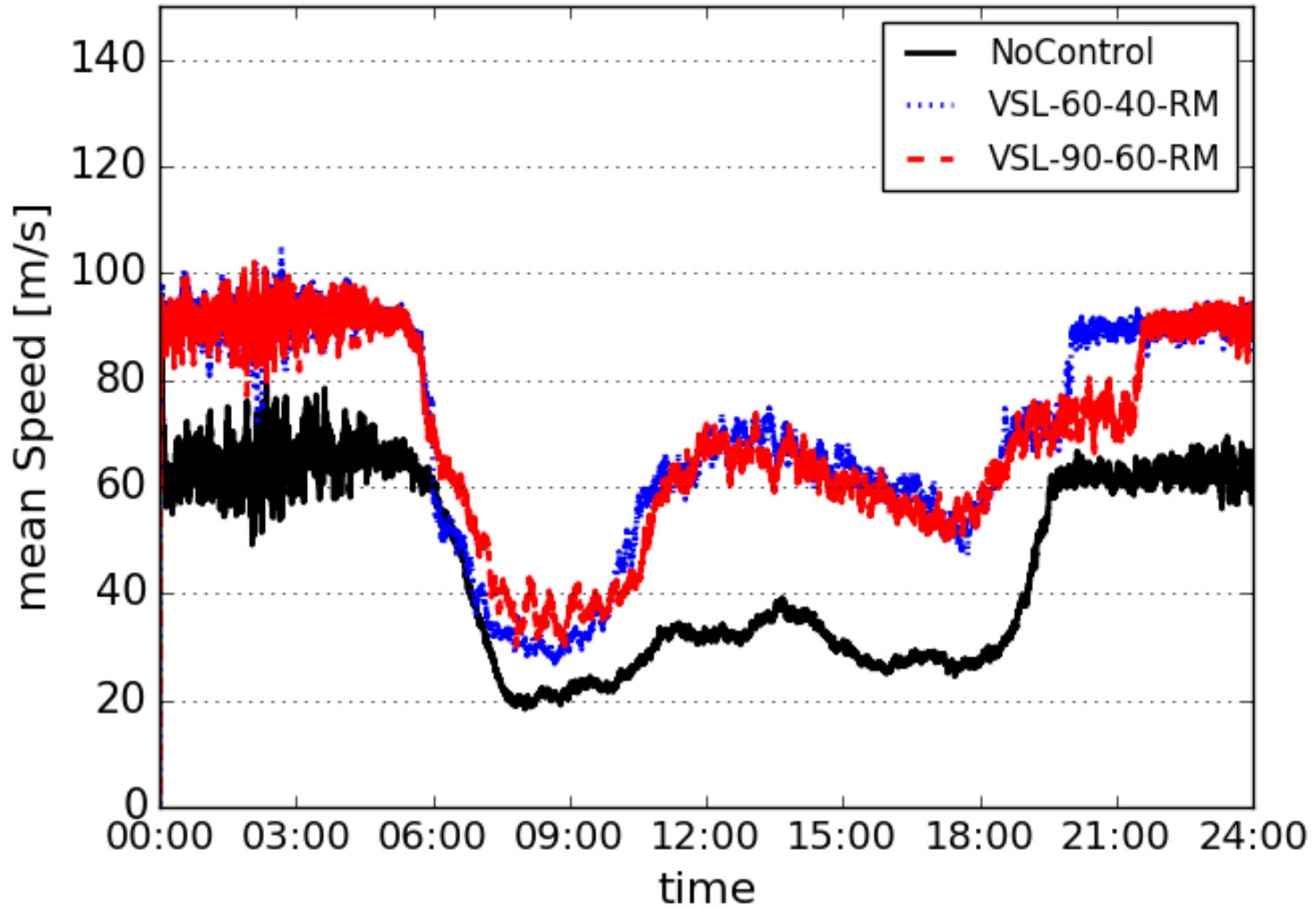


Figure 12

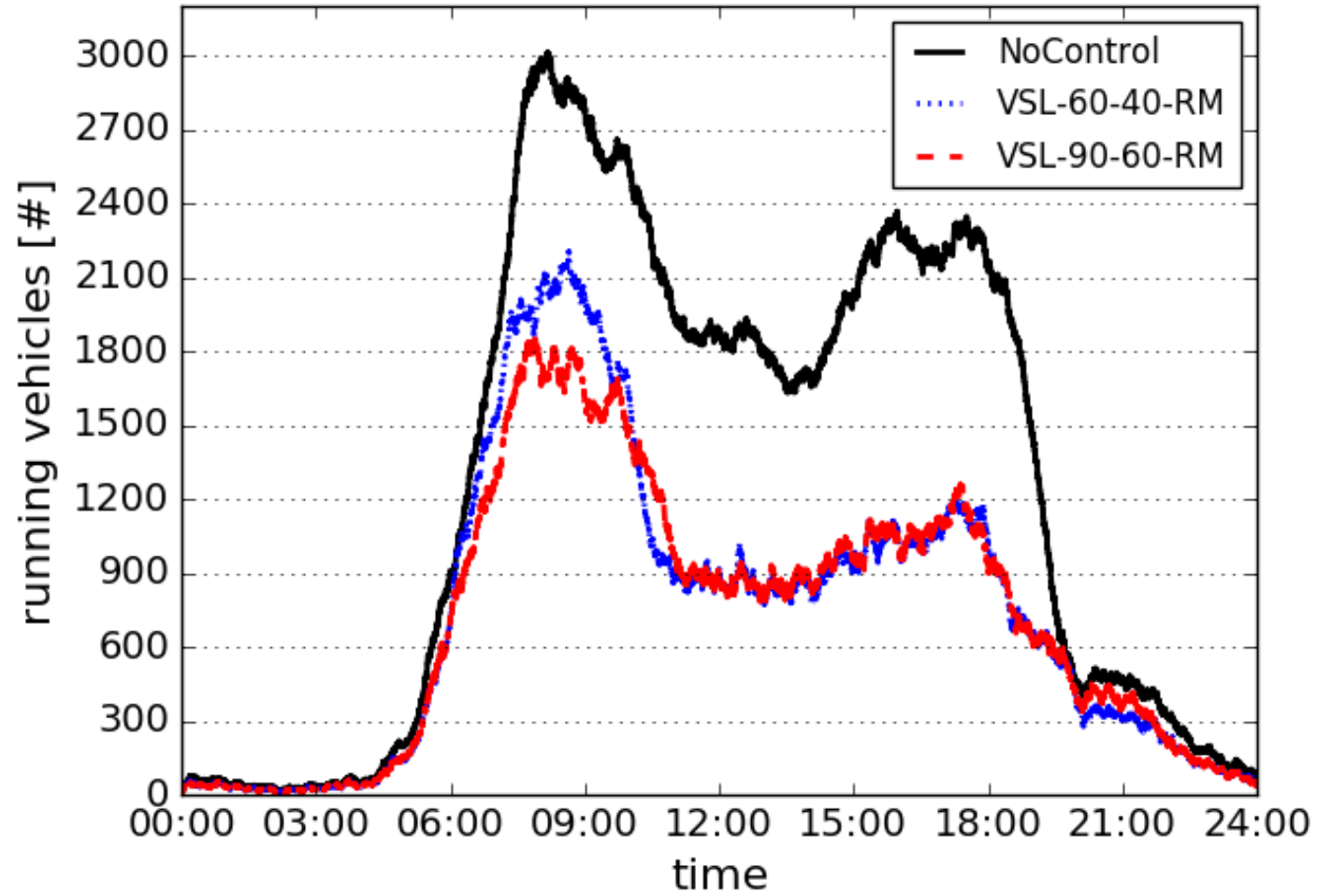


Figure 13

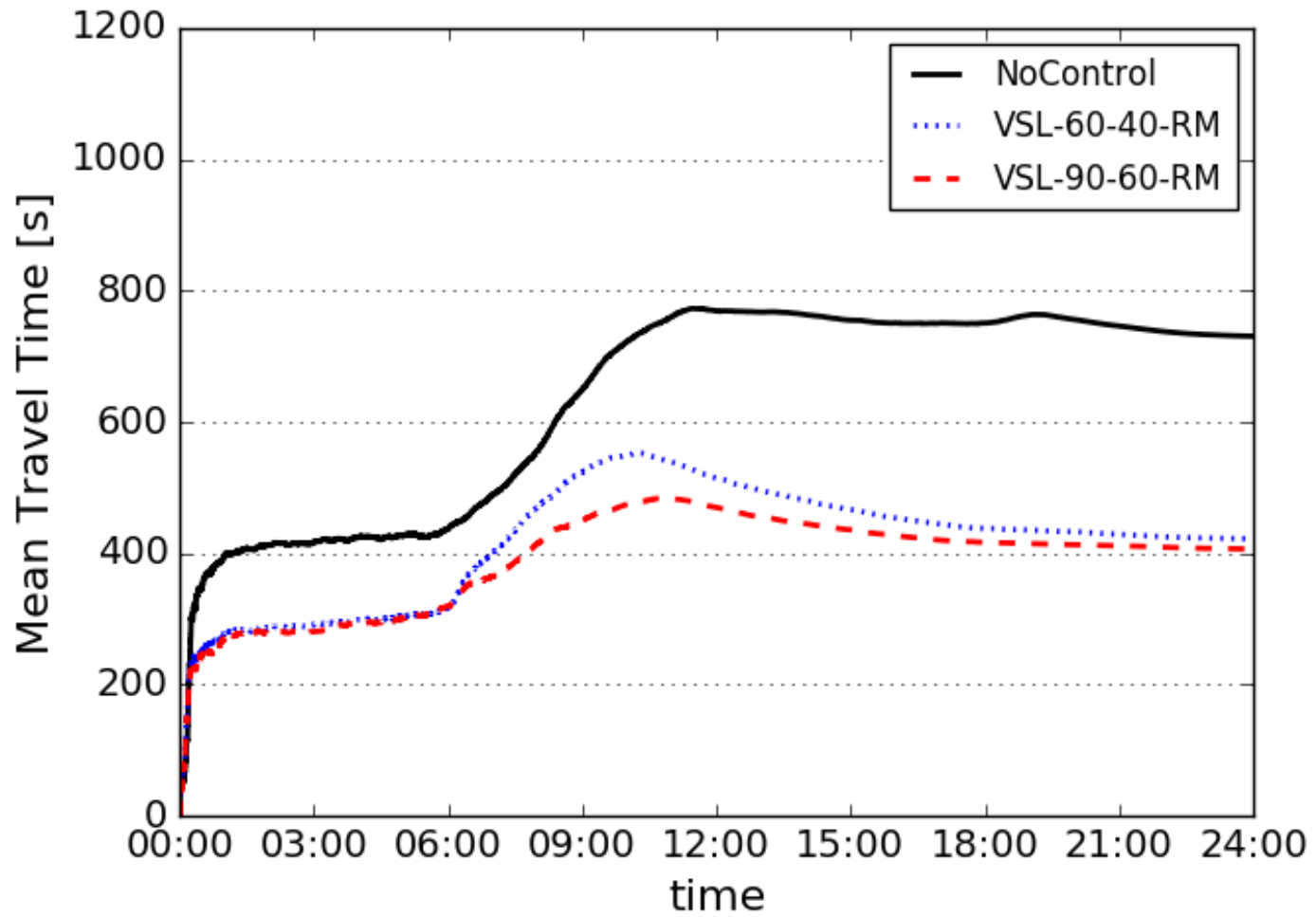


Figure 15

2. Further data analysis: traffic prediction

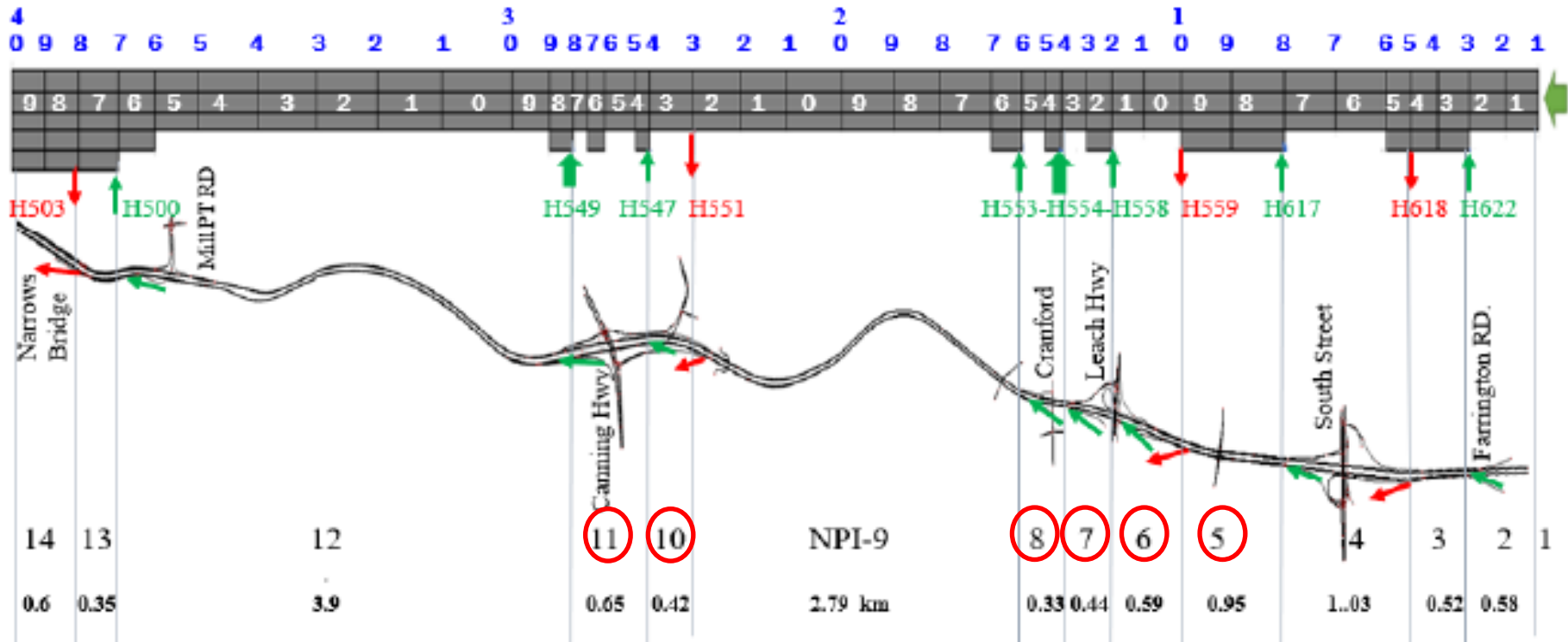


Figure 16

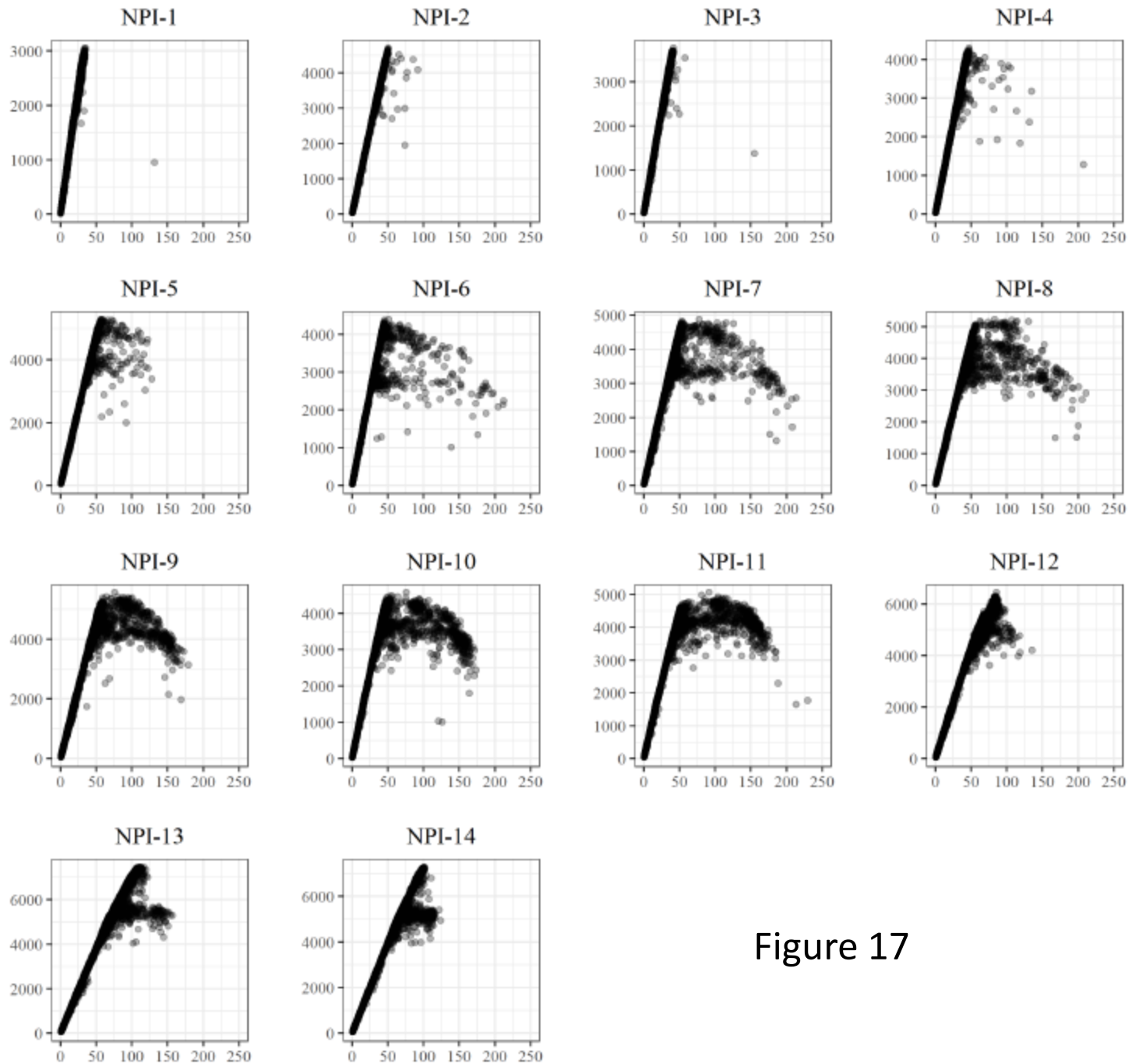


Figure 17

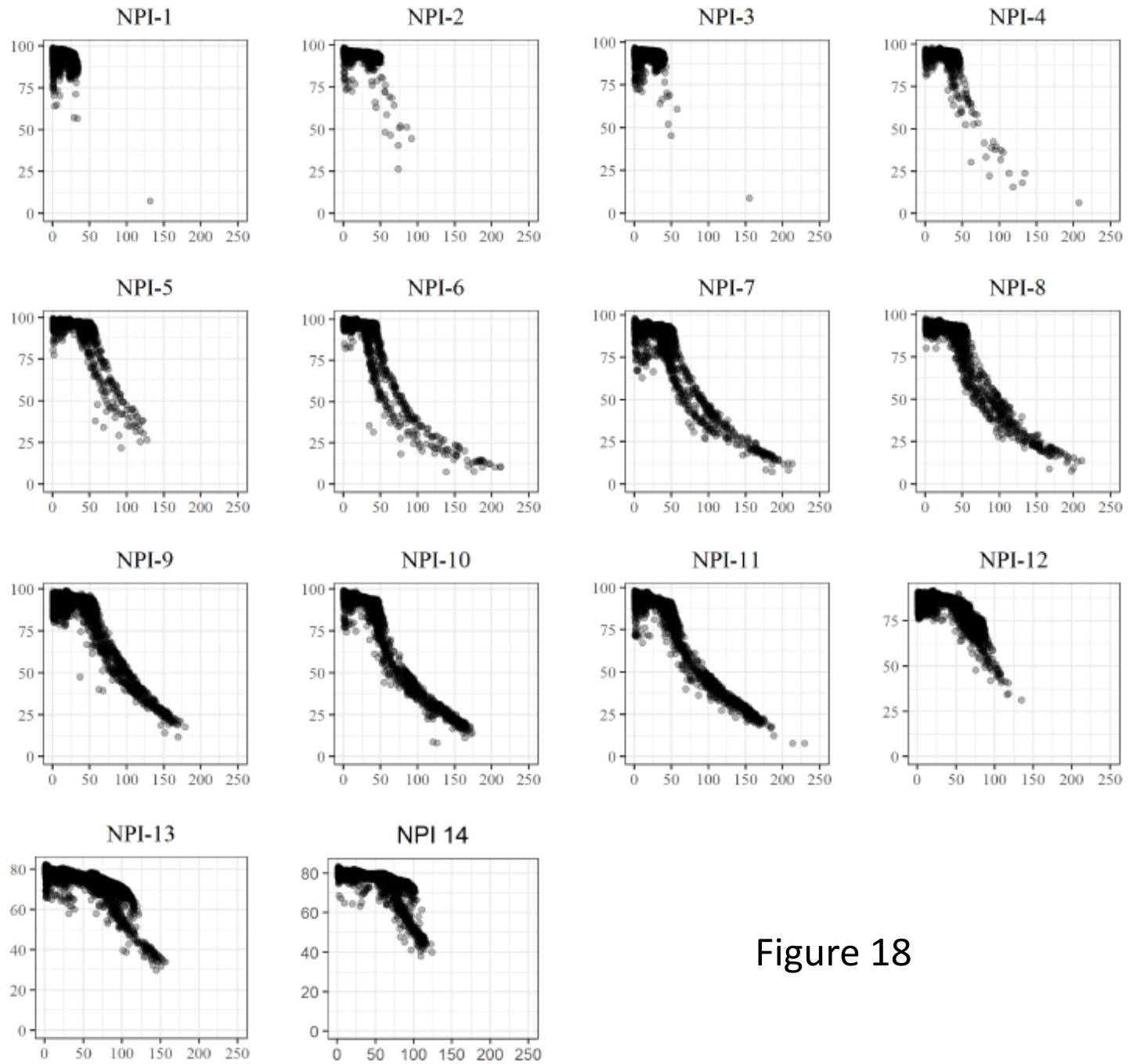
