

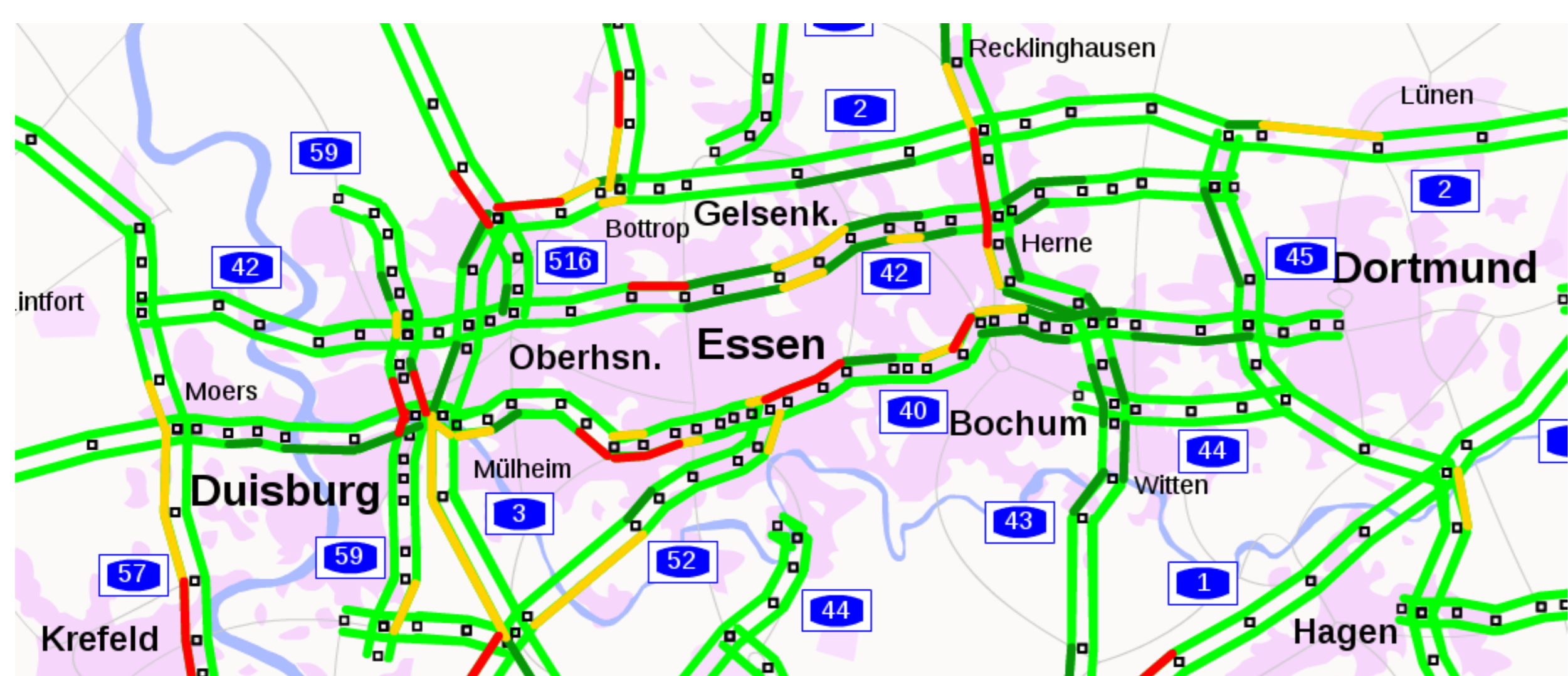
High-Flow Traffic States: Definition, Importance & Questions

- During periods of high-flow, the number of vehicles passing a road segment is very large.
- At such high-flows a road (network) is operating close to its optimum.
- Although the maximal possible value of the flow may depend on weather, road conditions etc., we define that **a flow of at least 51 vehicles per minute (> 3000 veh/h) is high.**

Under what conditions are high-flow states observed?

