Black carbon sampling at Gould Hall: Data collection and analysis

Sarah Titcomb & Peter Schmiedeskamp

2015-05-06 || URBDP 598I – Transportation and the Environment

Research Questions

Spatial Do levels of black carbon vary in different locations around Gould Hall? (We hypothesize that levels will be higher closer to high-traffic streets such as 15th.)

Temporal Do levels of black carbon vary over the course of the day? (We hypothesize that levels will correlate to traffic volumes.)

A Tale of Two Sampling Strategies

Spatial

- 10 minute sample frames
- locations: University Way, 40th St, 15th Ave, Green Wall
- 30 second sample rate, 100ml flow
- repeated over 4 days

Temporal

- Continuous sample frame, approx 1 week
- 3rd floor window overlooking NE 40th street, west side
- 300 second sample rate, 100ml flow

Spatial variability in counts

	Point	min	mean	median	max
1	15th Ave	154	1760	1450	8737
2	40th St	0	534	353	2190
3	Green wall	0	530	457	1697
4	University Way	0	1695	0	15141

Table: Spot sample summary statistics by location

Spatial variability in counts visualized

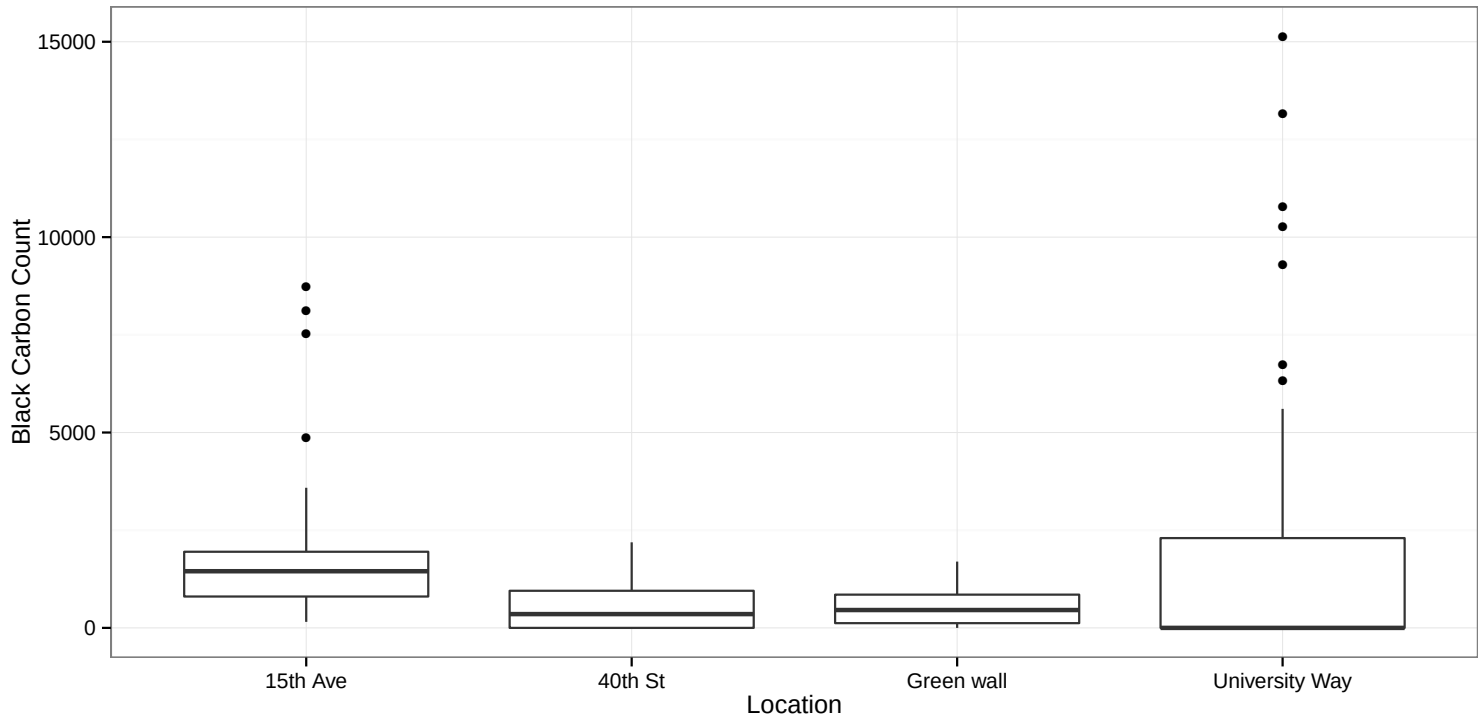

Figure: Black carbon counts by location

Temporal variability in counts

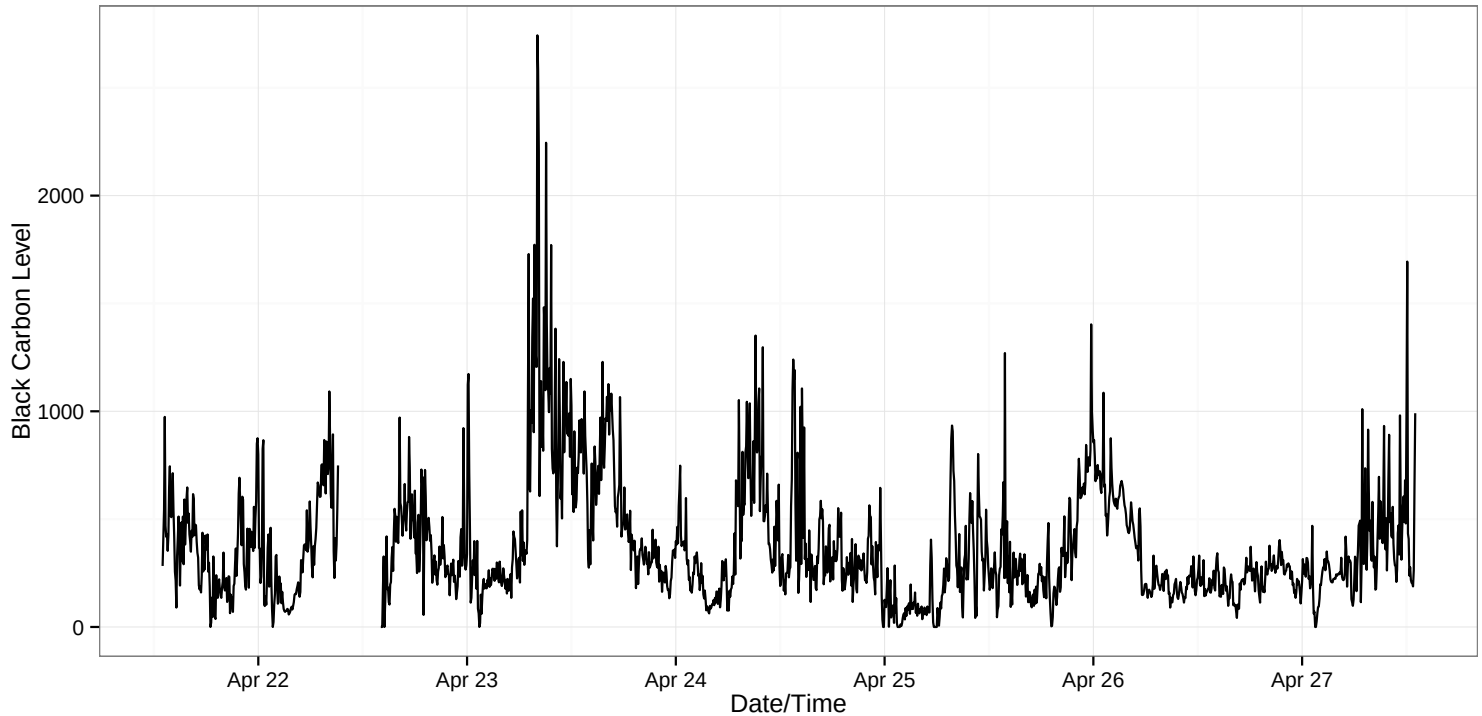

Figure: Timeseries plot of black carbon levels indicating some periodicity

Temporal variability continued...

