

Urban AirQ

**Calibration, validation,
and data analysis of NO₂**

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Dave de Jonge (GGD),

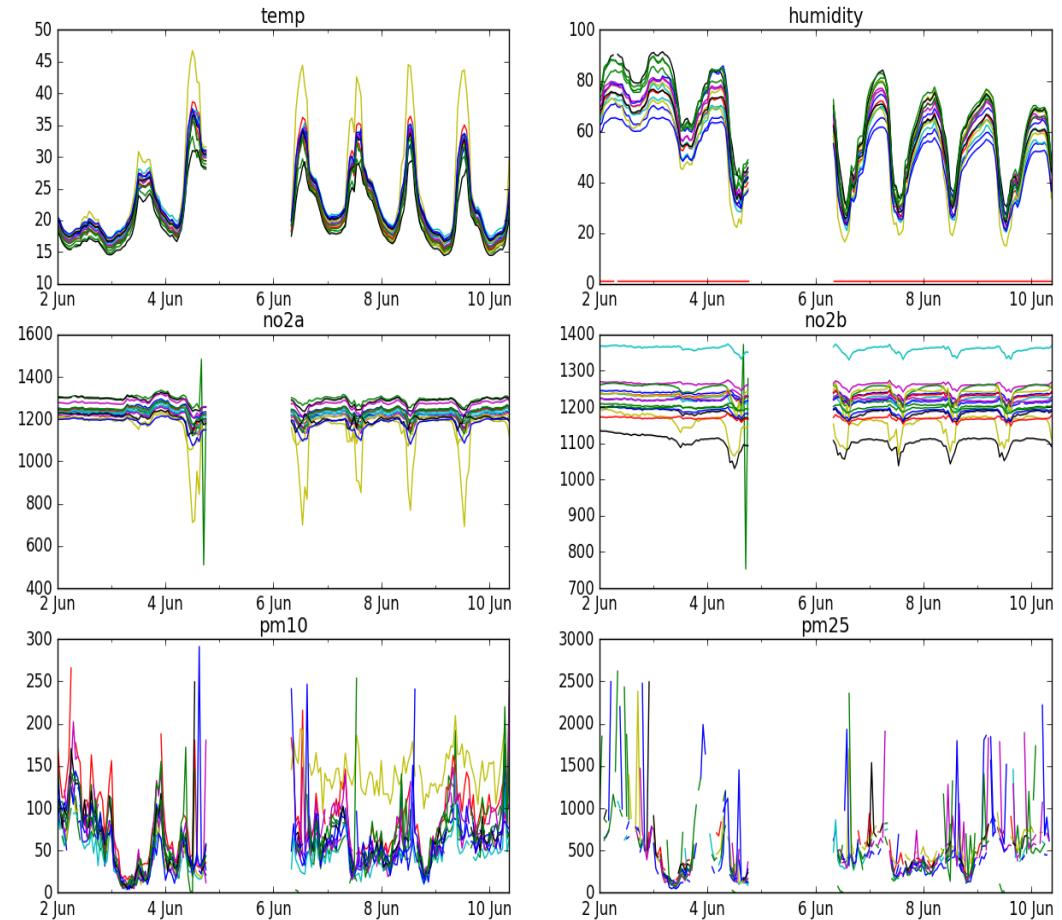
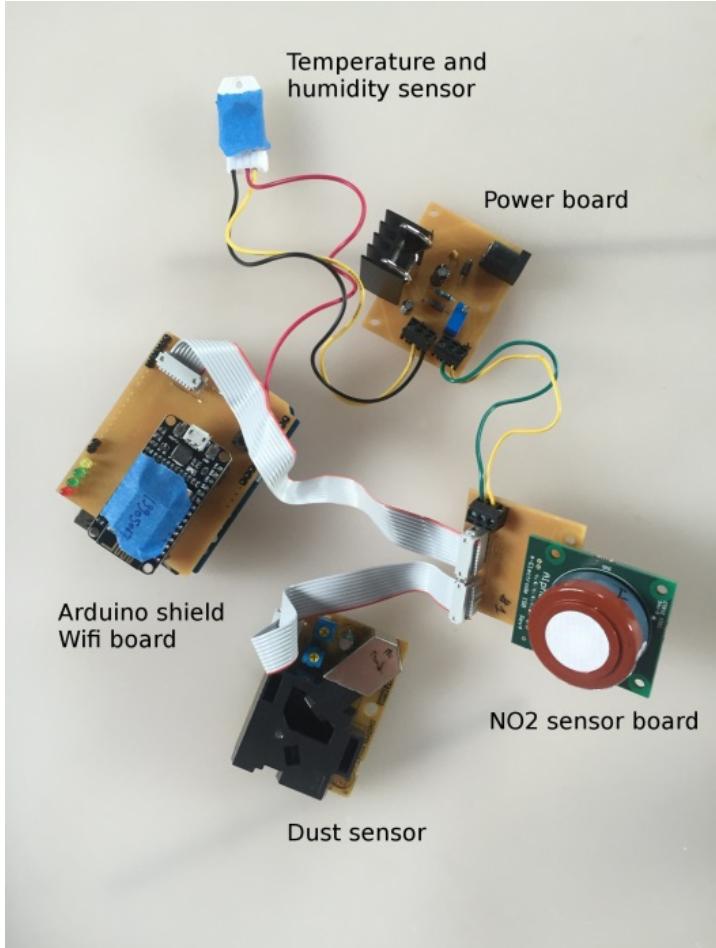
Danielle van Dinther, Ernie Weijers (ECN)