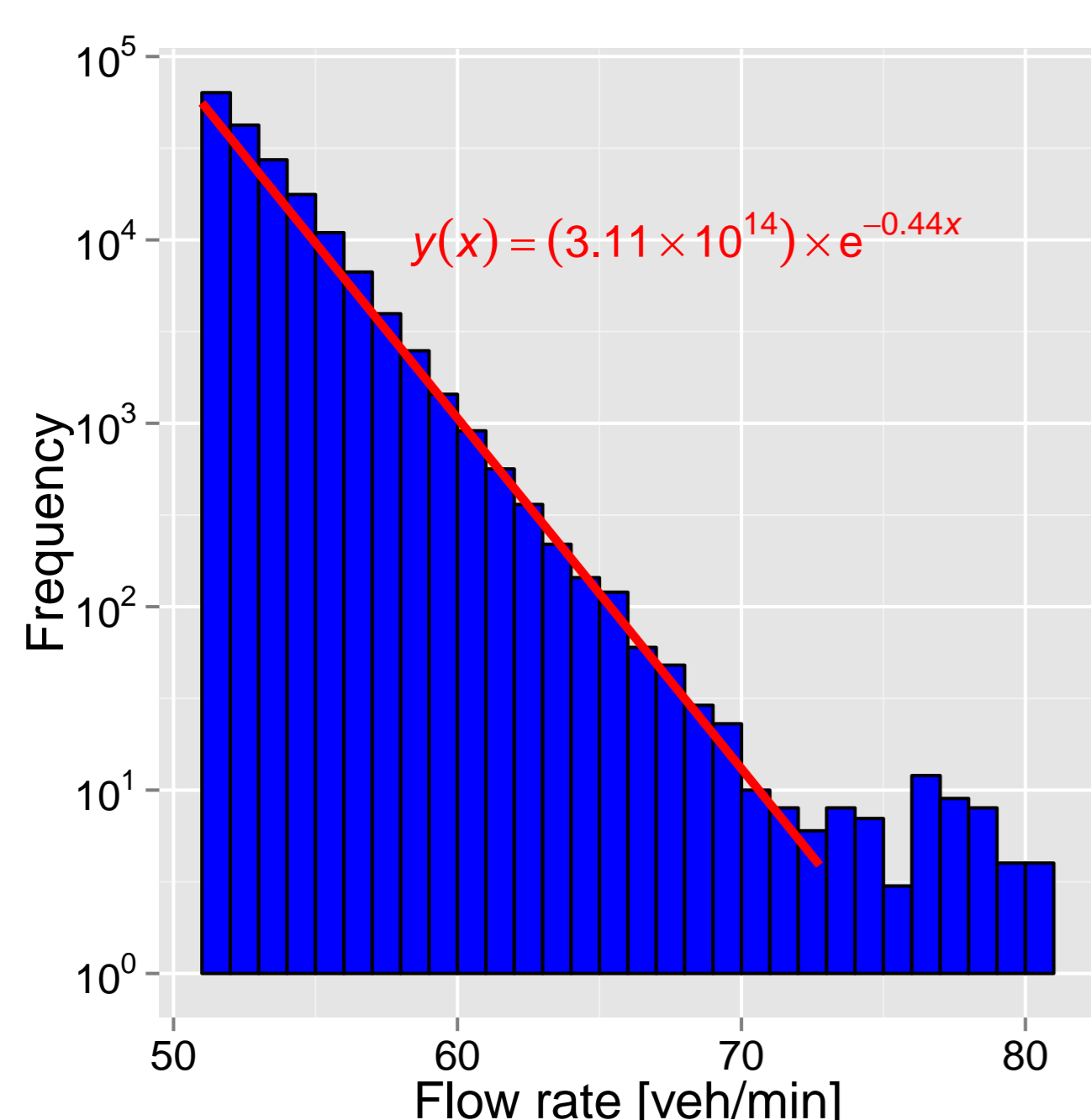
Analyzed Data

- We analyzed the data from loop detectors of North Rhine-Westphalia's Autobahn network (ca. 3000 detectors, 4600 km) in the time from December 19, 2011 till May 31, 2013.

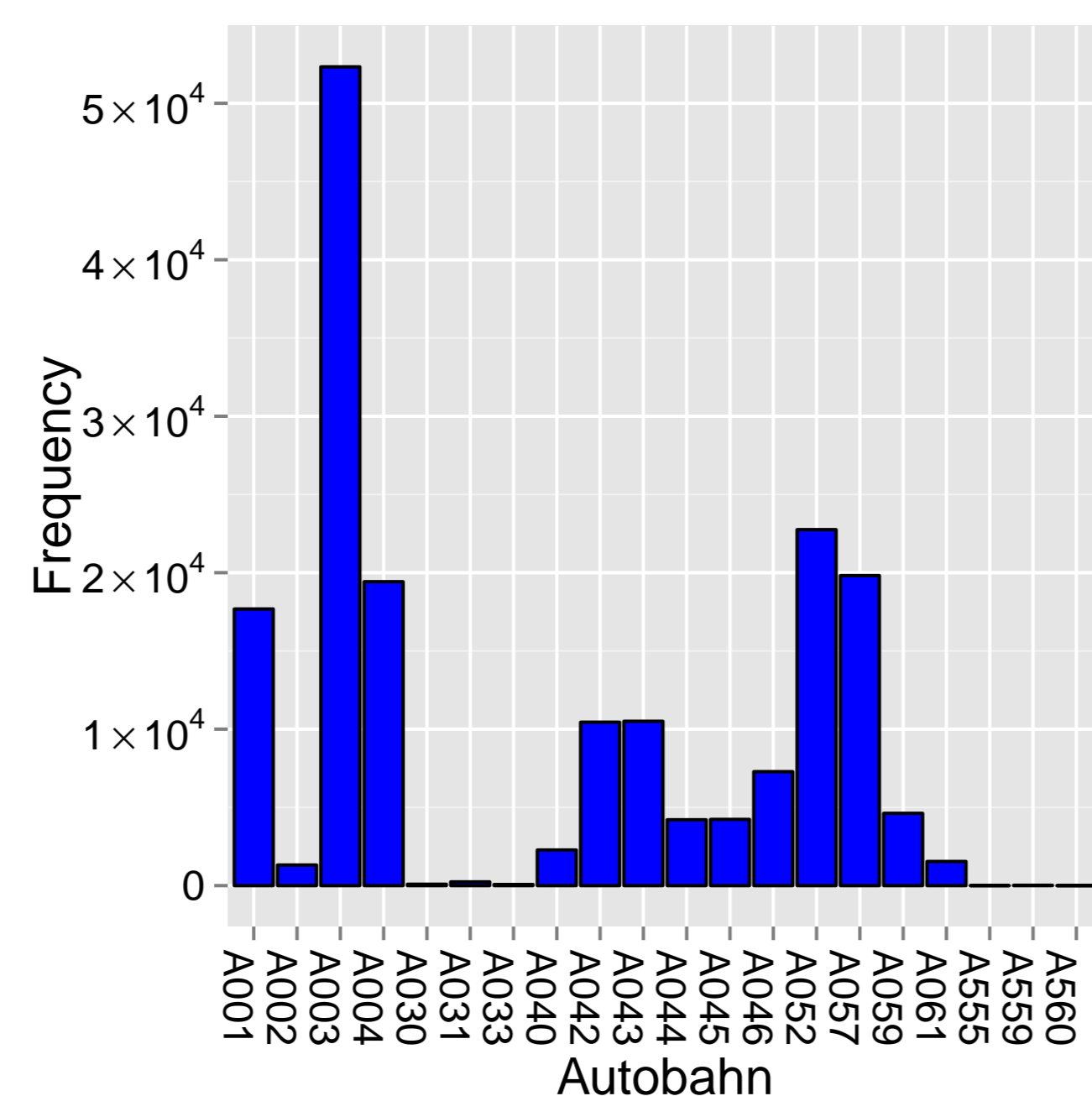


Section of the analyzed road network. (<http://www.autobahn.nrw.de>)