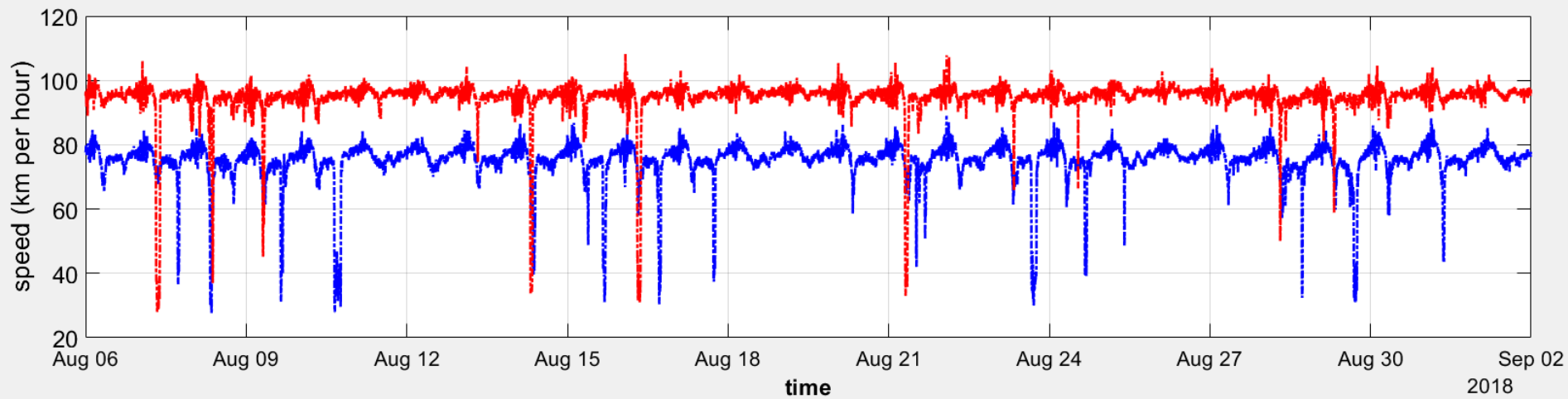
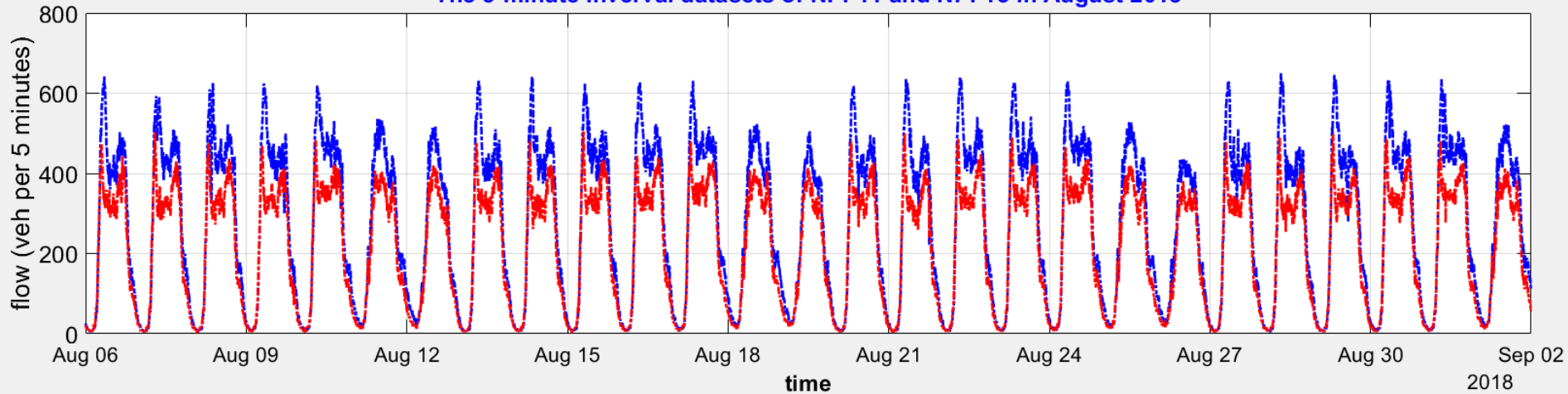


Figure 18

NPI-11, NPI-13: The 5-min interval traffic data (6 Aug – 1 Sep 2018)

The 5-minute interval datasets of NPI-11 and NPI-13 in August 2018



Monday

Tuesday

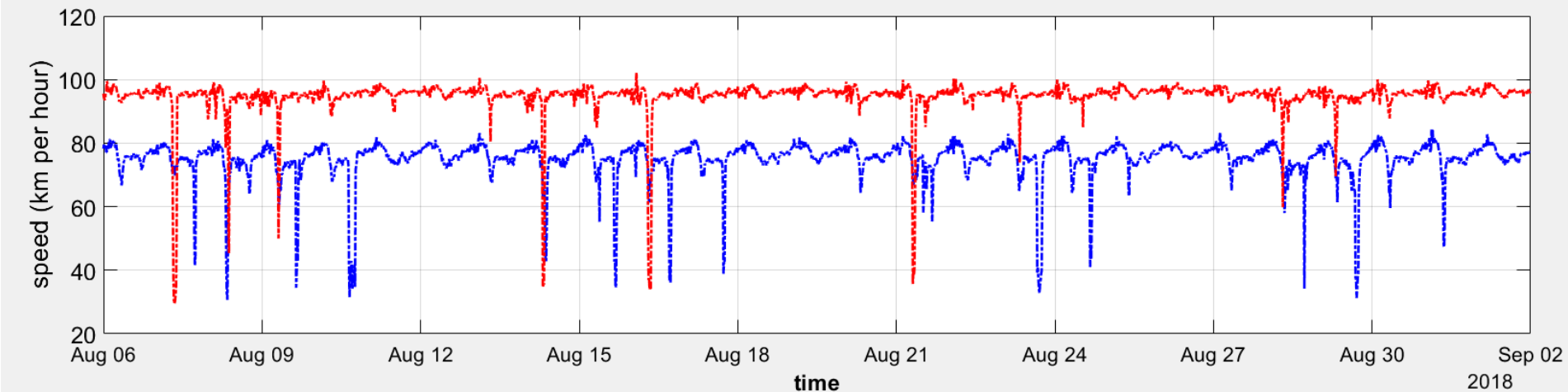
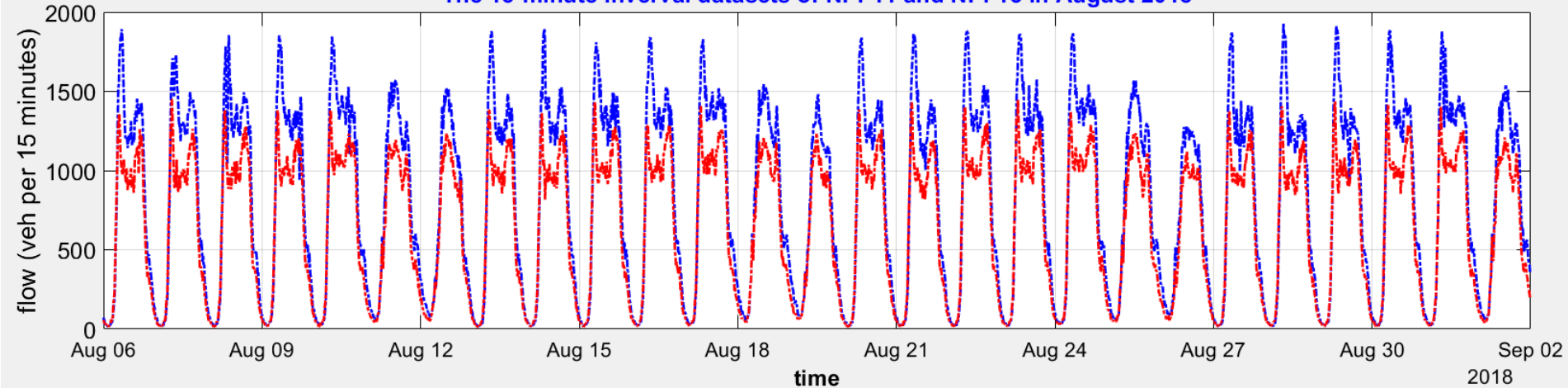
Wednesday