Deelnemersbijeenkomst, De Waag, 19 Oktober 2016

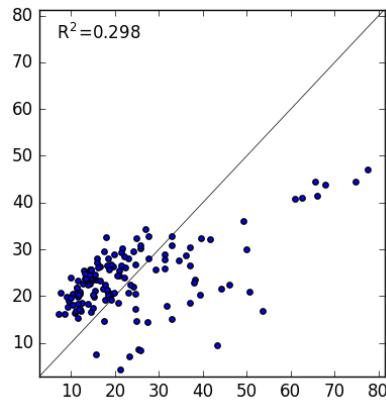
Calibration



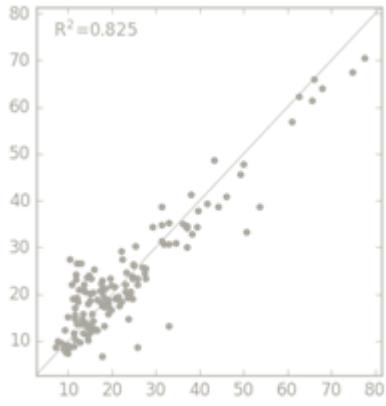
Making sense of raw measurements



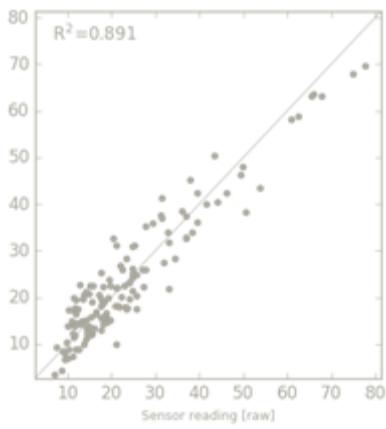
NO₂ sensor



NO₂ sensor + T + RH

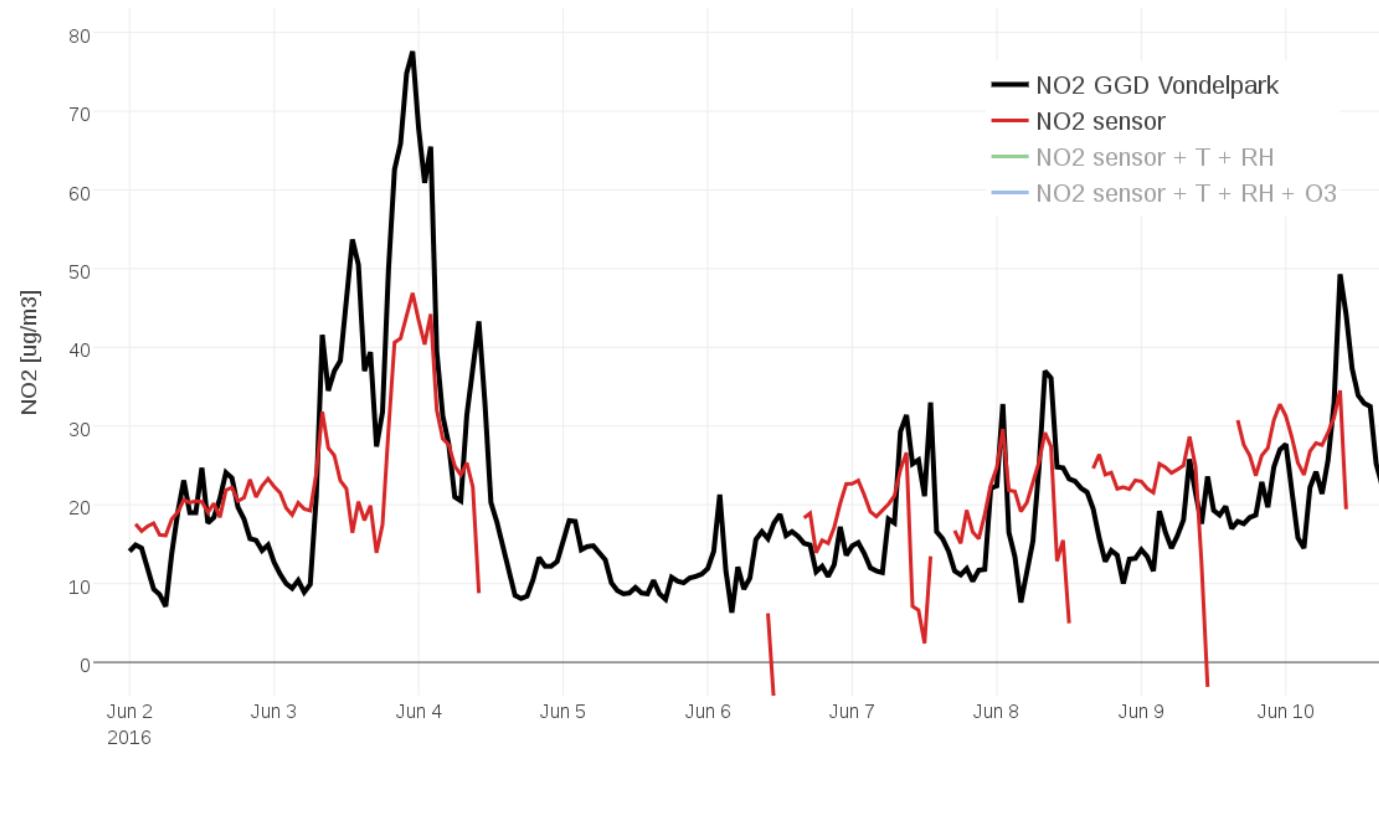


NO₂ sensor + T + RH + O₃

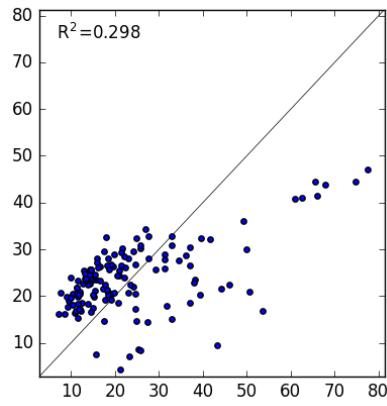


Performance typical sensor

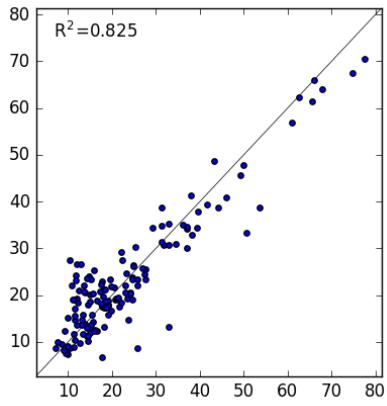
NO₂ calibration models for sensor 1184838