- Each detector measures the number of vehicles (distinguishing passenger cars and trucks) and their average velocity per (1 min)-interval.
- We found more than 178 000 measured data sets that classified as a "high-flow state".

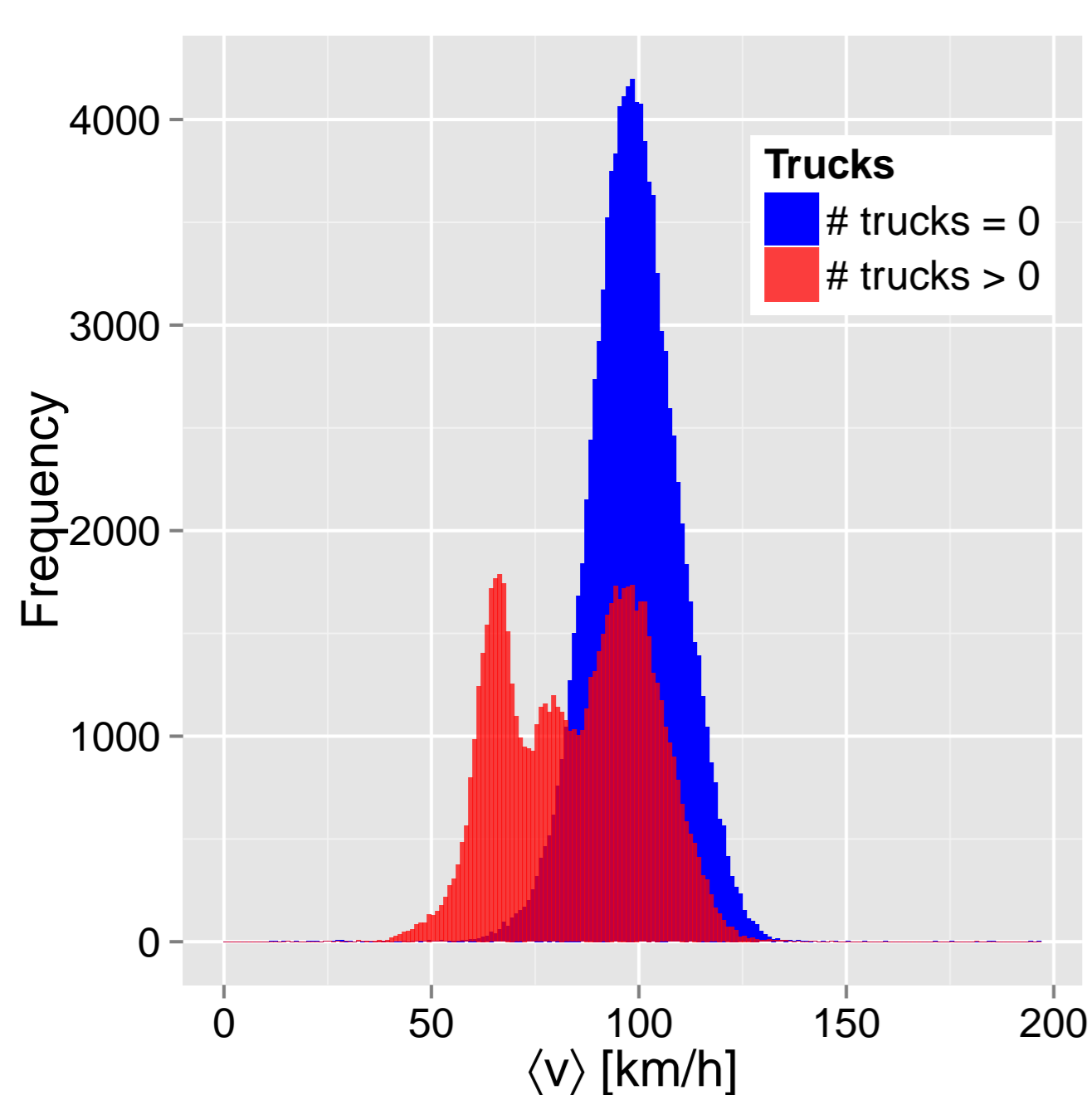


Frequency of high-flow states (left) and the number of the Autobahn where these states were observed.