Thursday

Friday

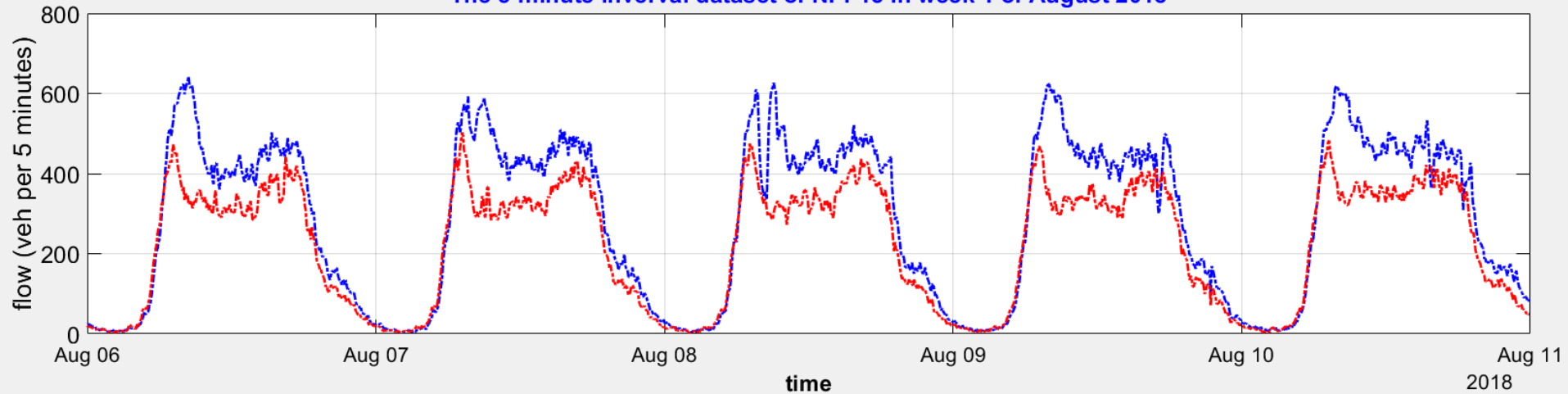
NPI-11, NPI-13: The 15-min interval traffic data (6 Aug – 1 Sep 2018)

The 15-minute interval datasets of NPI-11 and NPI-13 in August 2018

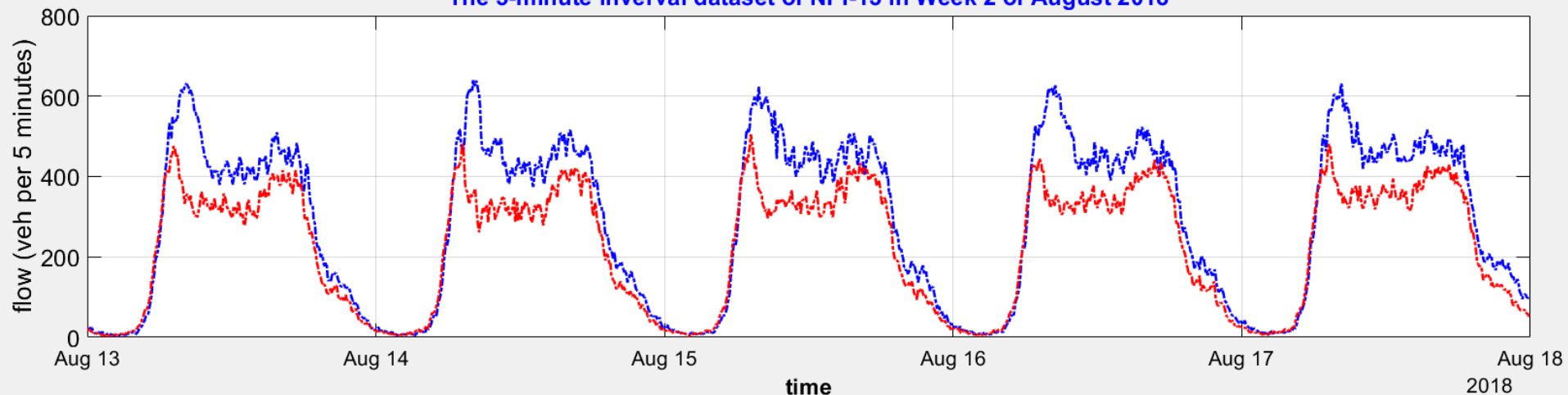


NPI-11, NPI-13: The 5-min interval dataset of traffic flow Weeks 1 & 2

The 5-minute interval dataset of NPI-13 in week 1 of August 2018



The 5-minute interval dataset of NPI-13 in Week 2 of August 2018



Monday

Tuesday

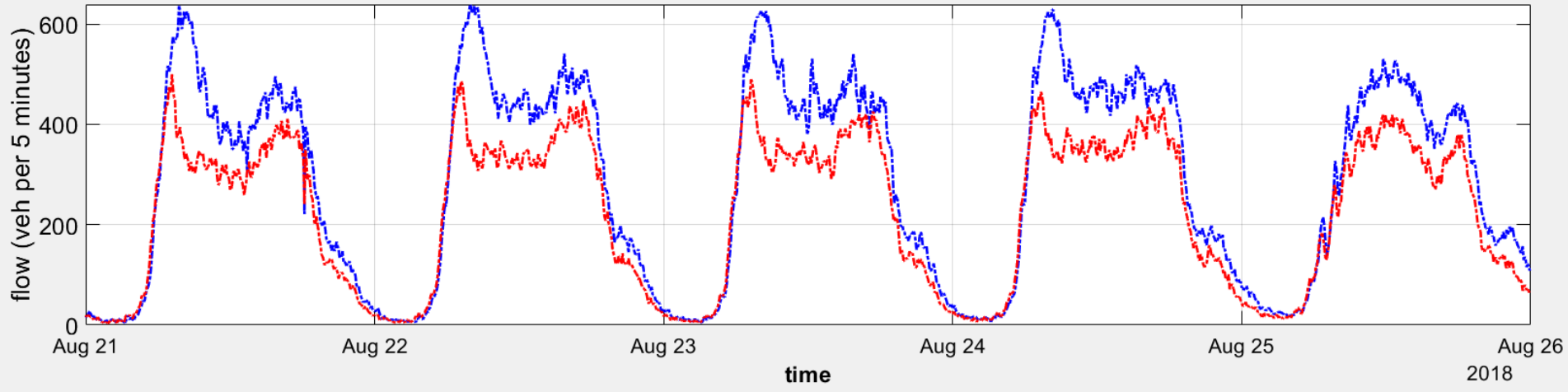
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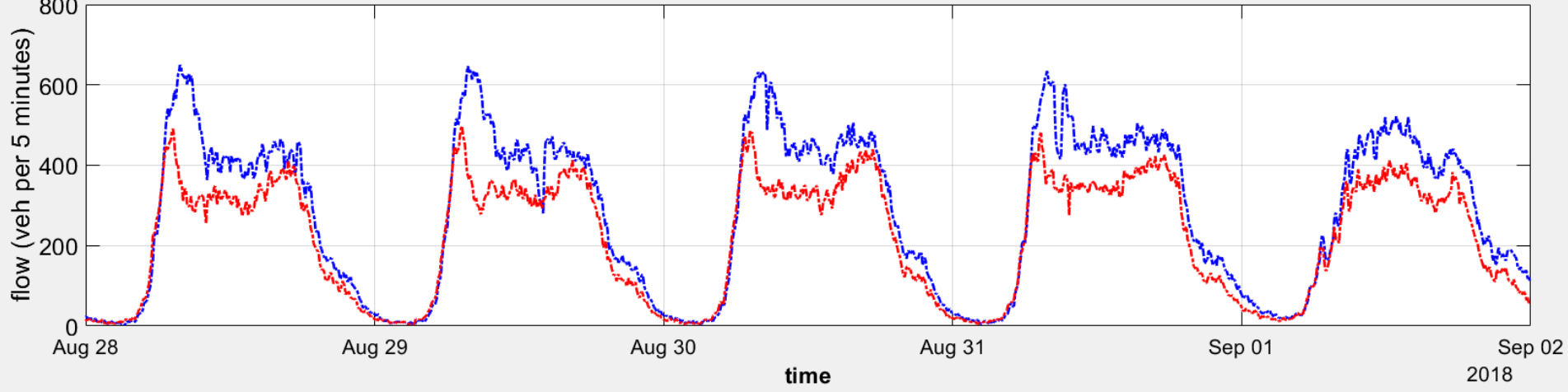
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NPI-11, NPI-13 : The 5-min interval dataset of traffic flow Weeks 3 & 4

The 5-minute interval dataset of NPI-13 in Week 3 of August 2018



The 5-minute interval dataset of NPI-13 in Week 4 of August 2018



Monday

Tuesday

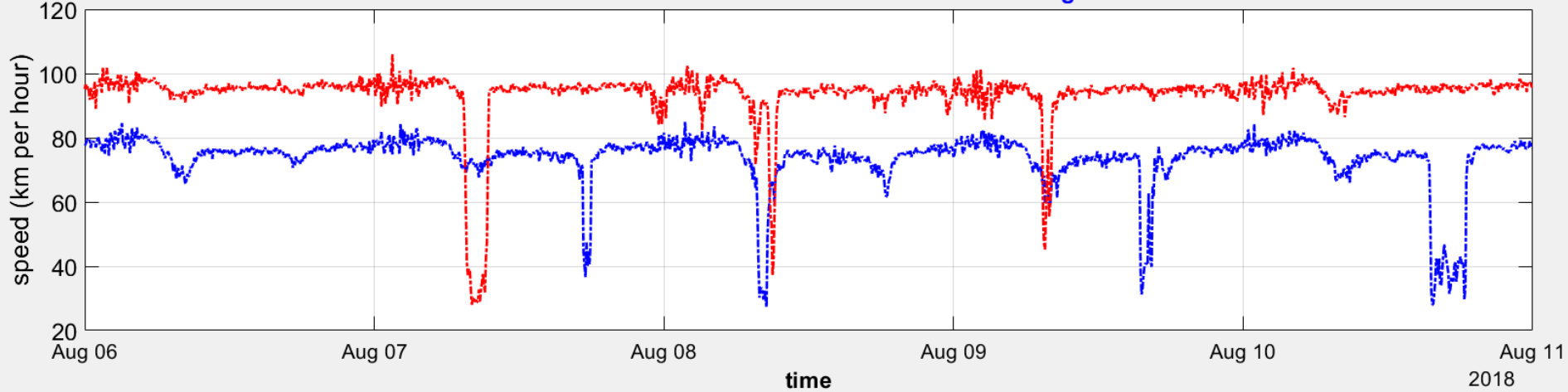
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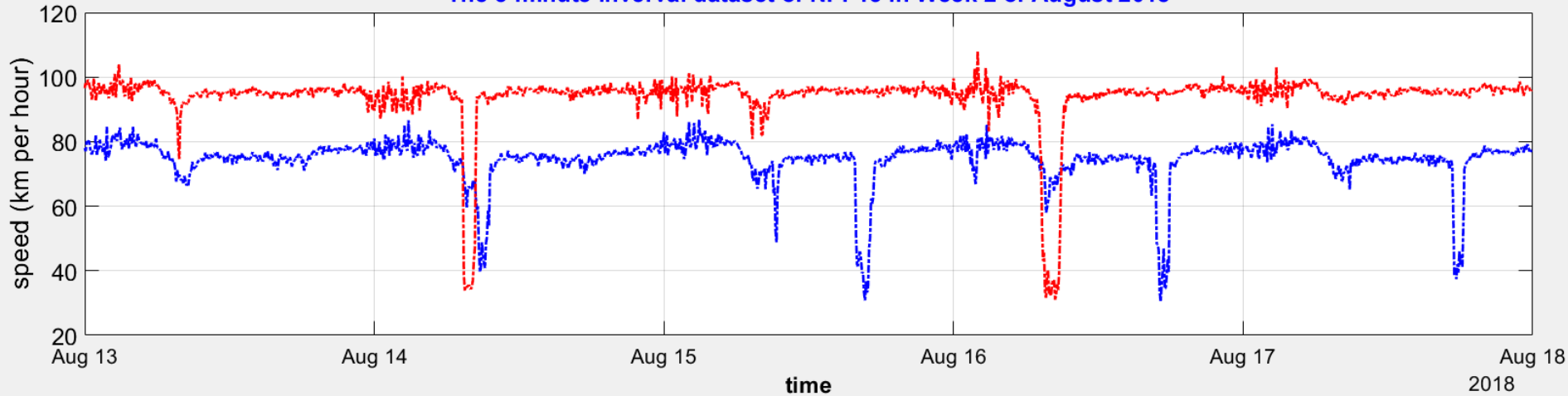
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NPI-11, NPI-13 : The 5-min interval dataset of traffic speed Weeks 1 & 2

The 5-minute interval dataset of NPI-13 in week 1 of August 2018



The 5-minute interval dataset of NPI-13 in Week 2 of August 2018



Monday

Tuesday

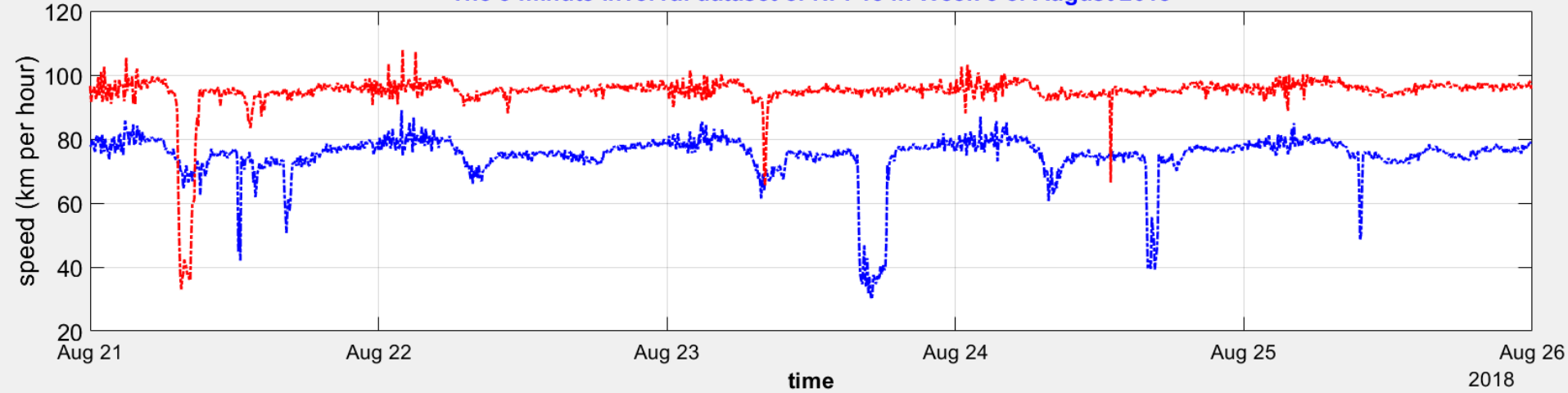
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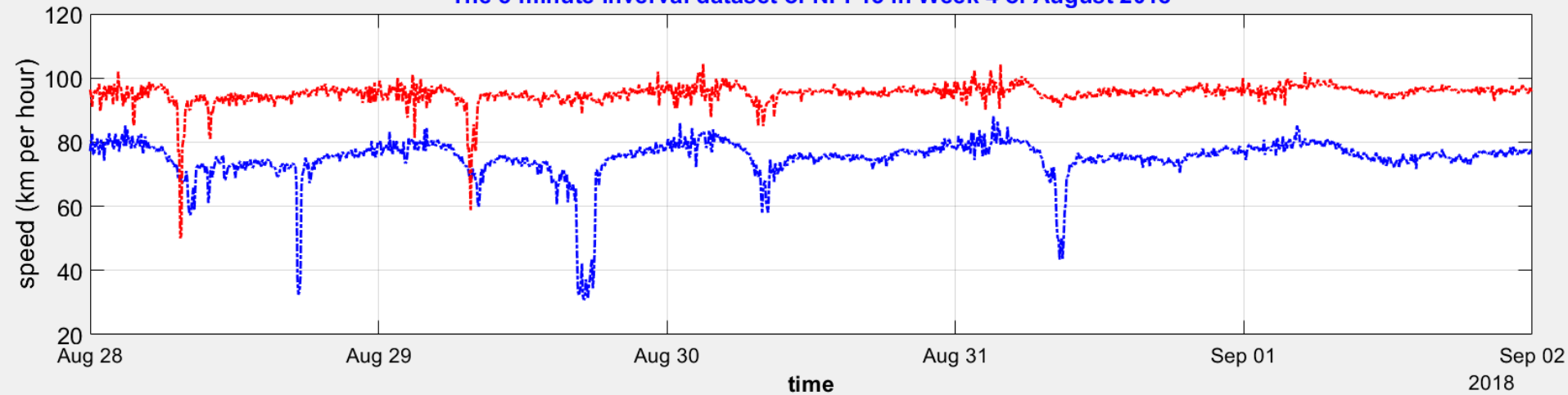
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NPI-11, NPI-13 : The 5-min interval dataset of traffic speed Weeks 3 & 4