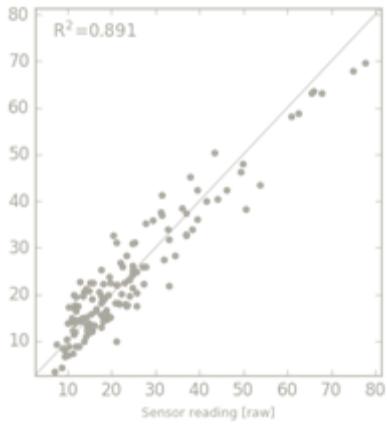
NO₂ sensor



NO₂ sensor + T + RH

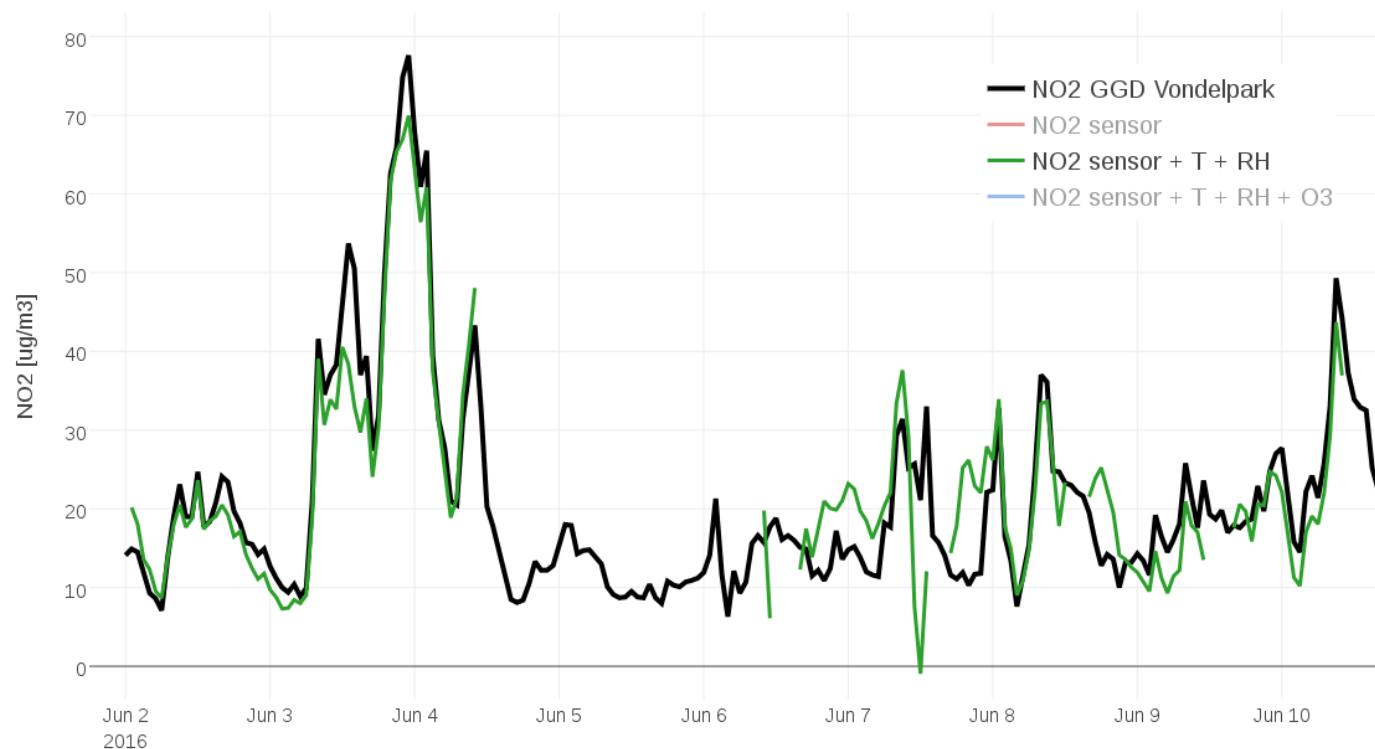


NO₂ sensor + T + RH + O₃

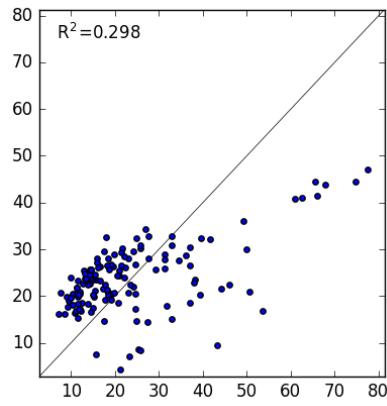


Performance typical sensor

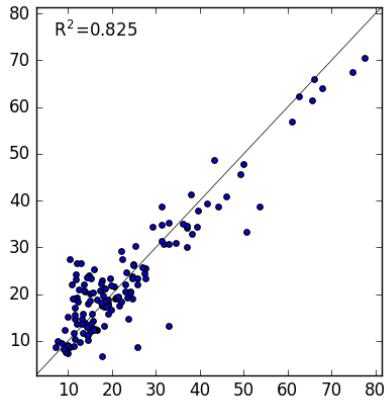
NO₂ calibration models for sensor 1184838