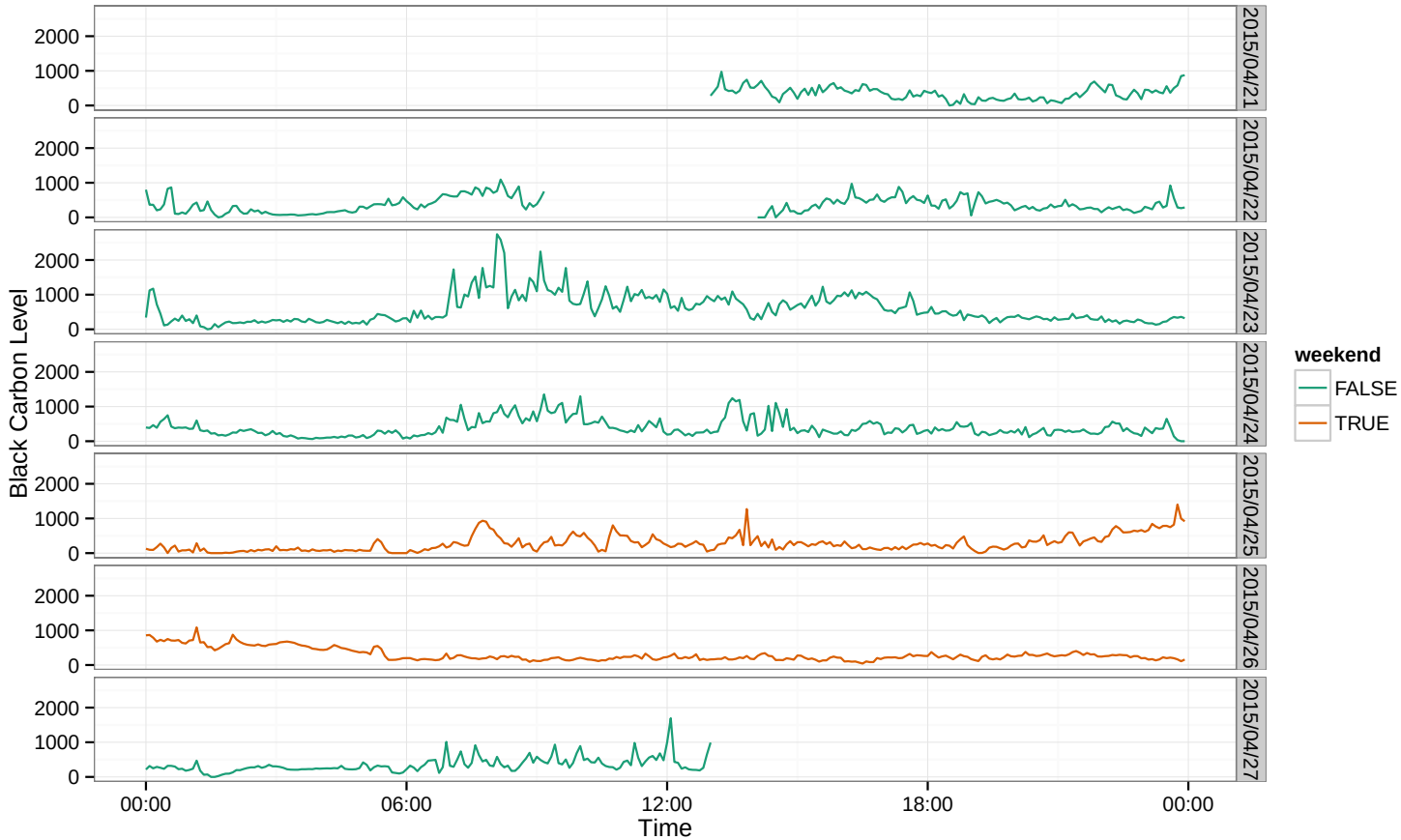

Figure: Timeseries plot of black carbon counts faceted by day

Temporal variability modeled

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	8.185	0.388	21.076	0.000
PeriodEvening	-0.098	0.048	-2.023	0.043
PeriodMid Day	0.744	0.055	13.577	0.000
PeriodPM Peak	0.326	0.054	6.005	0.000
PeriodAM Peak	0.746	0.059	12.583	0.000
weekendTRUE	-0.397	0.049	-8.034	0.000
RHum	-0.026	0.002	-14.237	0.000
Temp	-0.016	0.006	-2.751	0.006
Speed	0.006	0.006	0.957	0.339
nob	-0.000	0.000	-0.564	0.573