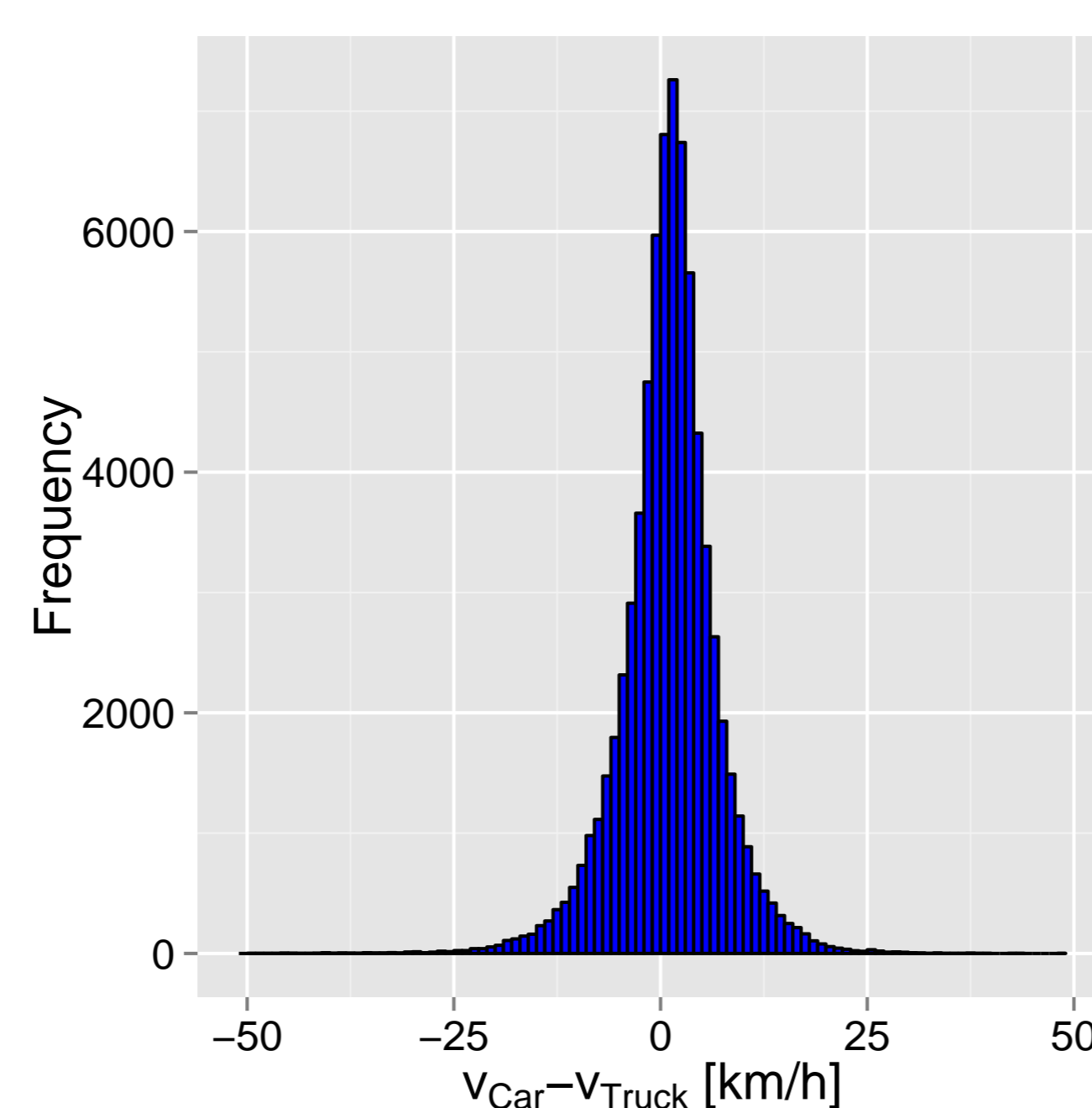


Average Velocities of High-Flow Traffic States

- The following histograms show the frequency with which high-flow states occur depending on the vehicles' average velocity.
- We distinguished two cases: **no trucks were measured** and **at least one truck was measured** during a (1 min)-interval.