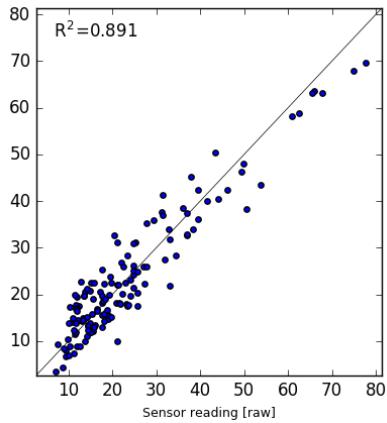
NO₂ sensor



NO₂ sensor + T + RH

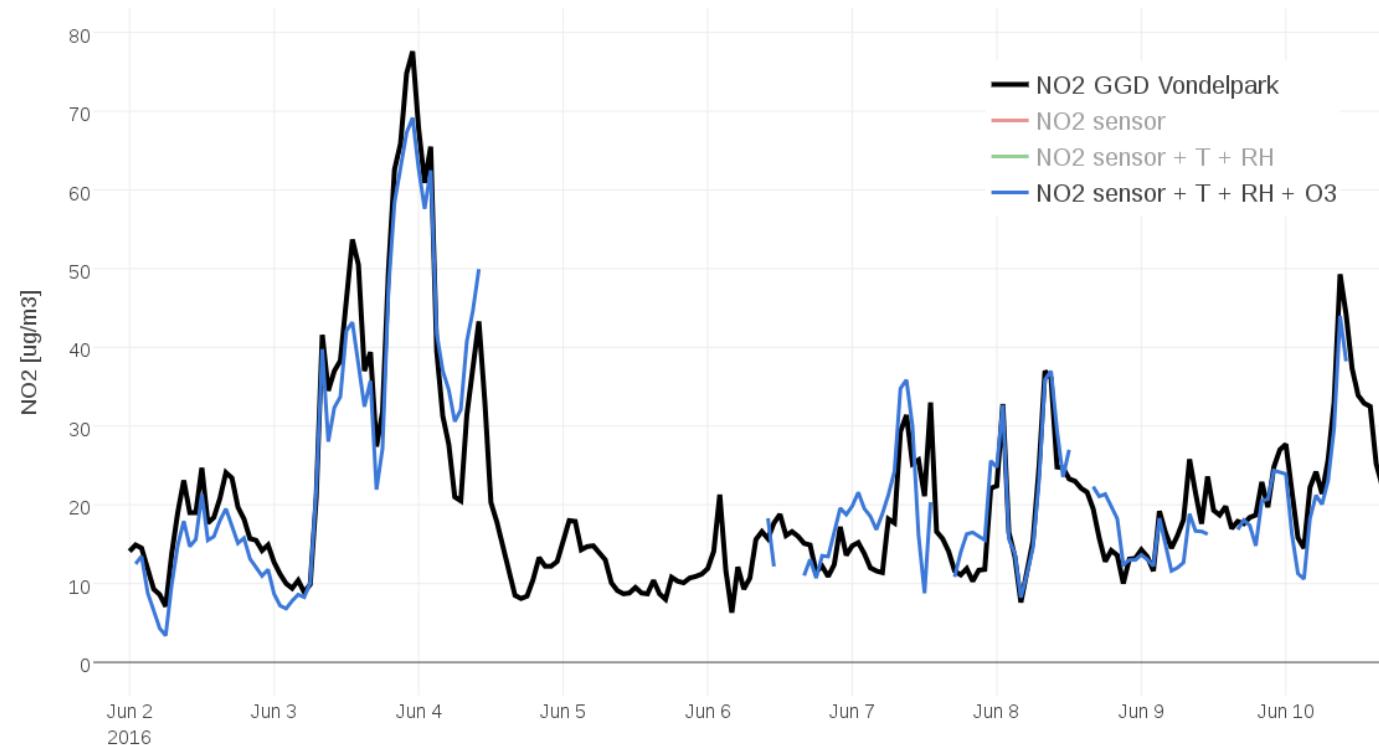


NO₂ sensor + T + RH + O₃



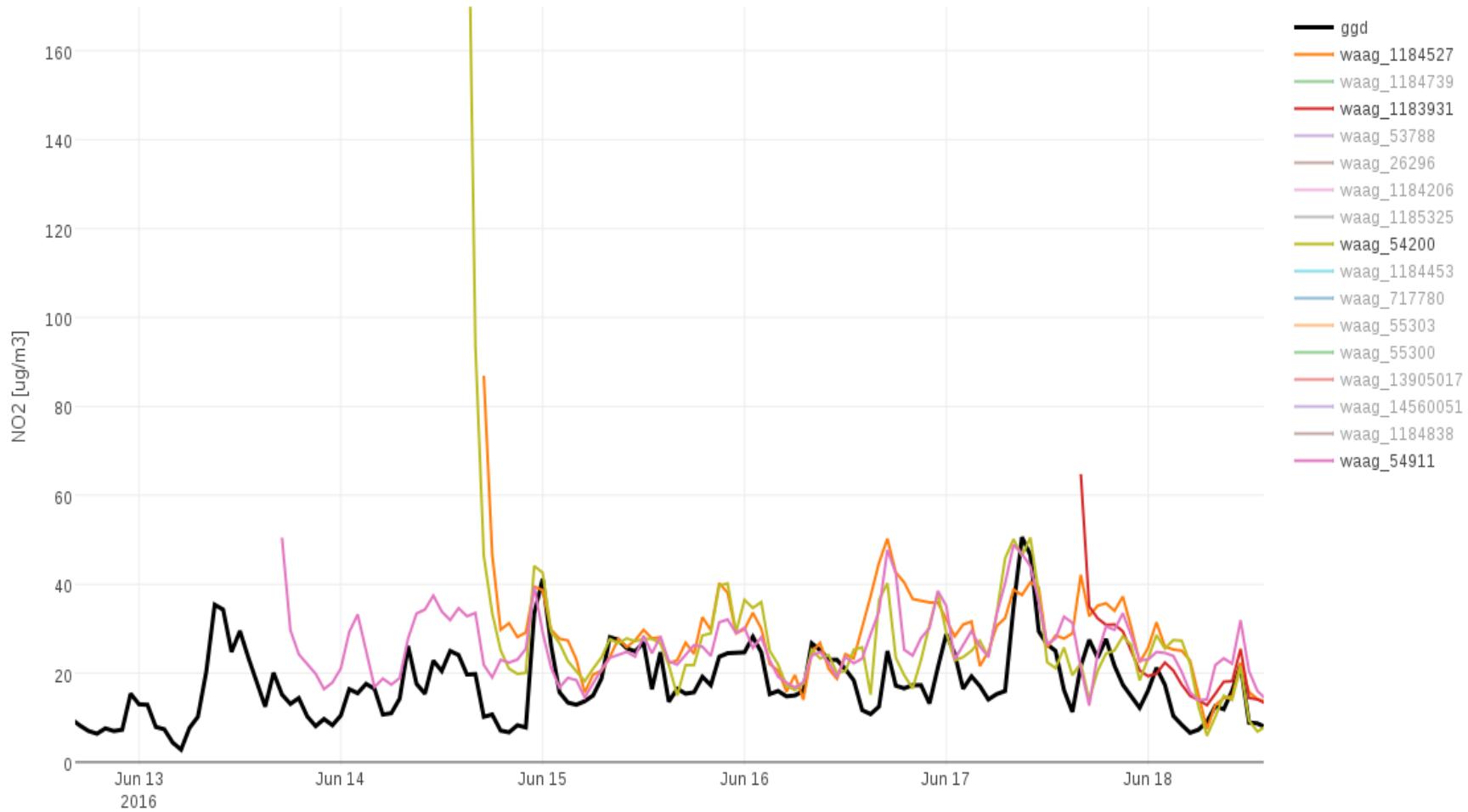
Performance typical sensor

NO₂ calibration models for sensor 1184838



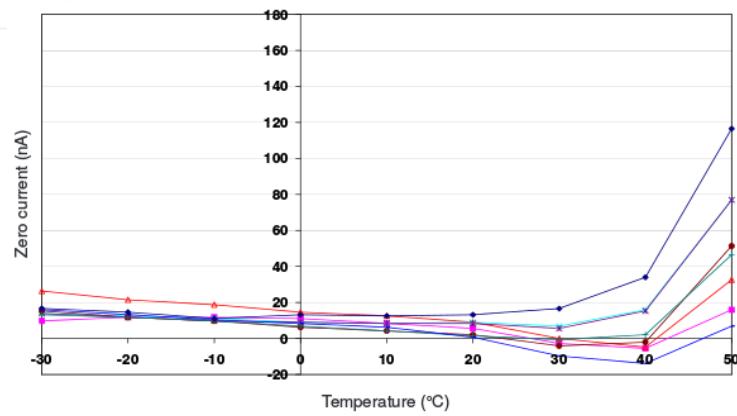
Startup time

Urban AirQ NO2 (hourly, calibrated)



Dependency on temperature

Urban AirQ NO₂ (hourly, calibrated)