The 5-minute interval dataset of NPI-13 in Week 3 of August 2018



The 5-minute interval dataset of NPI-13 in Week 4 of August 2018



Monday

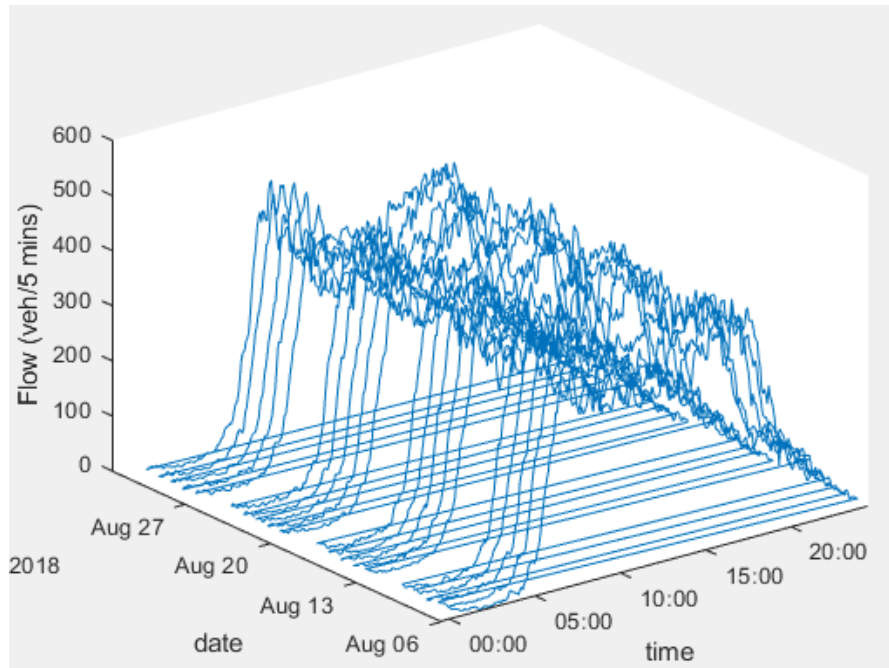
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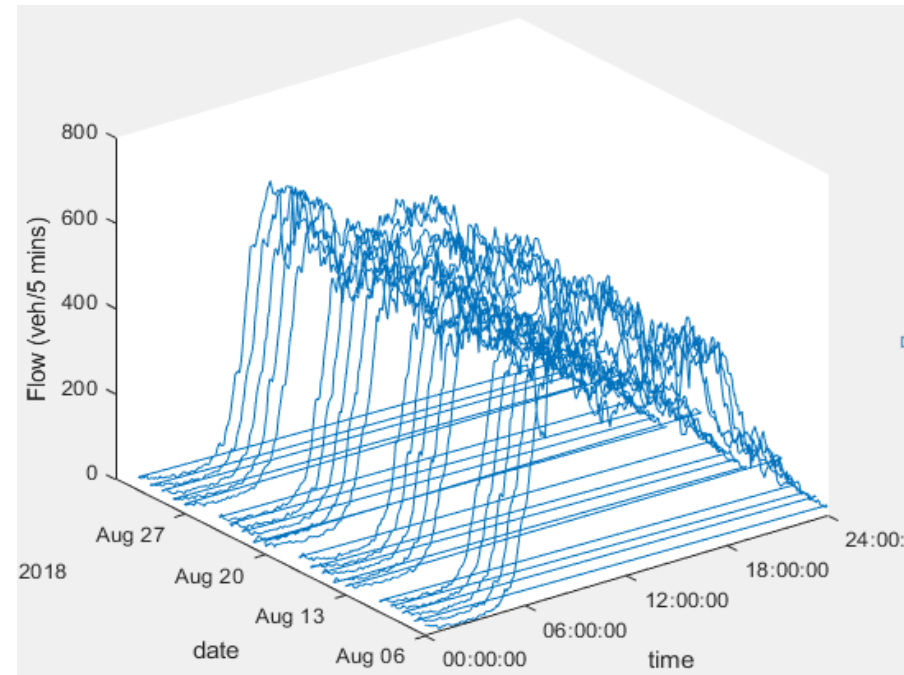
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NPI-11

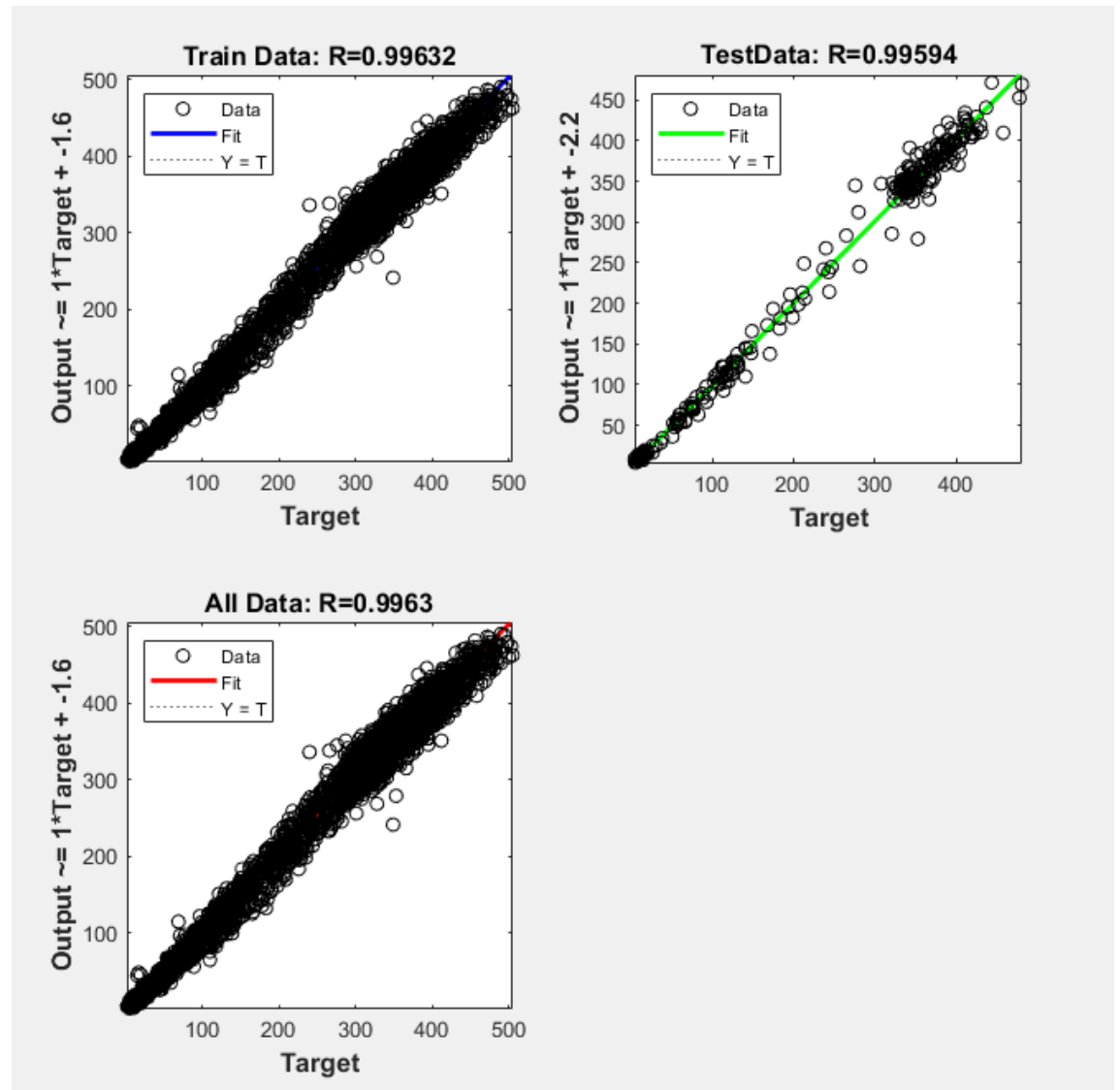


NPI-13

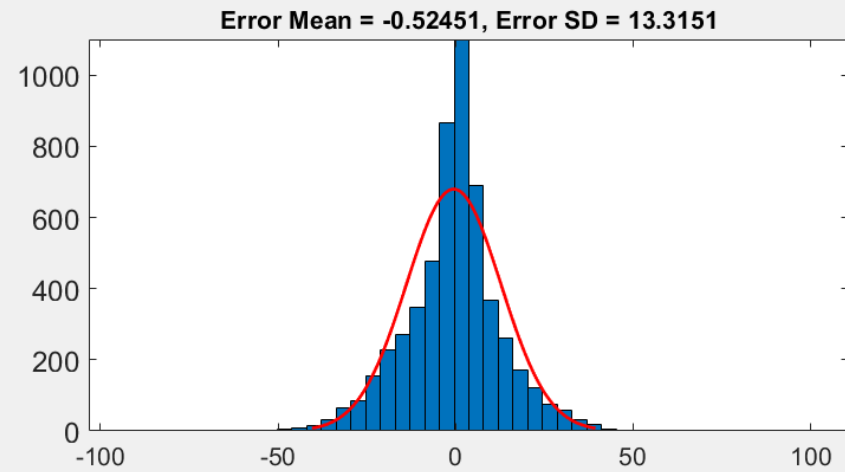
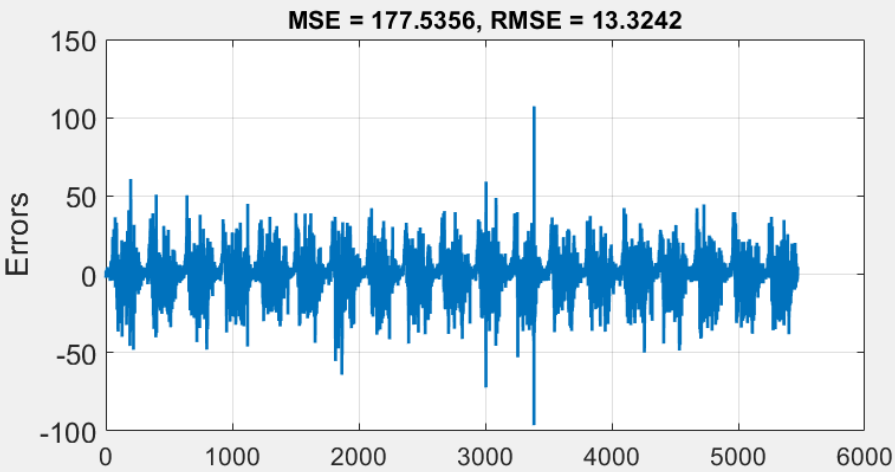
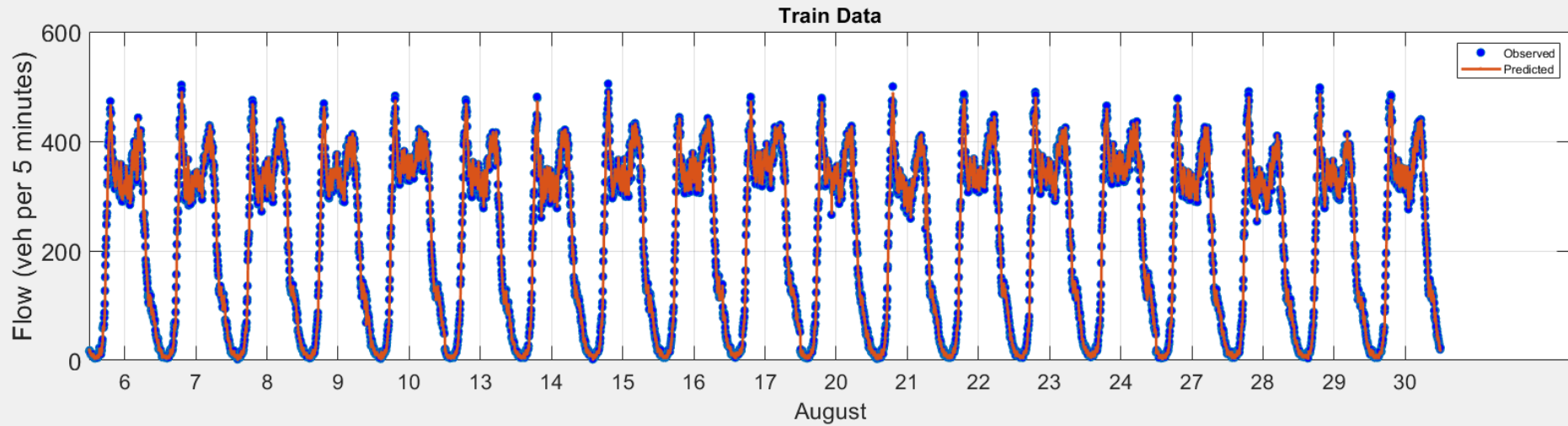