Table: Negative binomial model estimation

Colophon

Code and data available from:
`https://github.com/pschmied/ae51summary`

Model Fit - Actual vs. Predicted

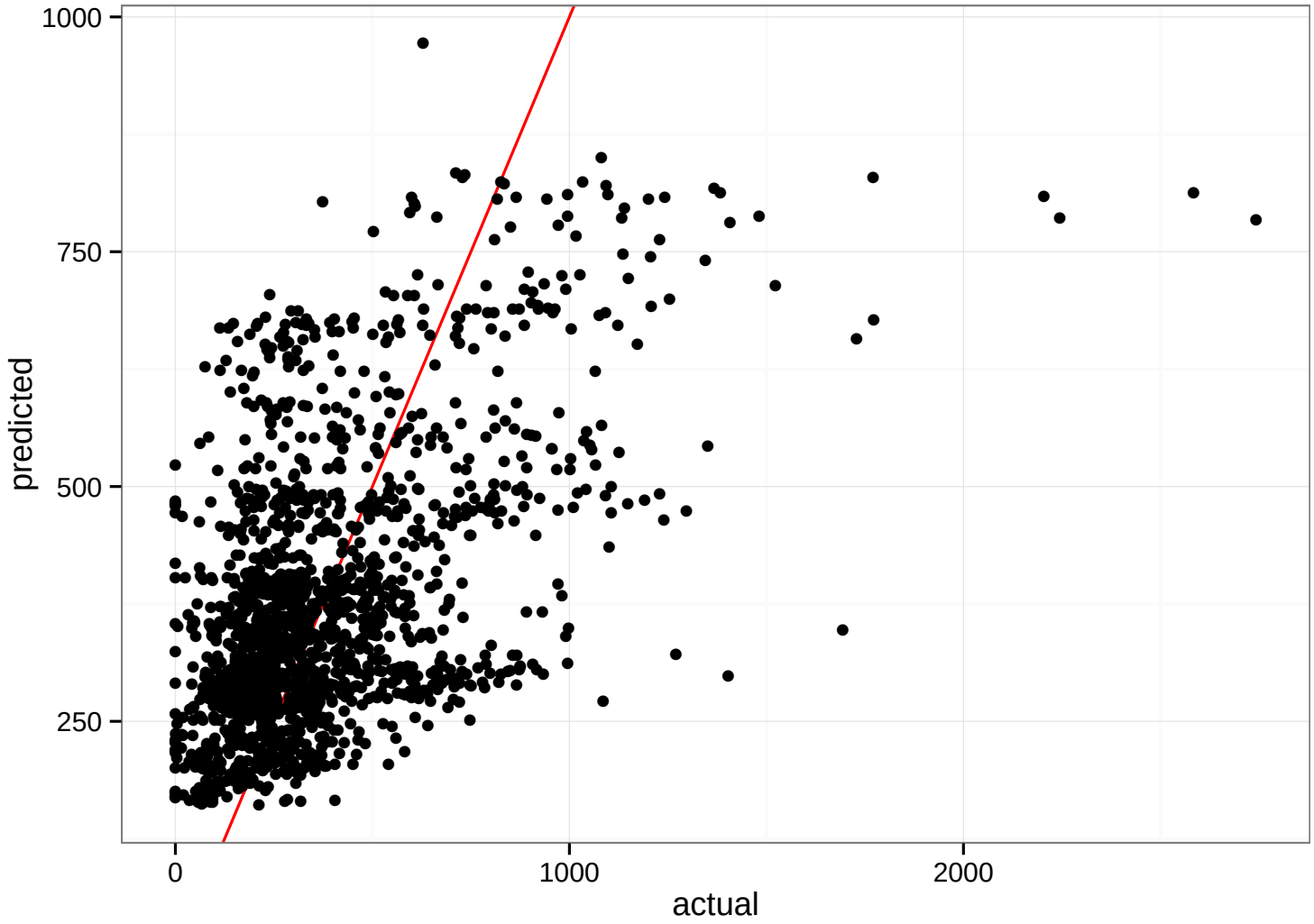