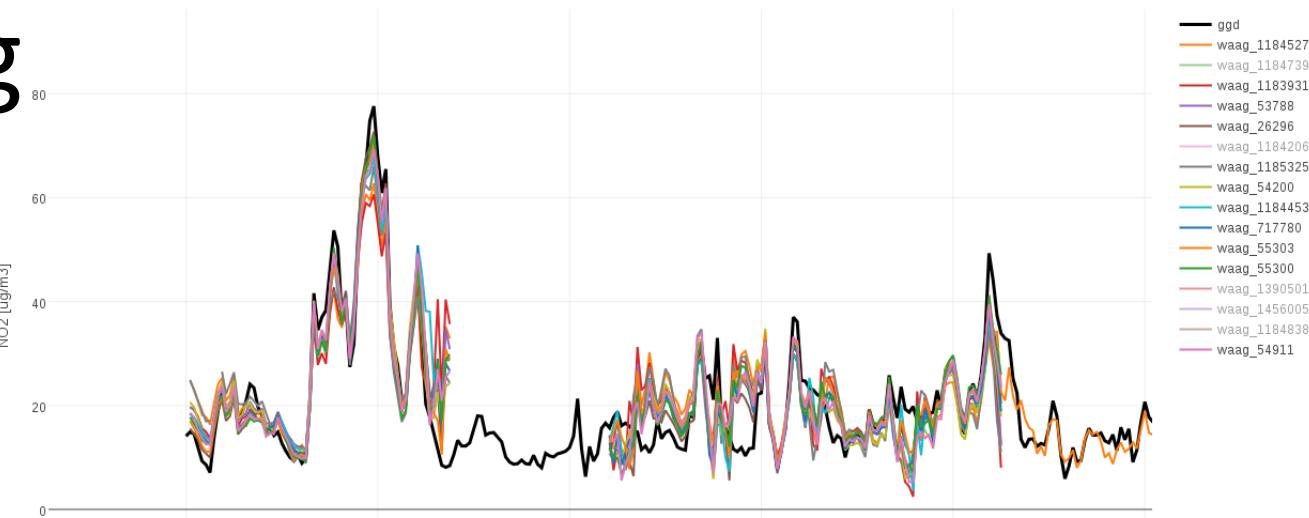


(Taken from Alphasense Application Note)

Drift during campaign

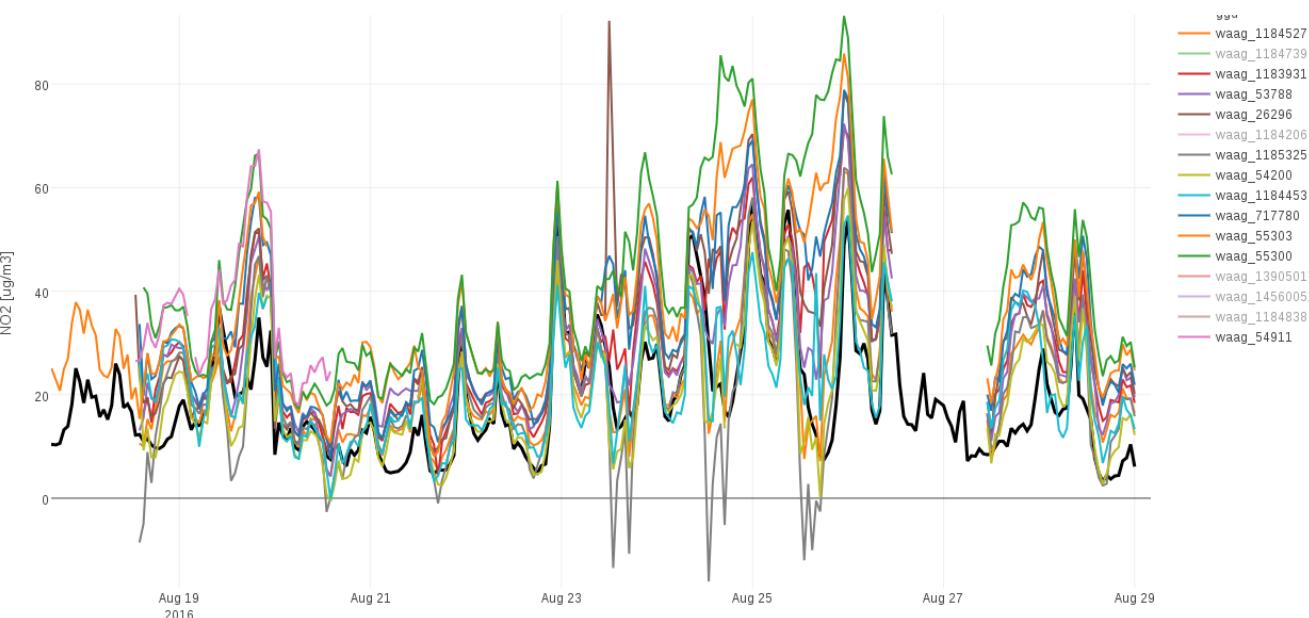
1st calibration period

Used to derive regression coefficients



Two months later...

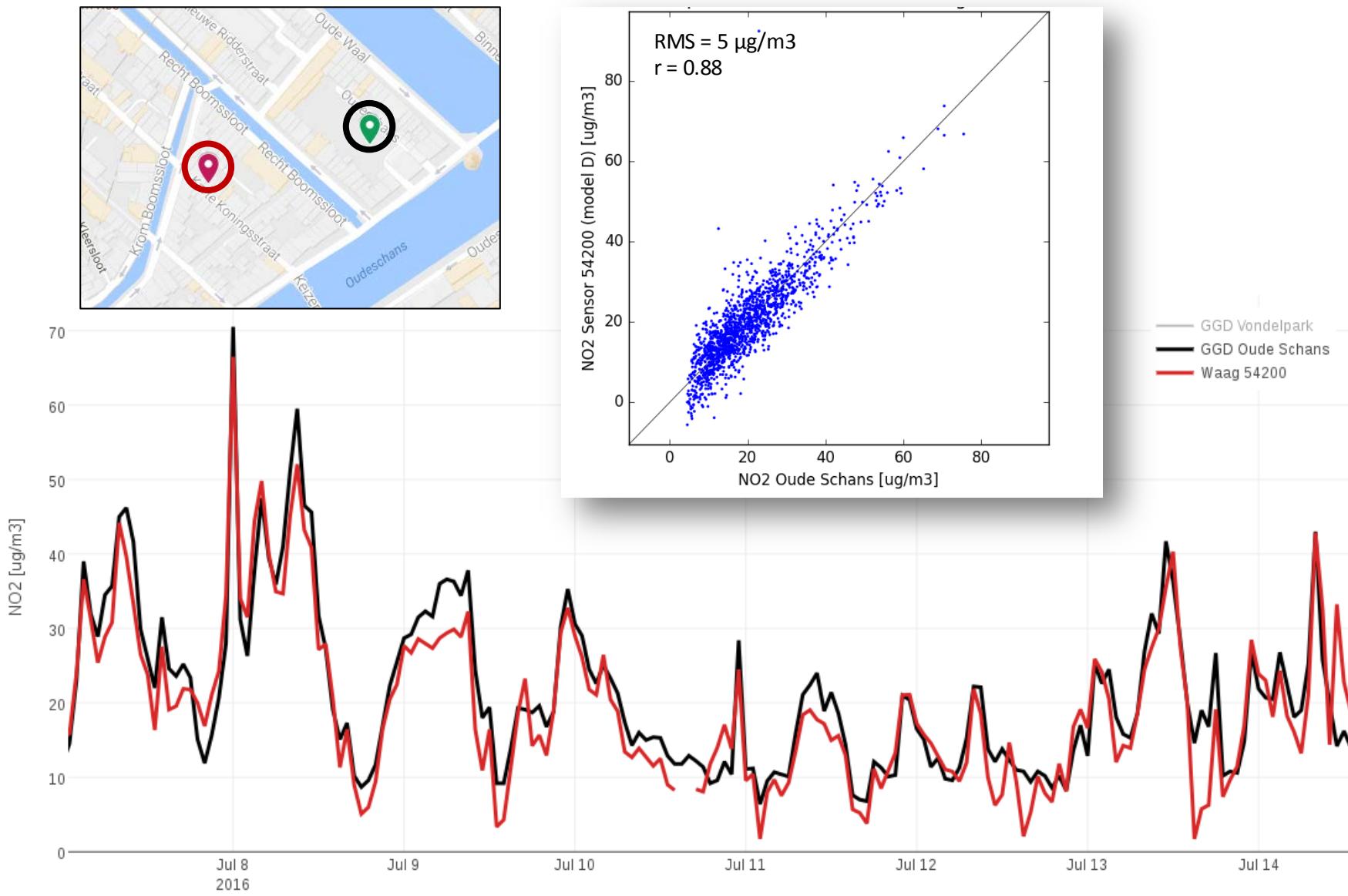
2nd calibration period
using coefficients
determined in 1st
calibration period