Traffic Flow Rate
Veh/minute

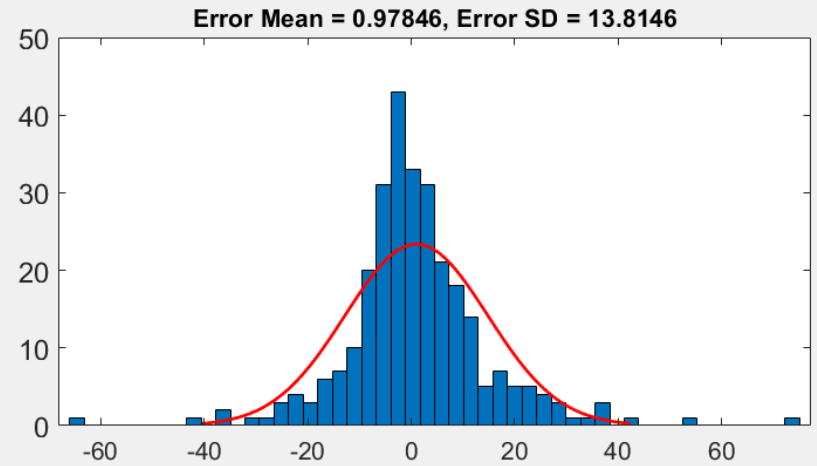
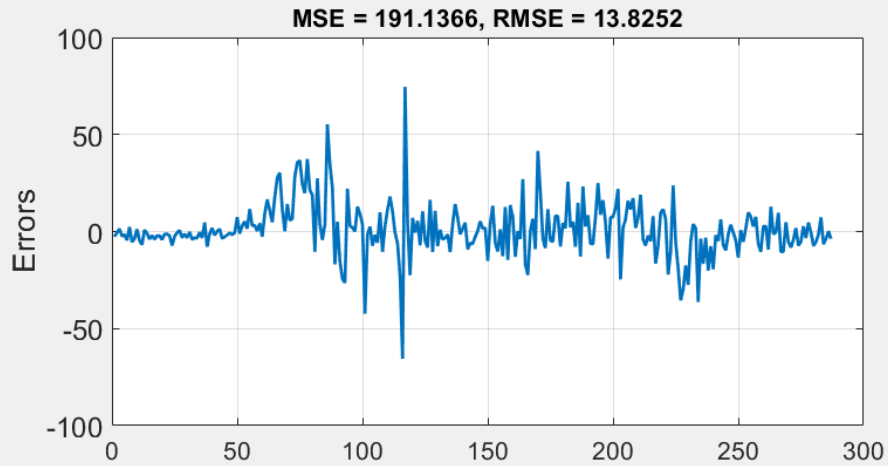
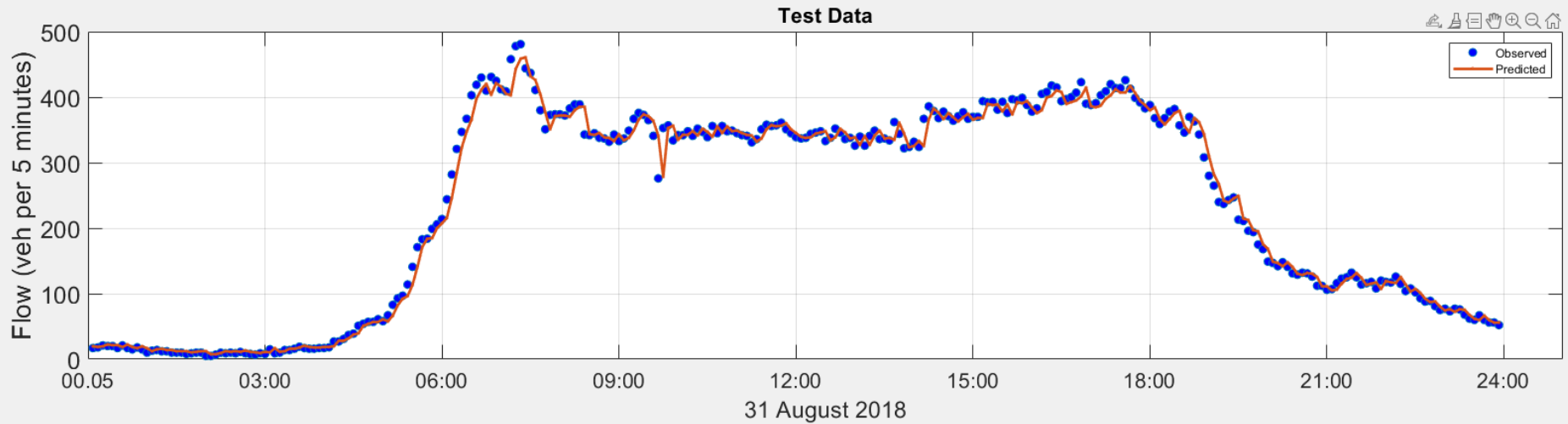
NPI-11