Figure: Actual values versus predicted values

Continuous sample's distribution

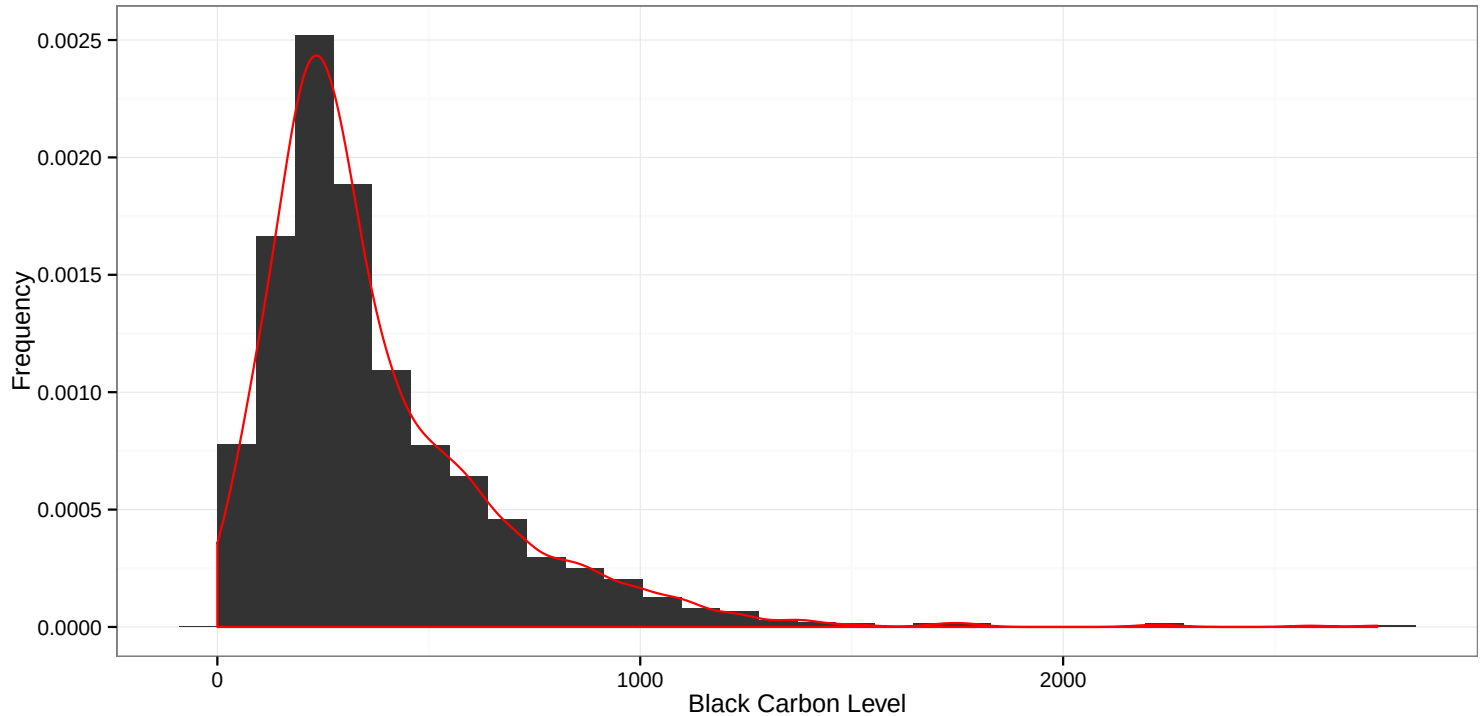

Figure: Distribution of black carbon counts in continuous sample appears to be approximately Poisson