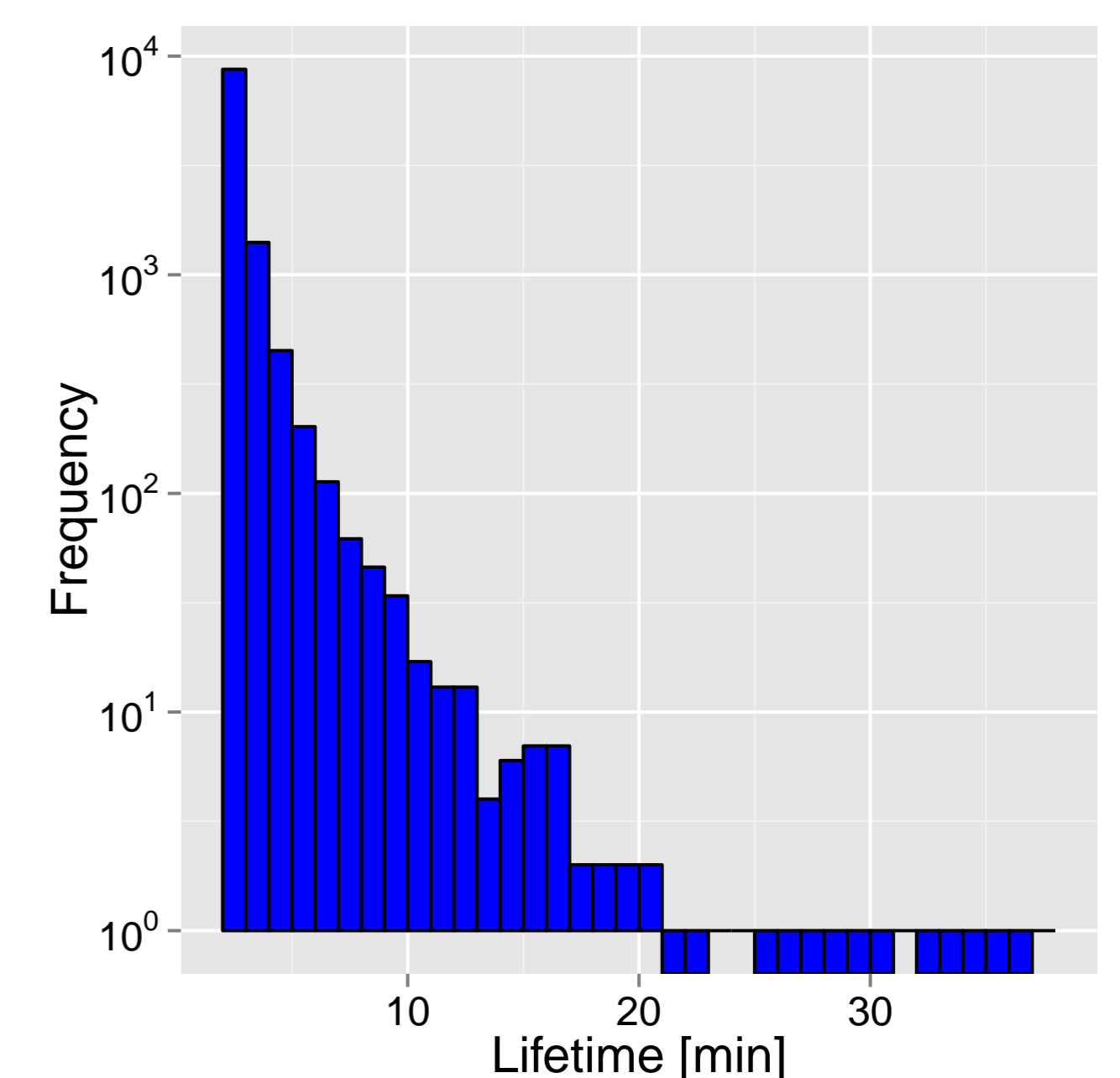