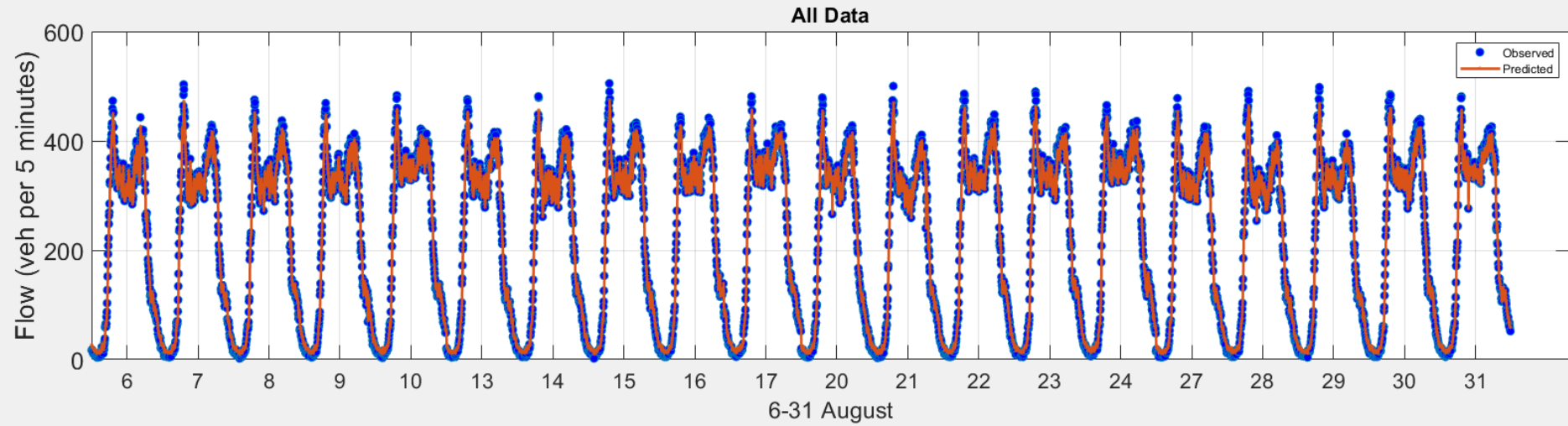
NPI-11



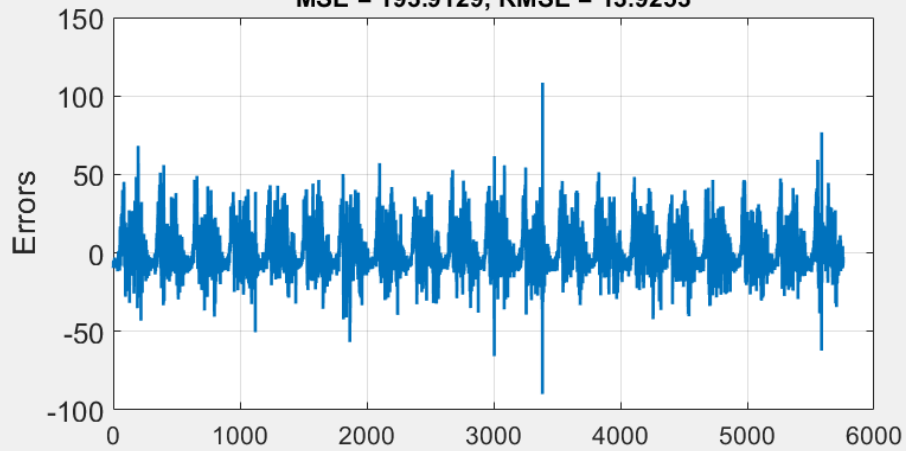
NPI-11



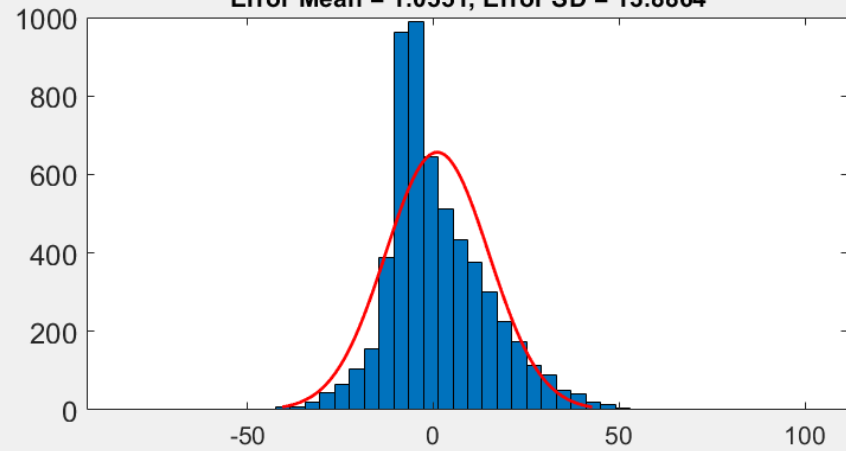
NPI-11



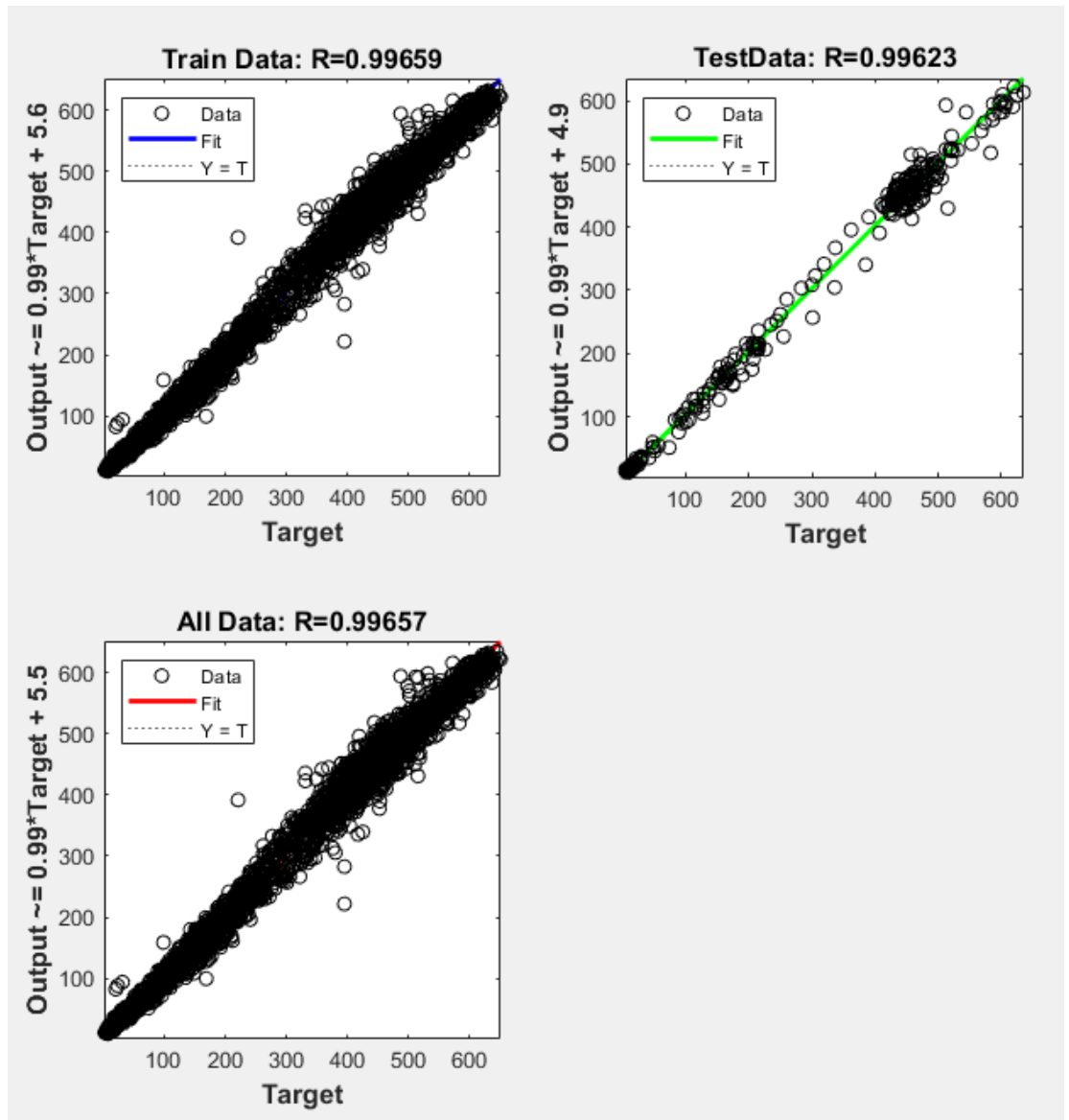
MSE = 193.9129, RMSE = 13.9253



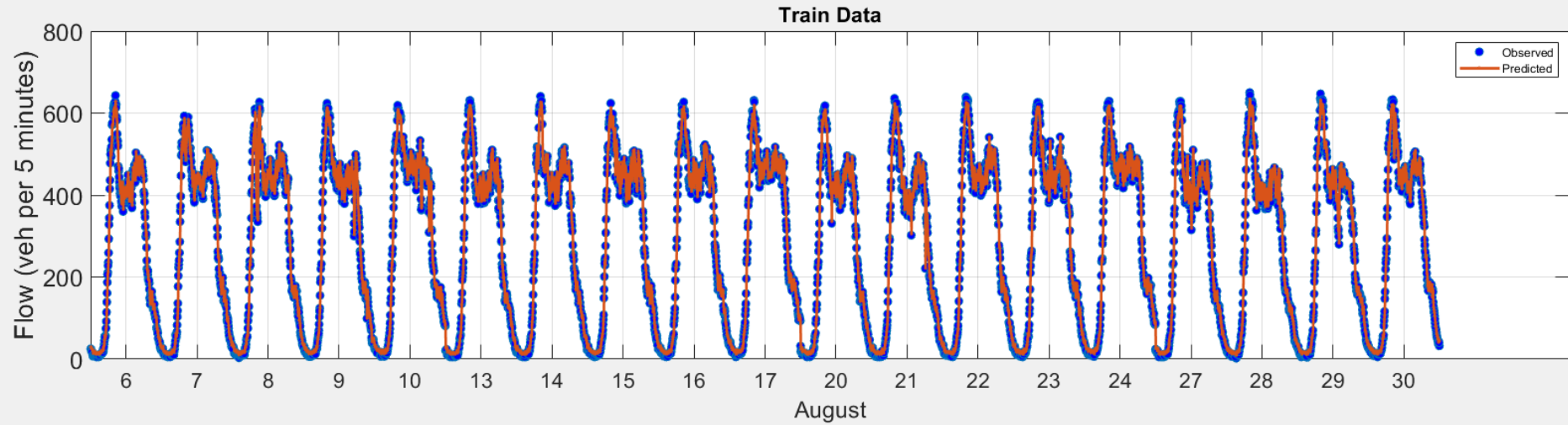
Error Mean = 1.0551, Error SD = 13.8864



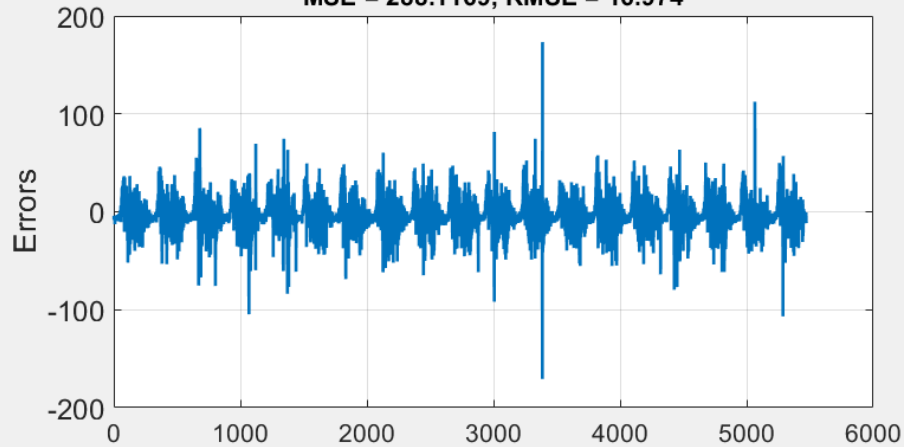
NPI-13



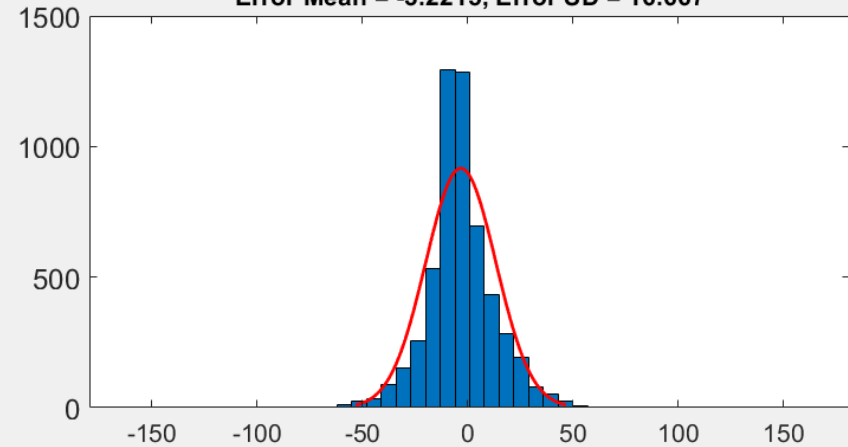
NPI-13



MSE = 288.1169, RMSE = 16.974

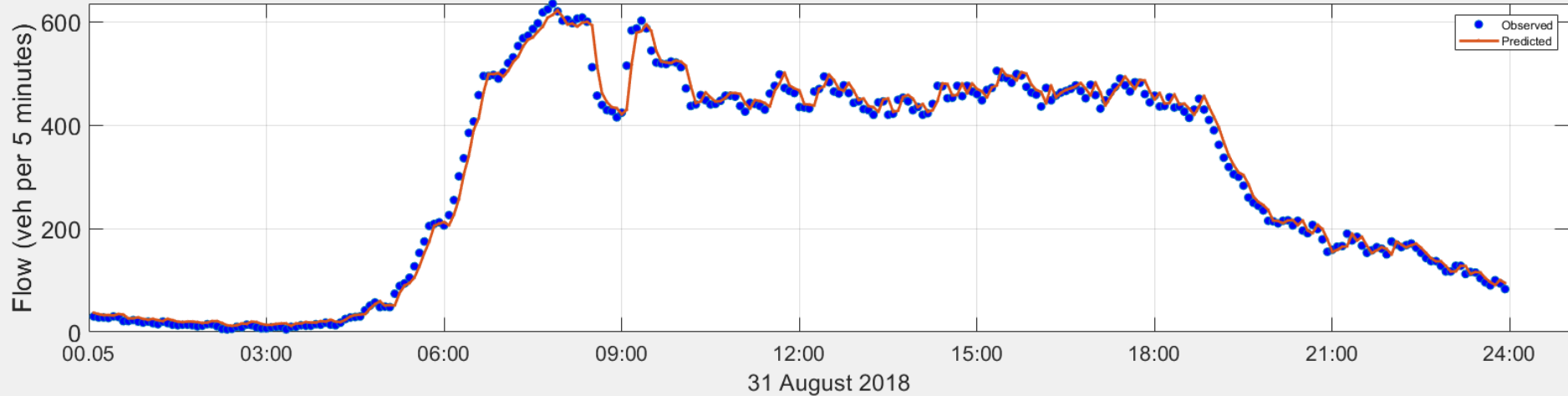


Error Mean = -3.2215, Error SD = 16.667

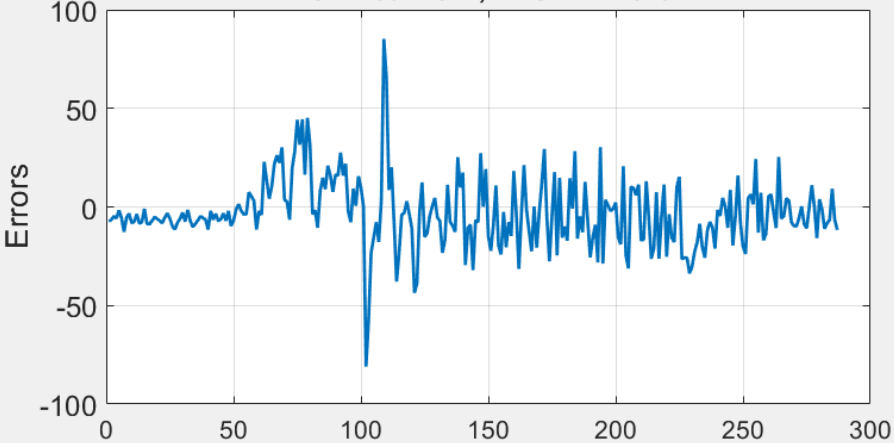


NPI-13

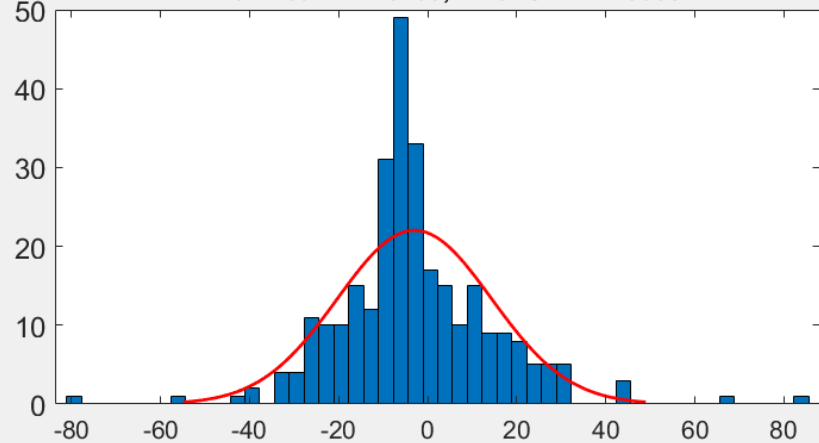
Test Data



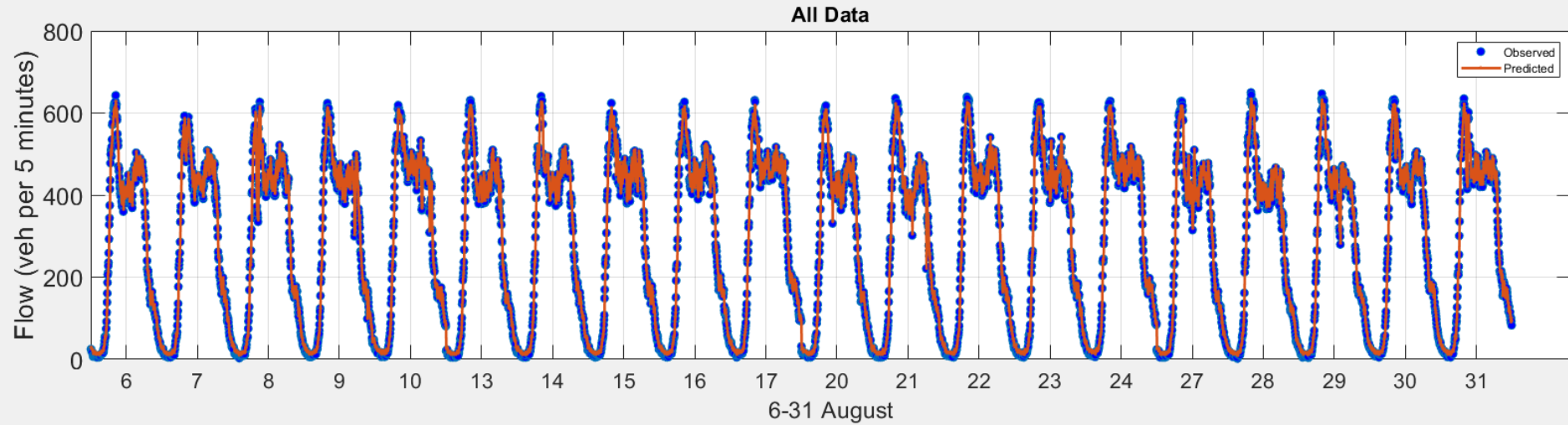
MSE = 307.2917, RMSE = 17.5297



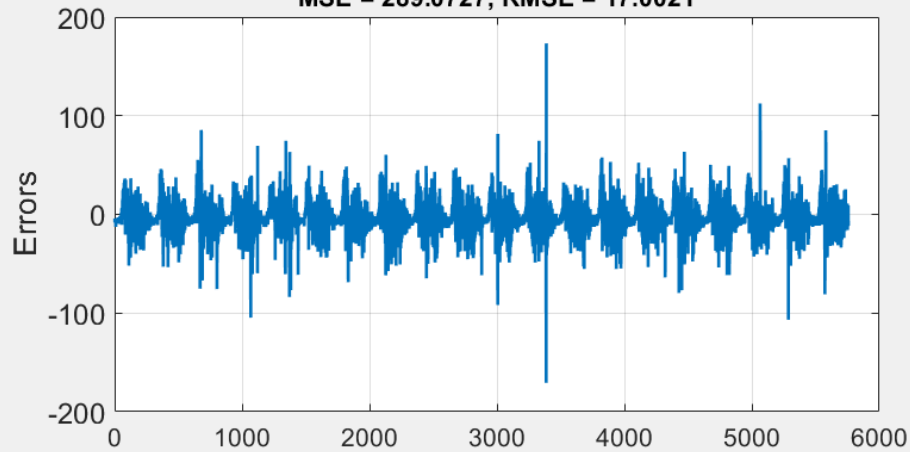
Error Mean = -2.9739, Error SD = 17.3058



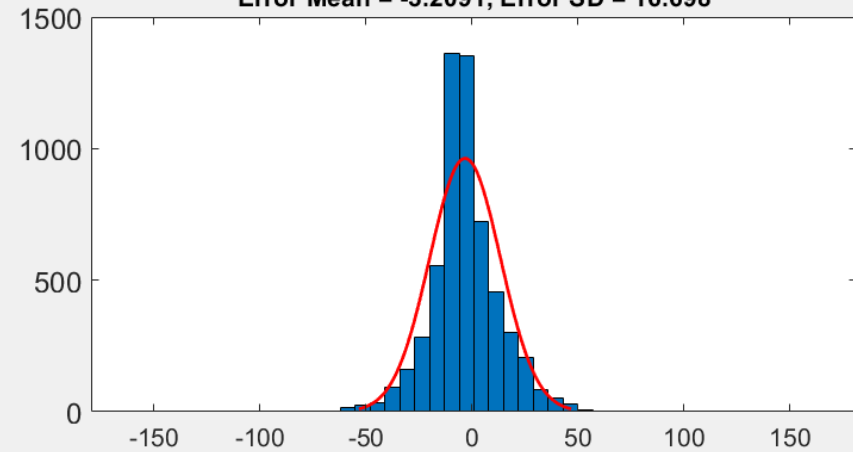
NPI-13



MSE = 289.0727, RMSE = 17.0021

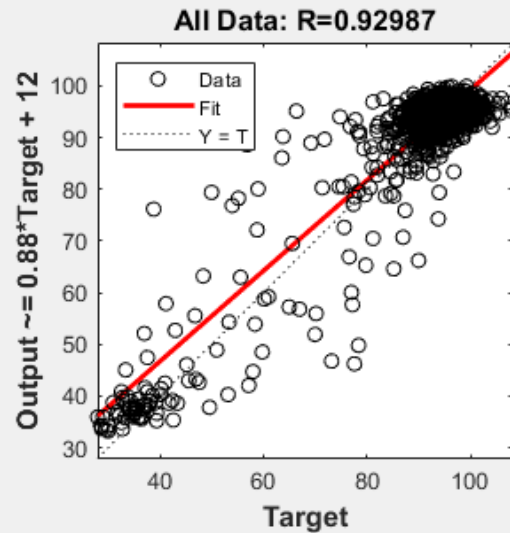
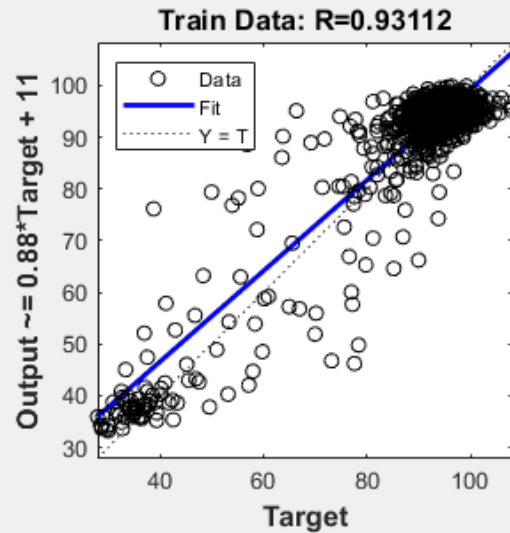