Spot sample's distribution

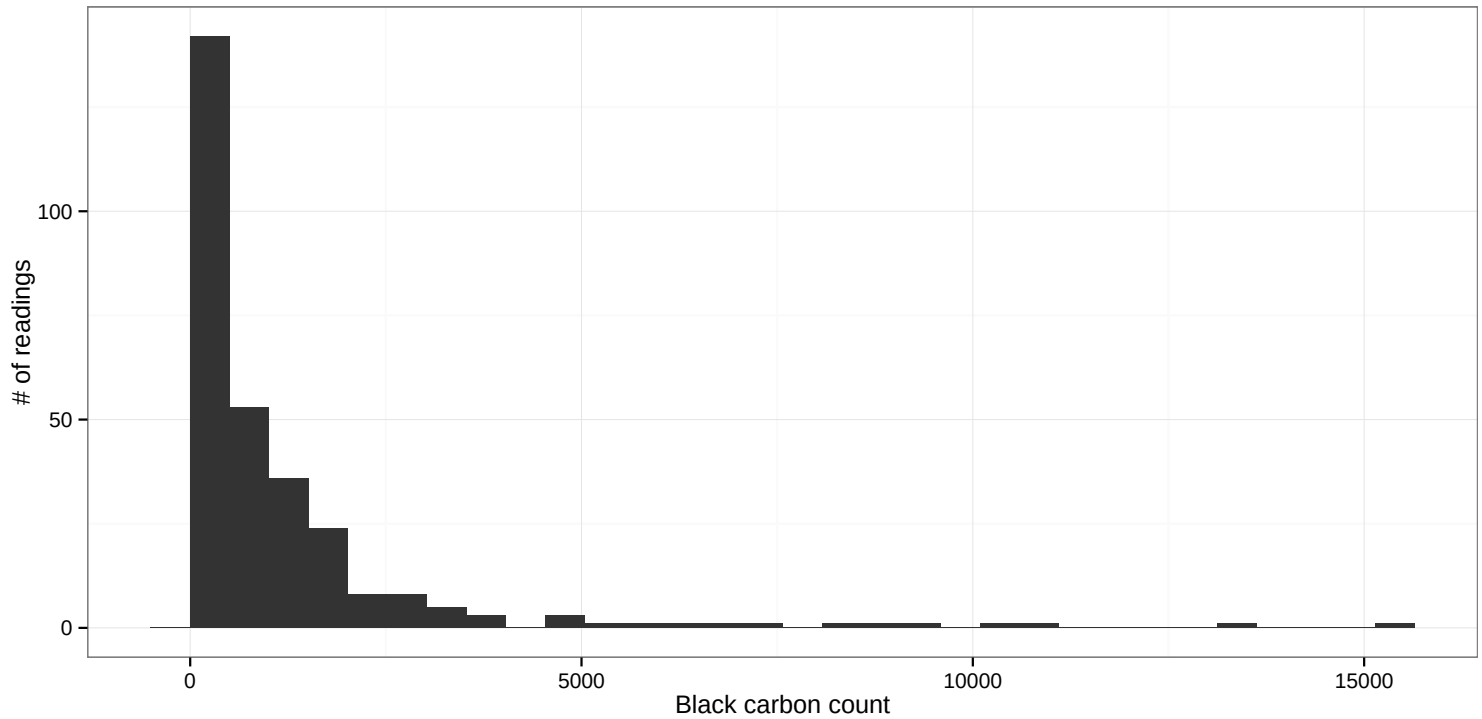

Figure: Distribution of black carbon counts in spot sample