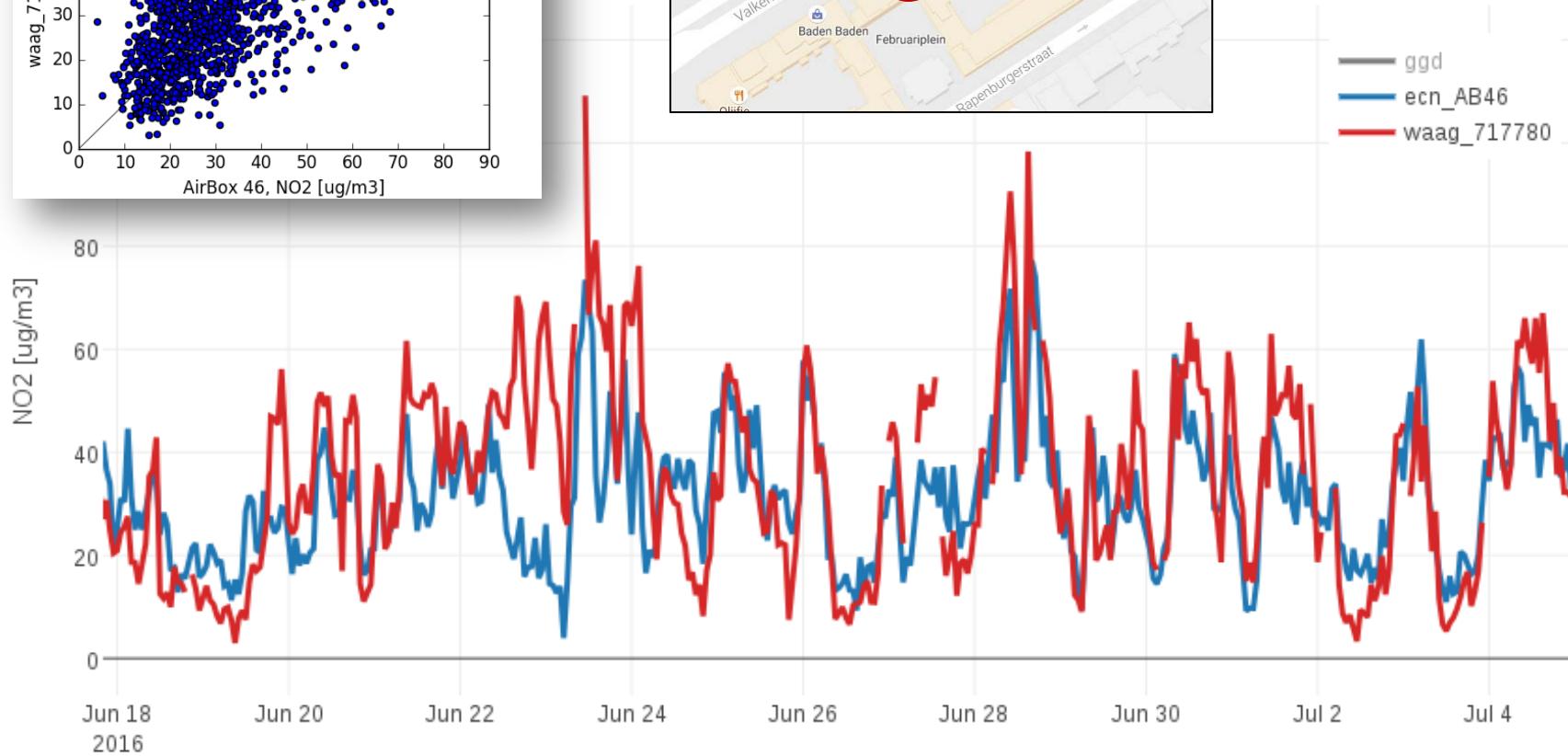
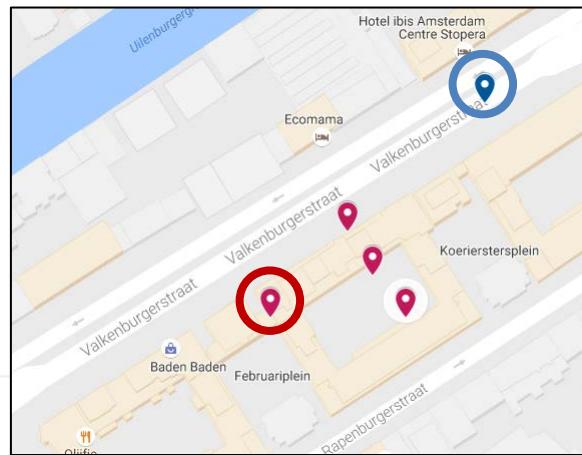
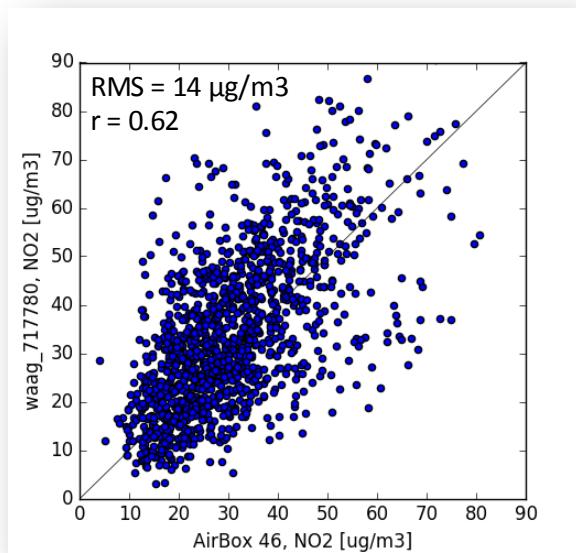
Validation