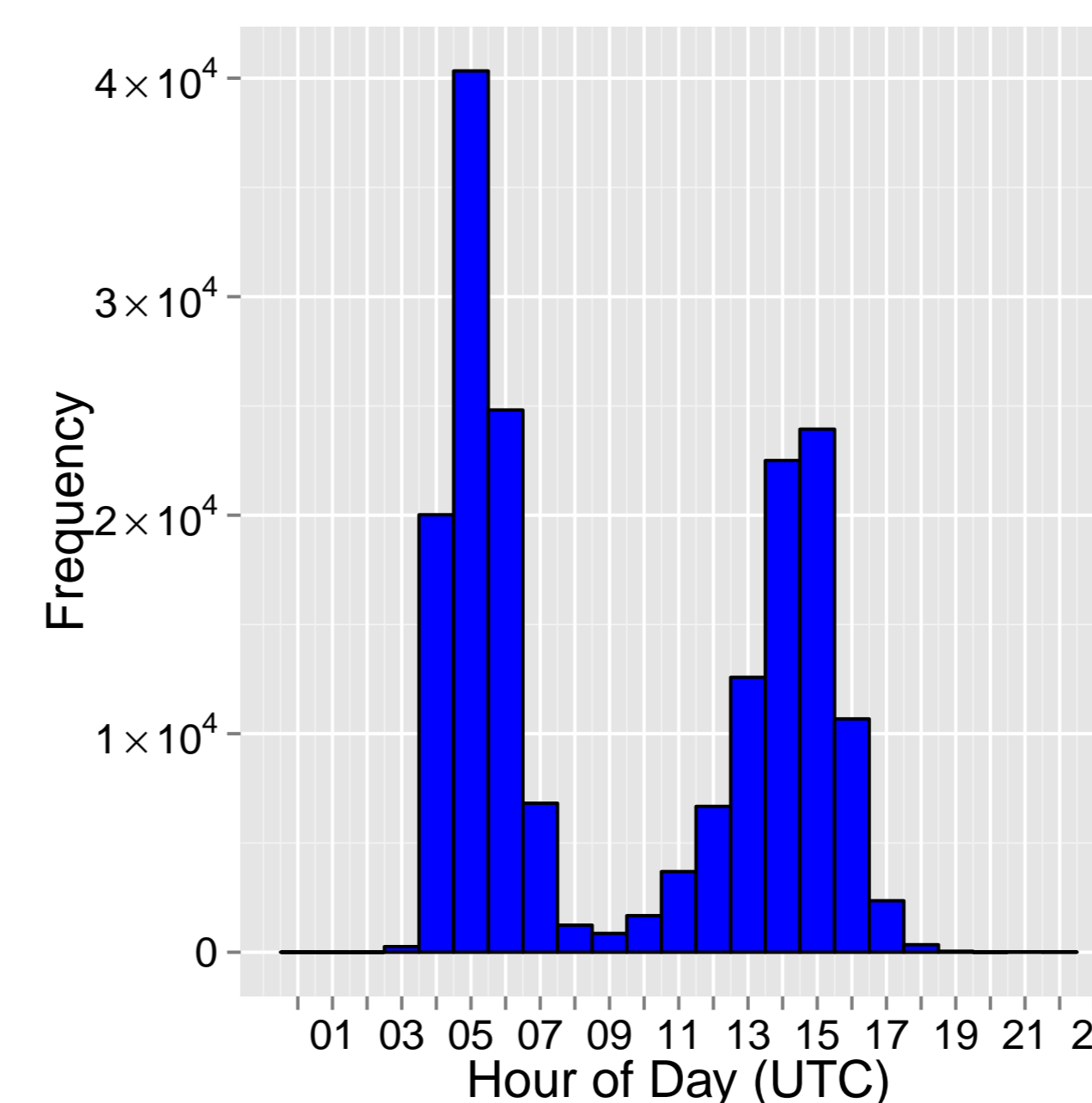
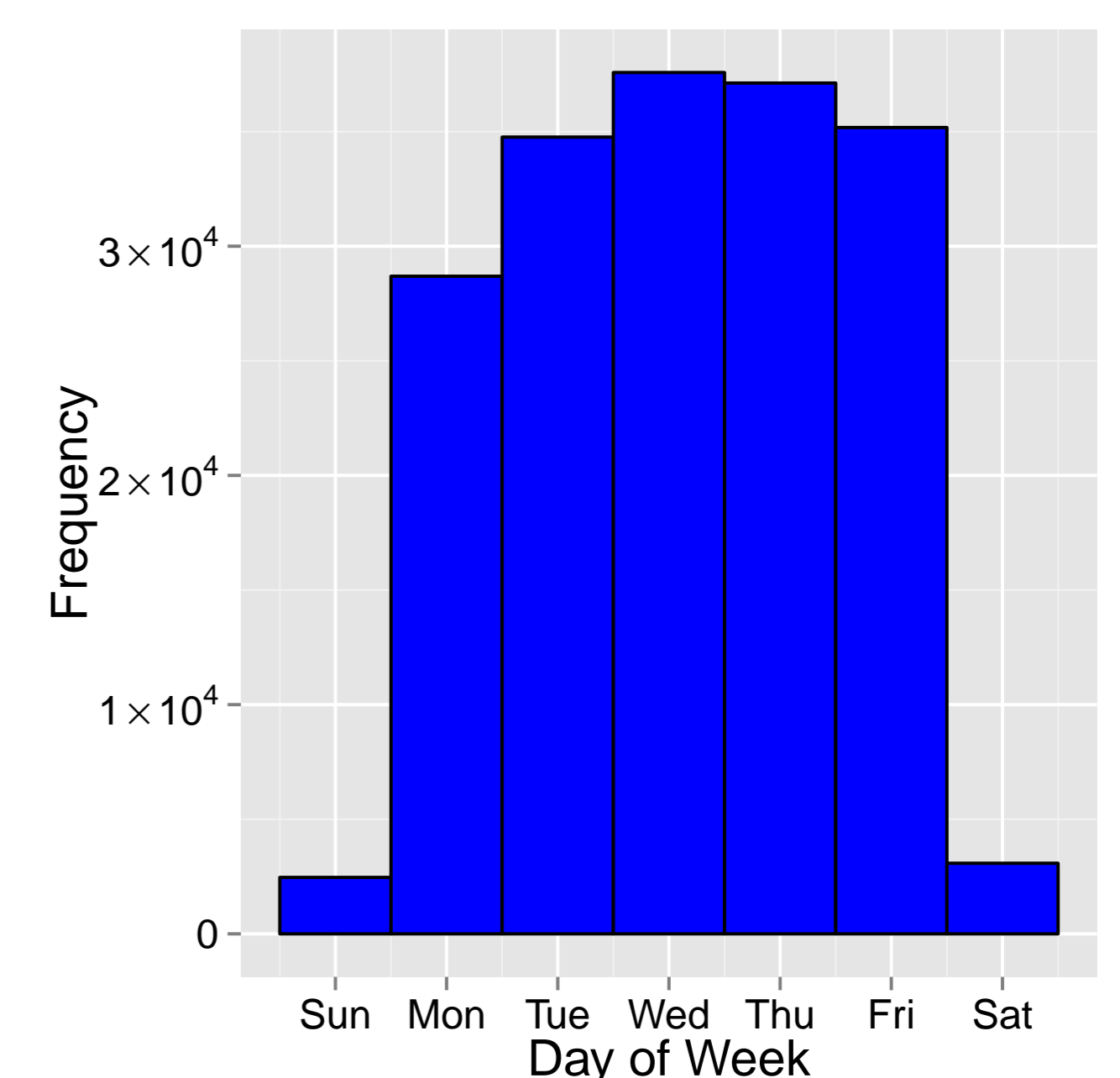