Error Mean = -3.2091, Error SD = 16.698



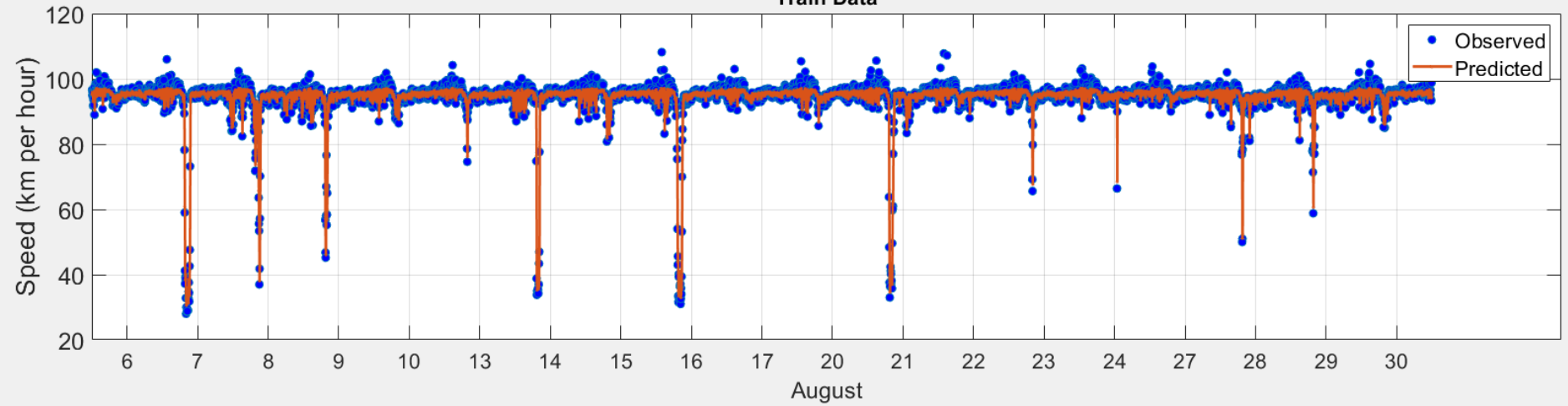
Traffic Speed
km/hr

NPI-11

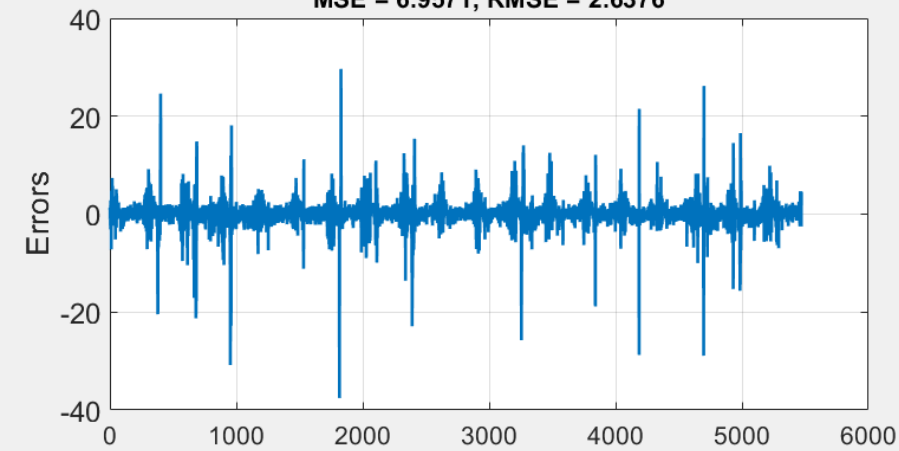


NPI-11

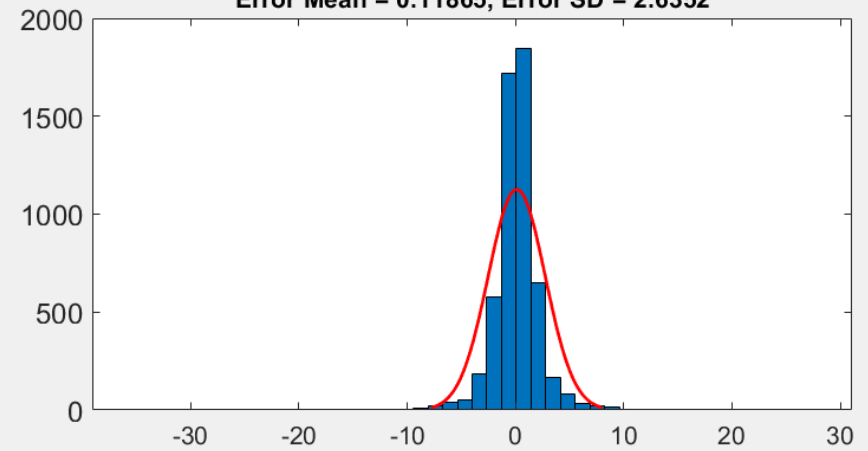
Train Data



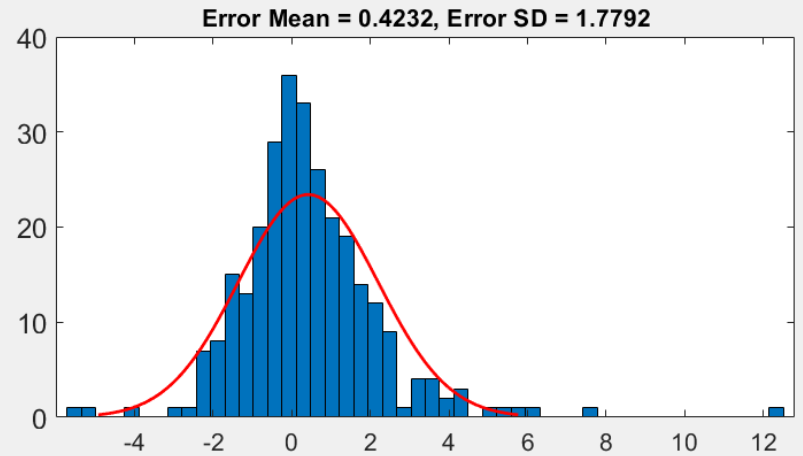
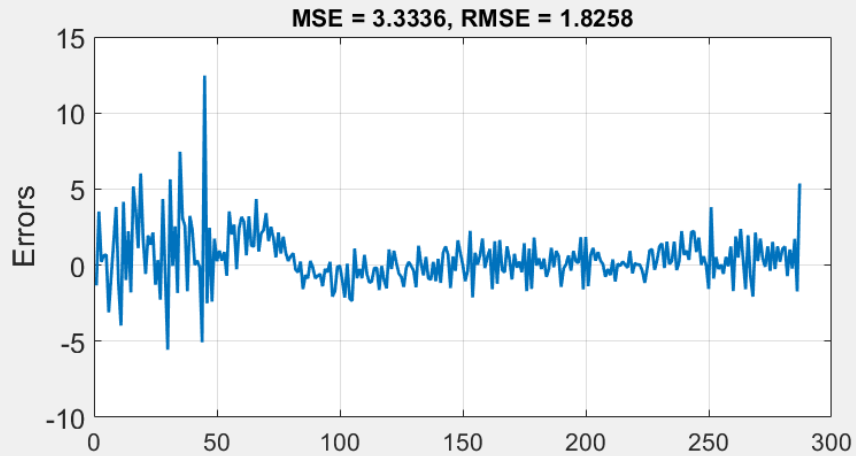
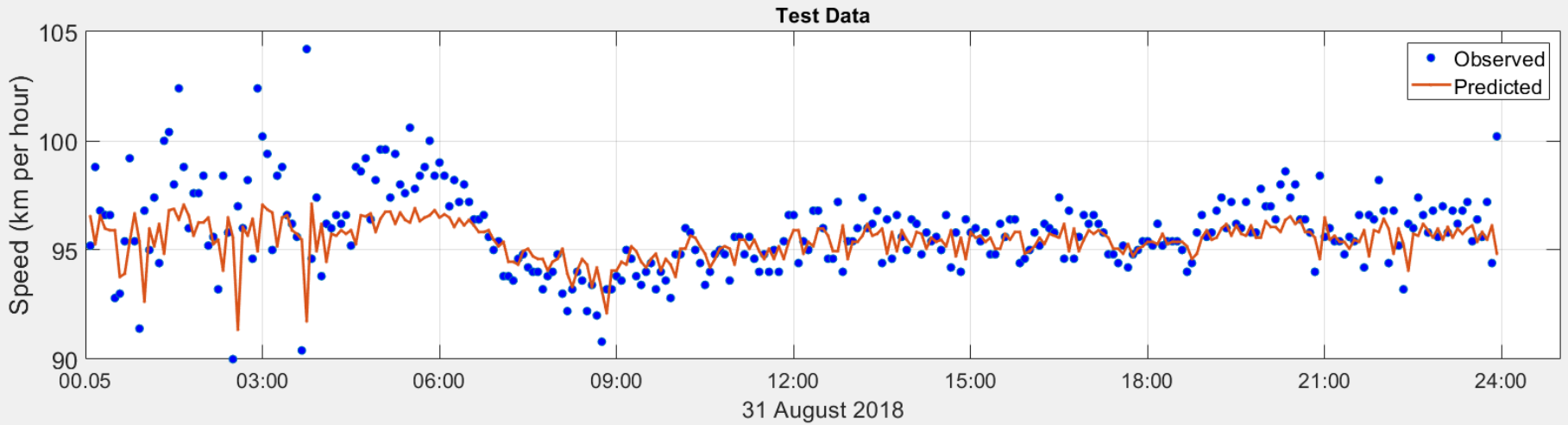
MSE = 6.9571, RMSE = 2.6376



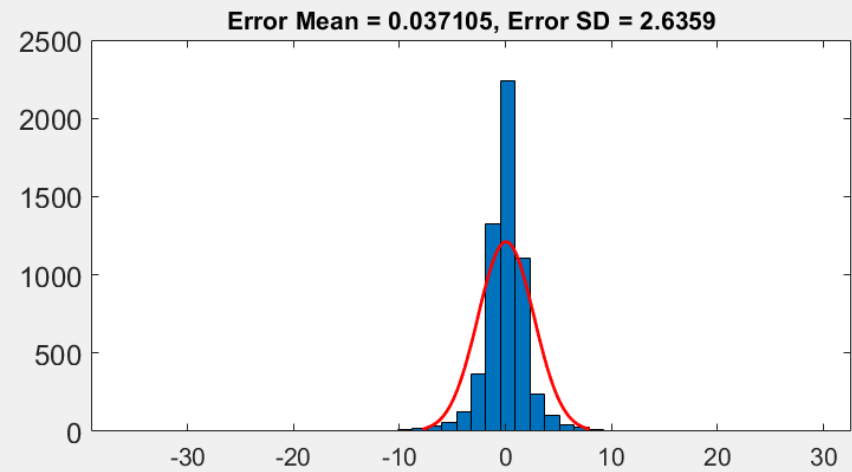
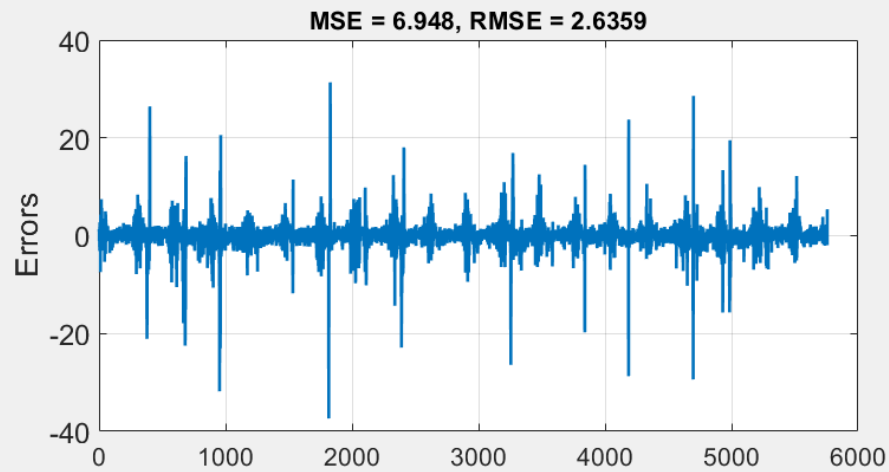
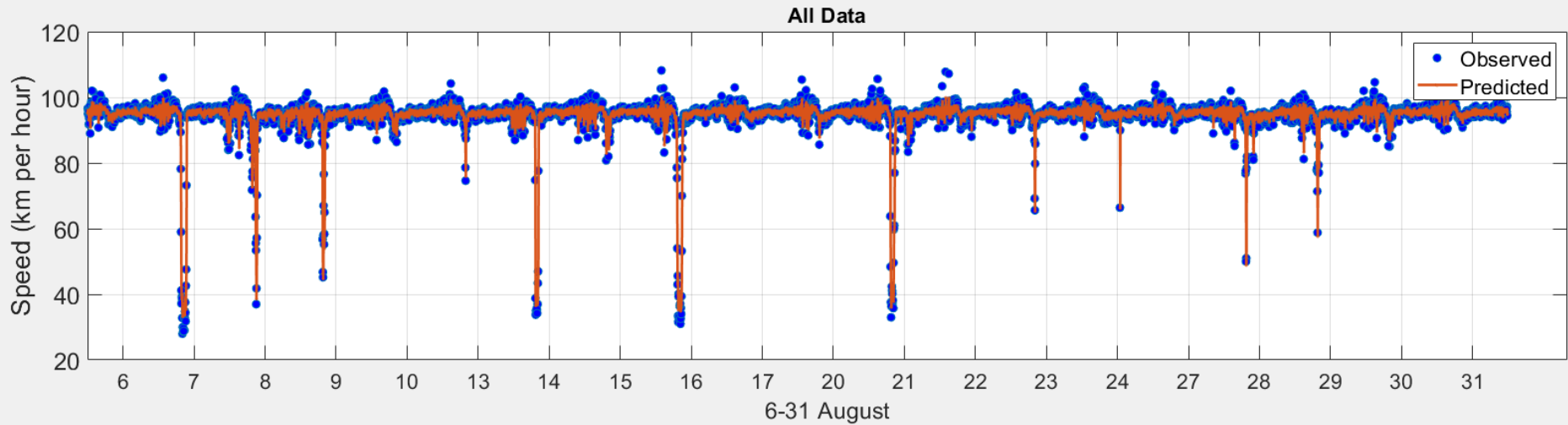
Error Mean = 0.11865, Error SD = 2.6352