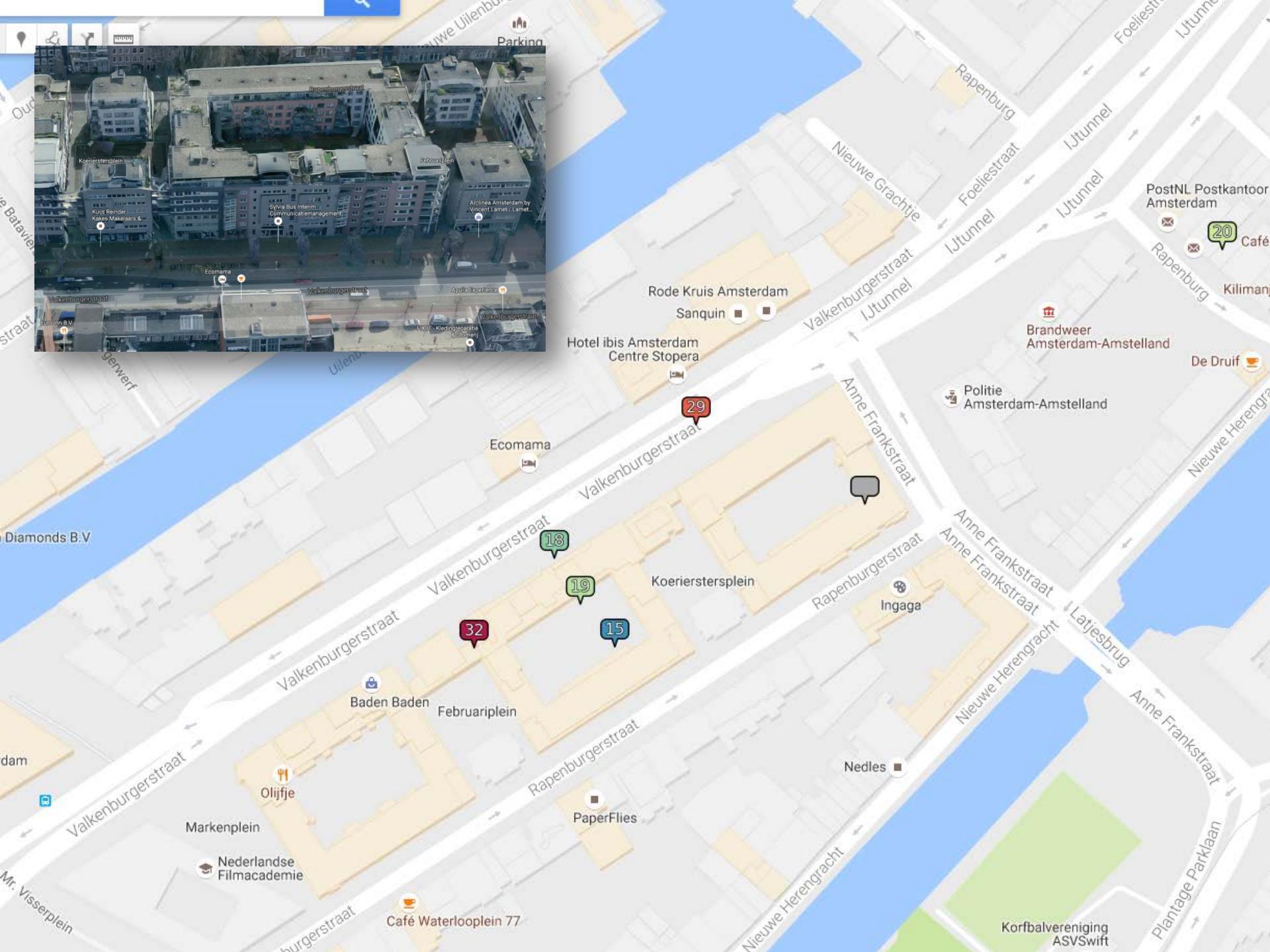
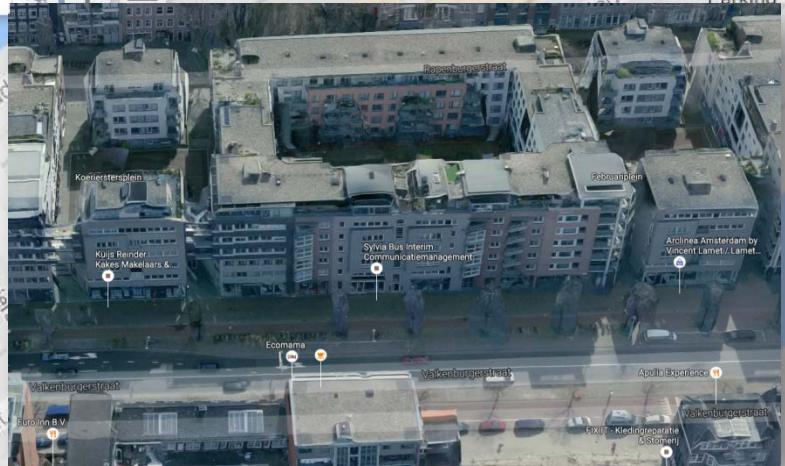