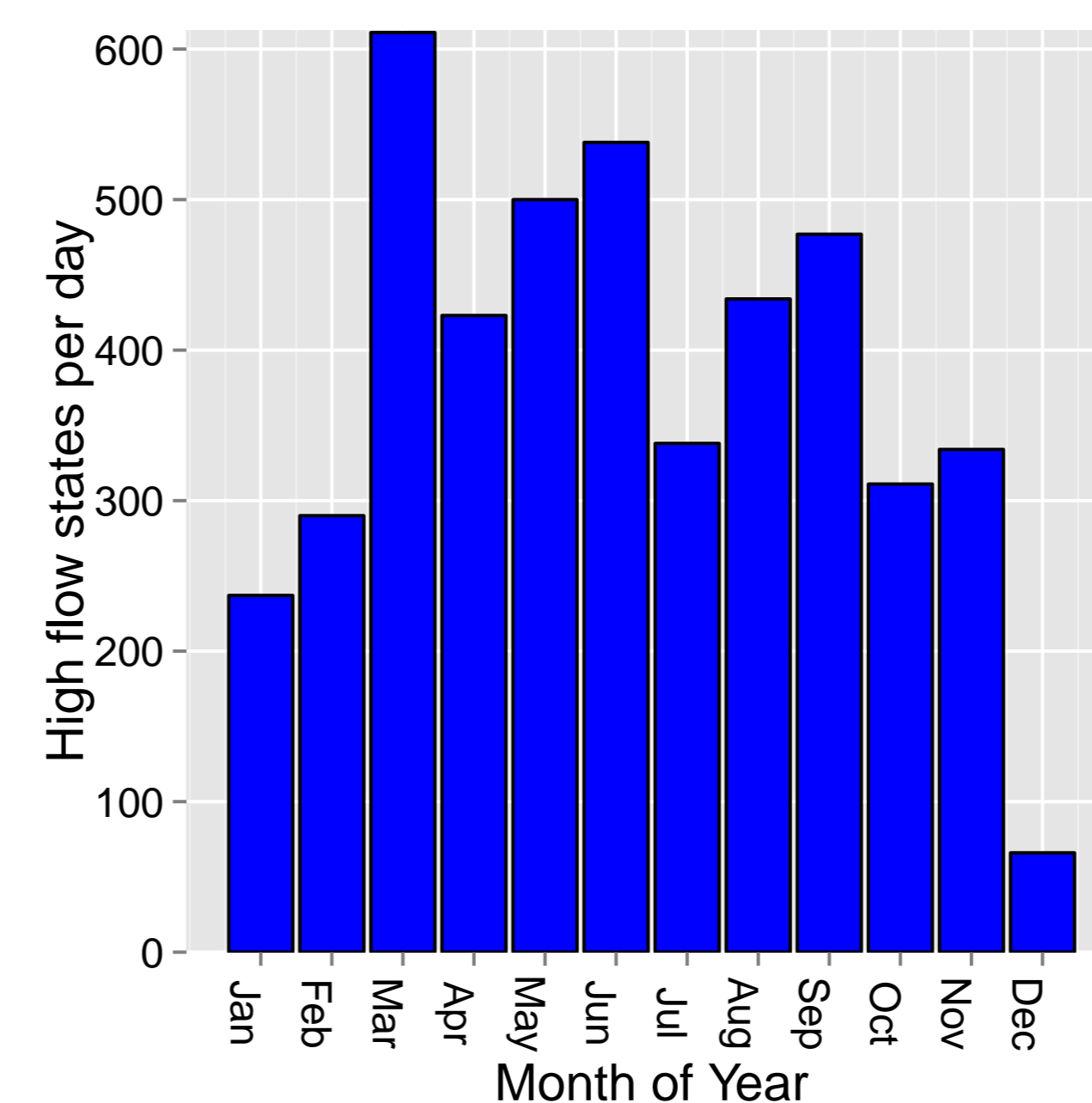