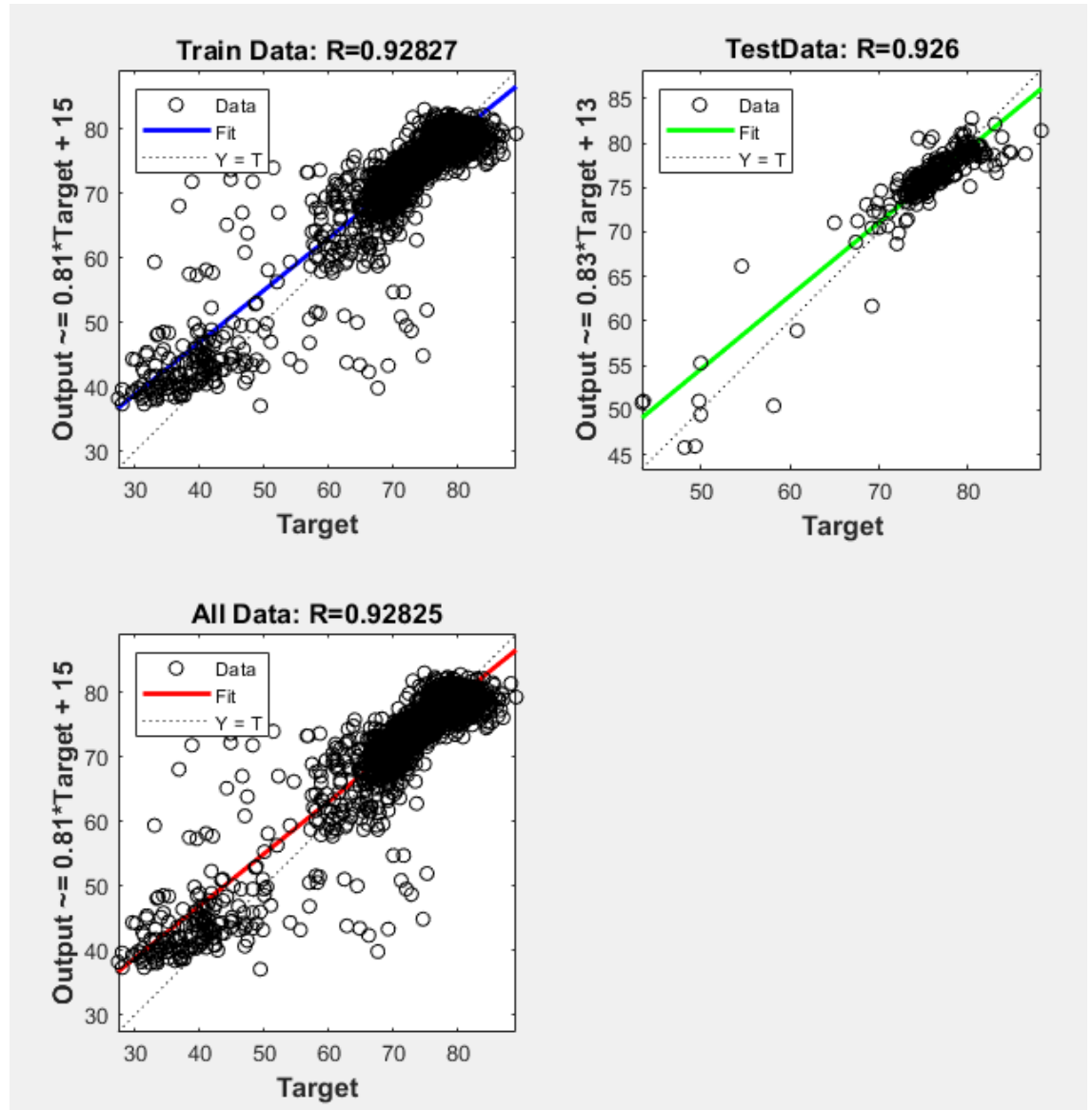
NPI-11



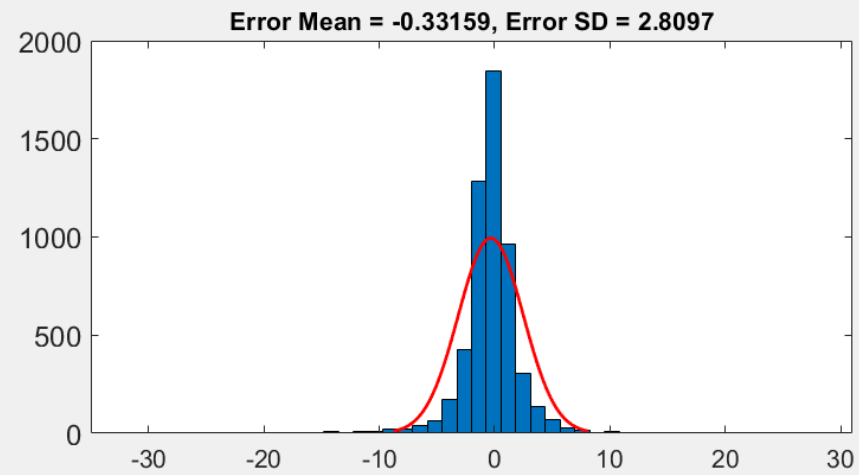
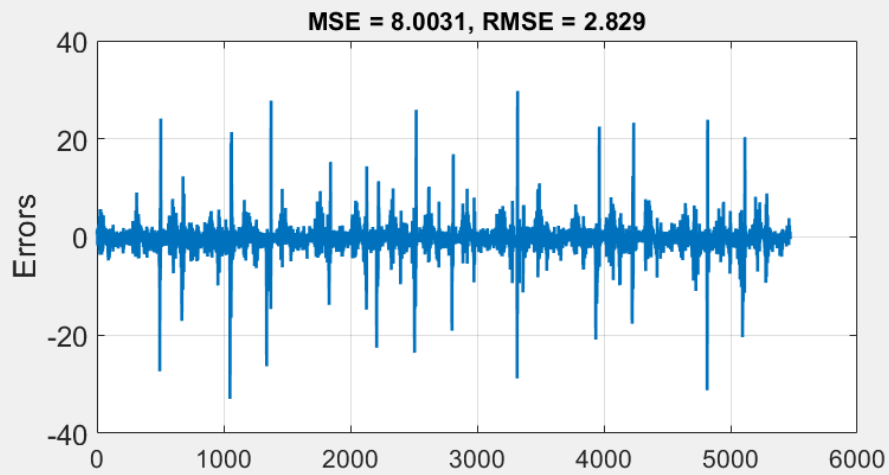
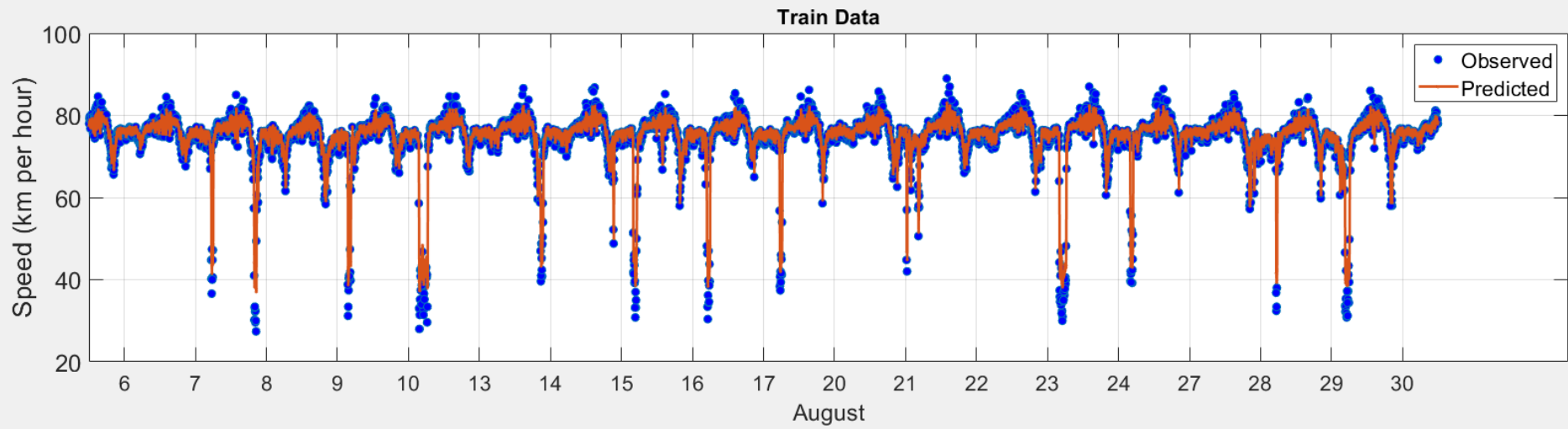
NPI-11



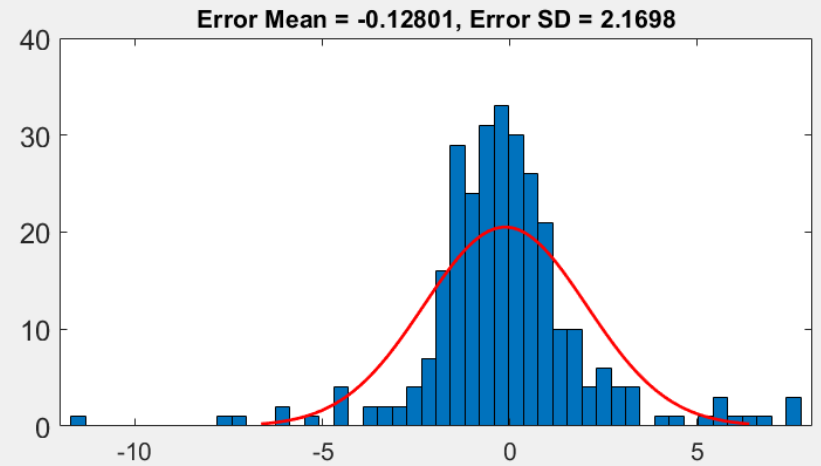
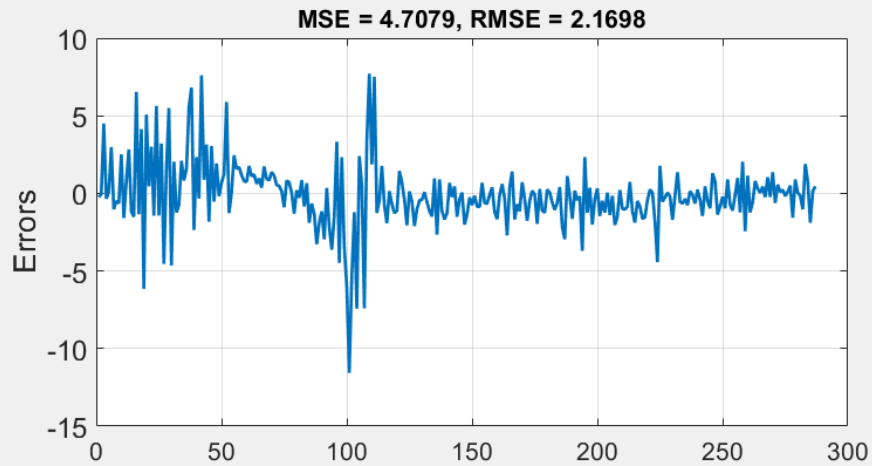
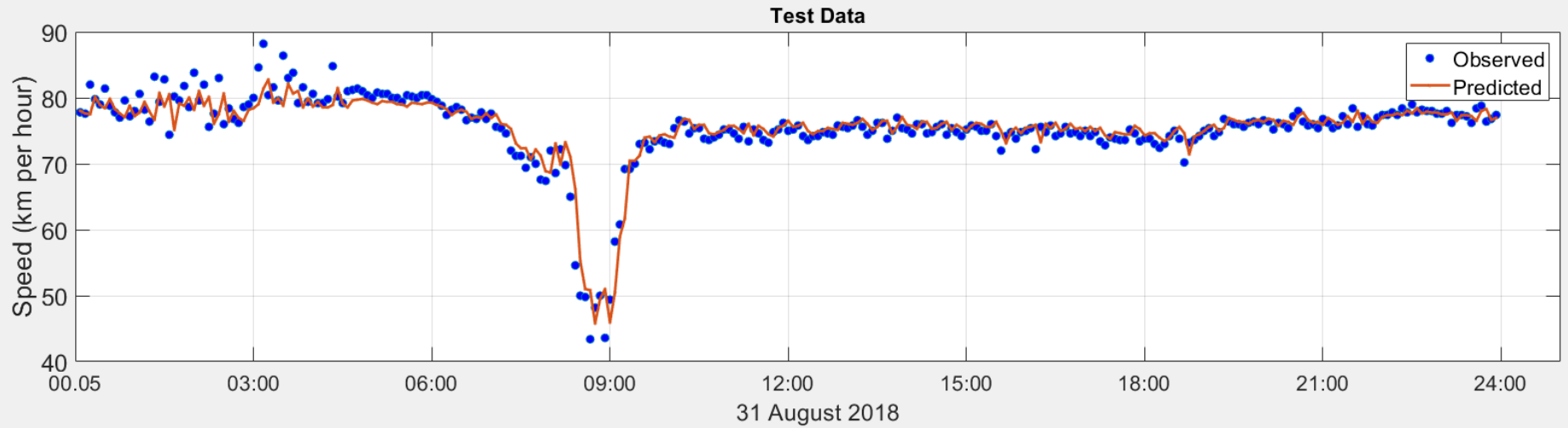
NPI-13



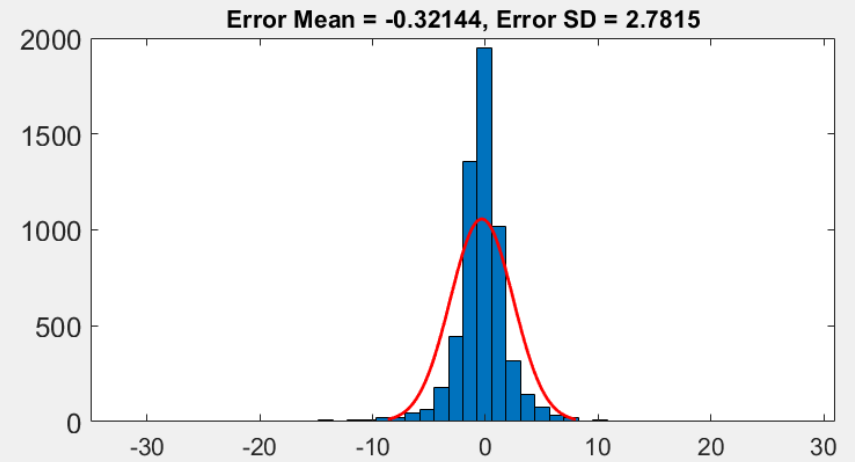
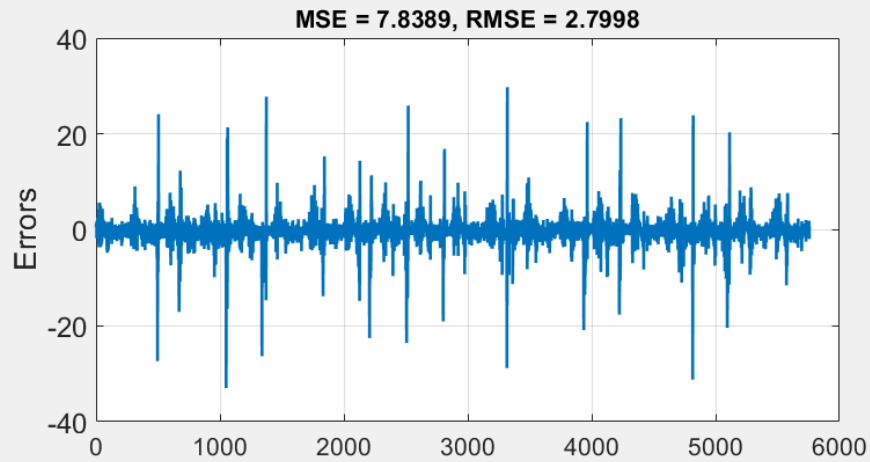
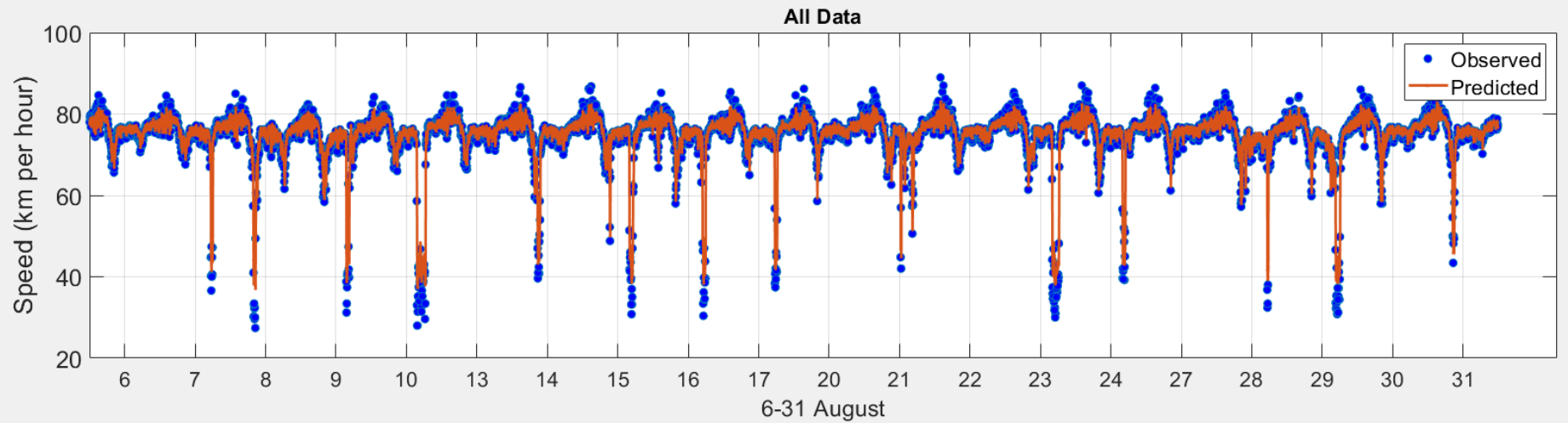
NPI-13



NPI-13



NPI-13



ACKNOWLEDGEMENTS

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Acknowledgement is made to the Australian Research Council, Main Roads WA, Roads and Maritime Services NSW, and the Australia's Sustainable Built Environment National Research Centre (SBEnc) for their support.

THANK YOU

For Your Attention