Average velocities $\langle v \rangle$ of high-flow states and the difference in the average velocities of trucks (v_{Truck}) and cars (v_{Car}).



Temporal Occurrences & Lifetimes of High-Flow Traffic States

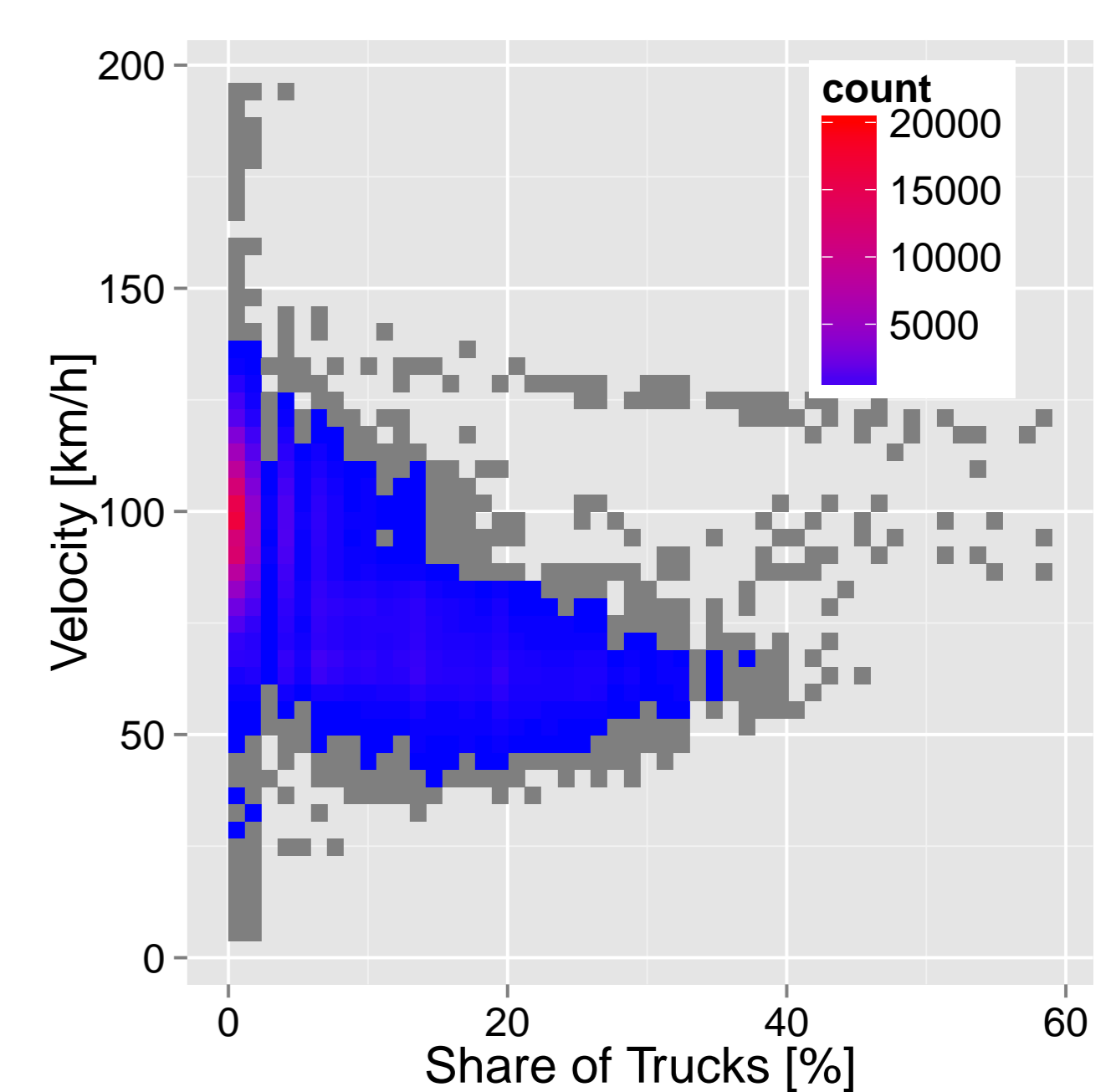
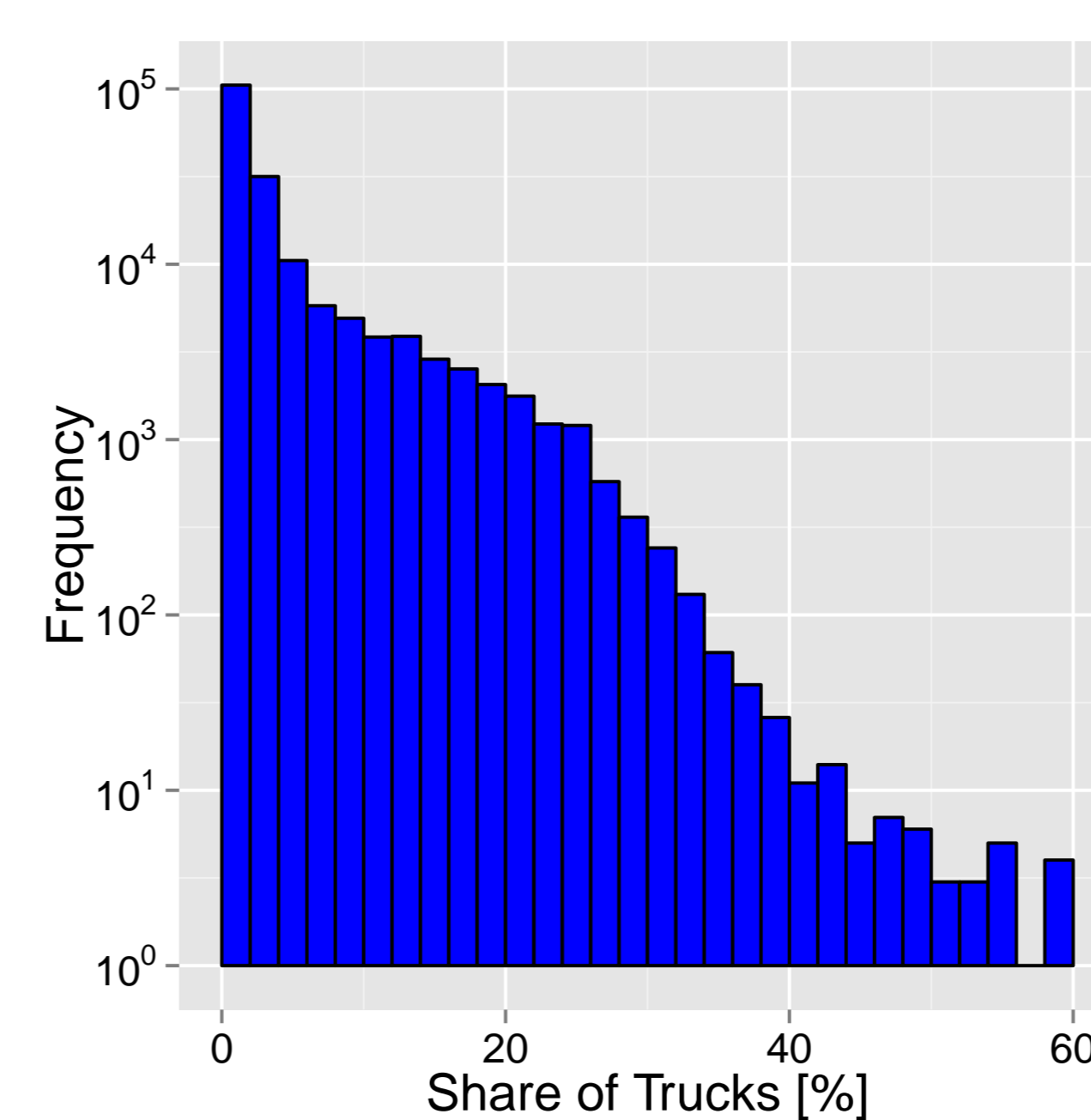
The following histograms show when high-flow states are most likely to occur (i.e., month, weekday, and hour of day) and their lifetime (i.e., the length of intervals during which successive measurements could be classified as "high-flow state").



Temporal distribution of high-flow states depending on the month (top left), the weekday (top right), and the hour (bottom left). The frequency of successive measurements classifying as high-flow is given in the bottom right figure.

Share of Trucks

The following histograms illustrate the influence of trucks on the occurrence and the velocity of high-flow states.



An increased share of trucks lowers the likelihood of high-flow states (left) as well as the average velocity of such states (right).

Conclusions

High-flow states make high demands on the traffic conditions.

- As a large number of vehicles is required for high-flow states, such states are usually observed during the morning and evening peak hour.
- For the same reasons the occurrence of such states is practically limited to the weekdays between Monday and Friday.
- The requirement of good road conditions is reflected by the fact that high-flow states are more likely to be observed in the summer.
- The share of trucks must be close to zero for high flows to occur.
- The lower the share of trucks, the higher is the average velocity.
- The lifetime of high-flow states is typically limited to intervals of a few minutes length.

Acknowledgments

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