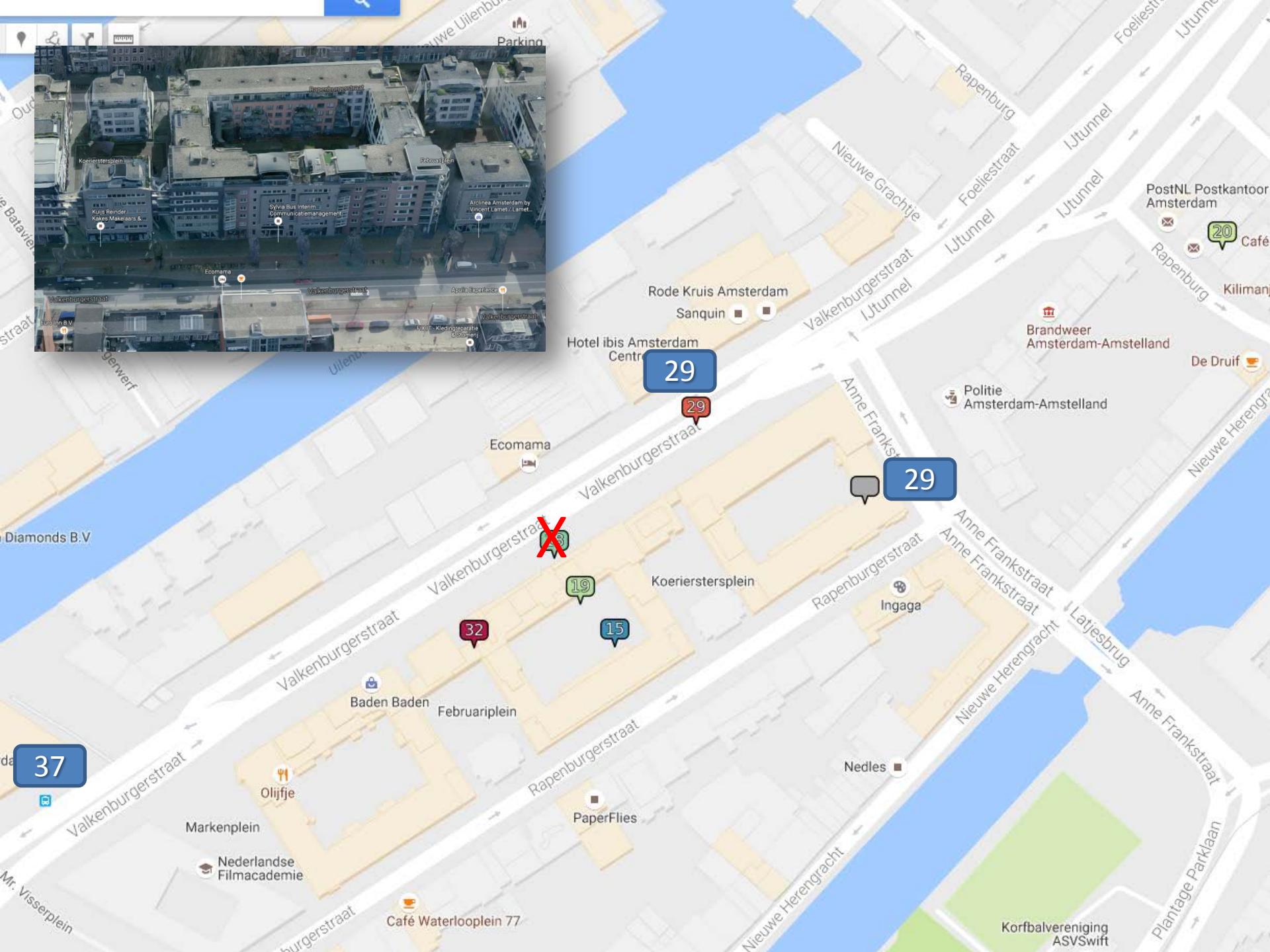
Comparison Waag 54200 and GGD Oude Schans

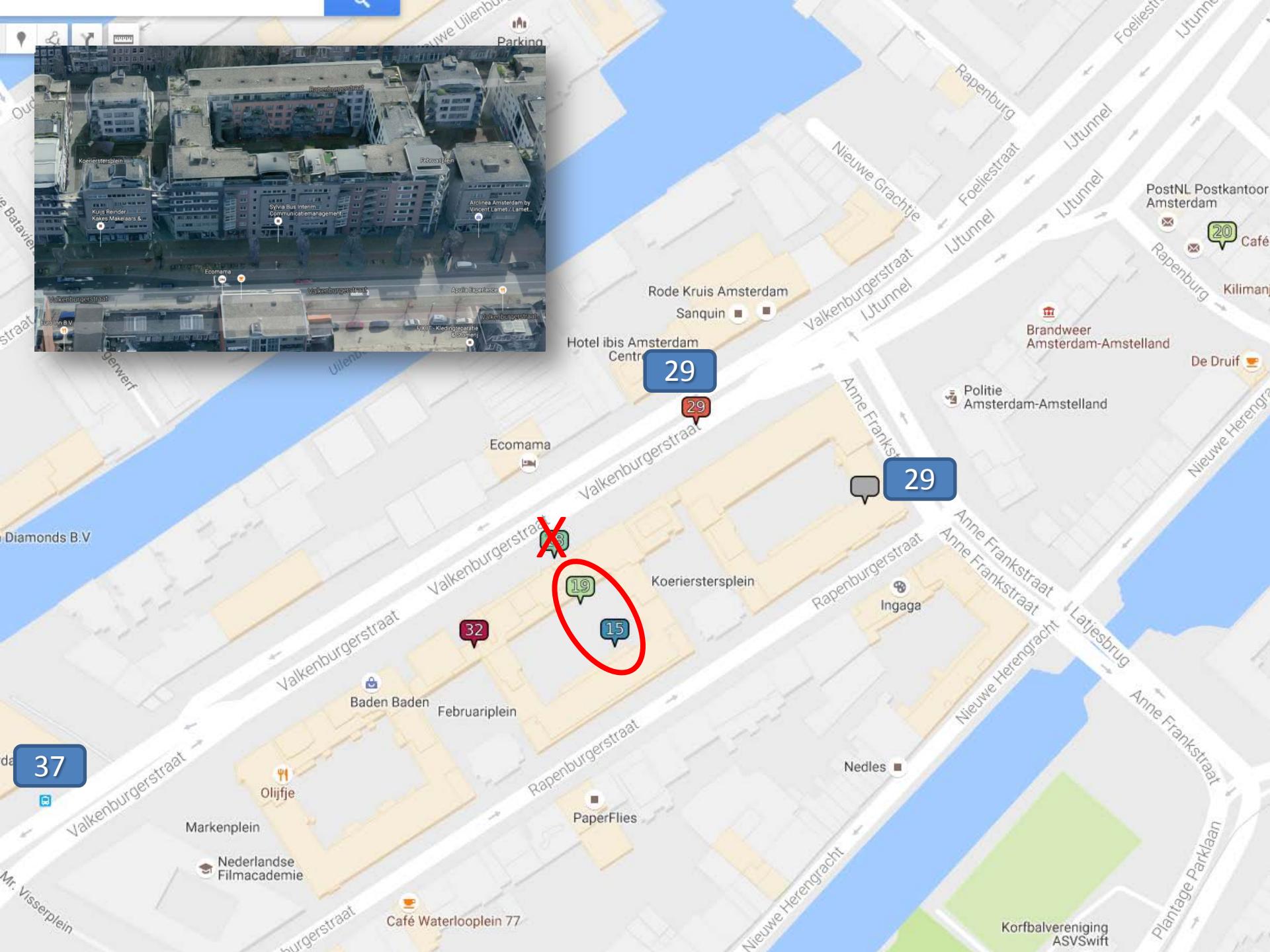


Comparison AirBox 46 and Waag 717780

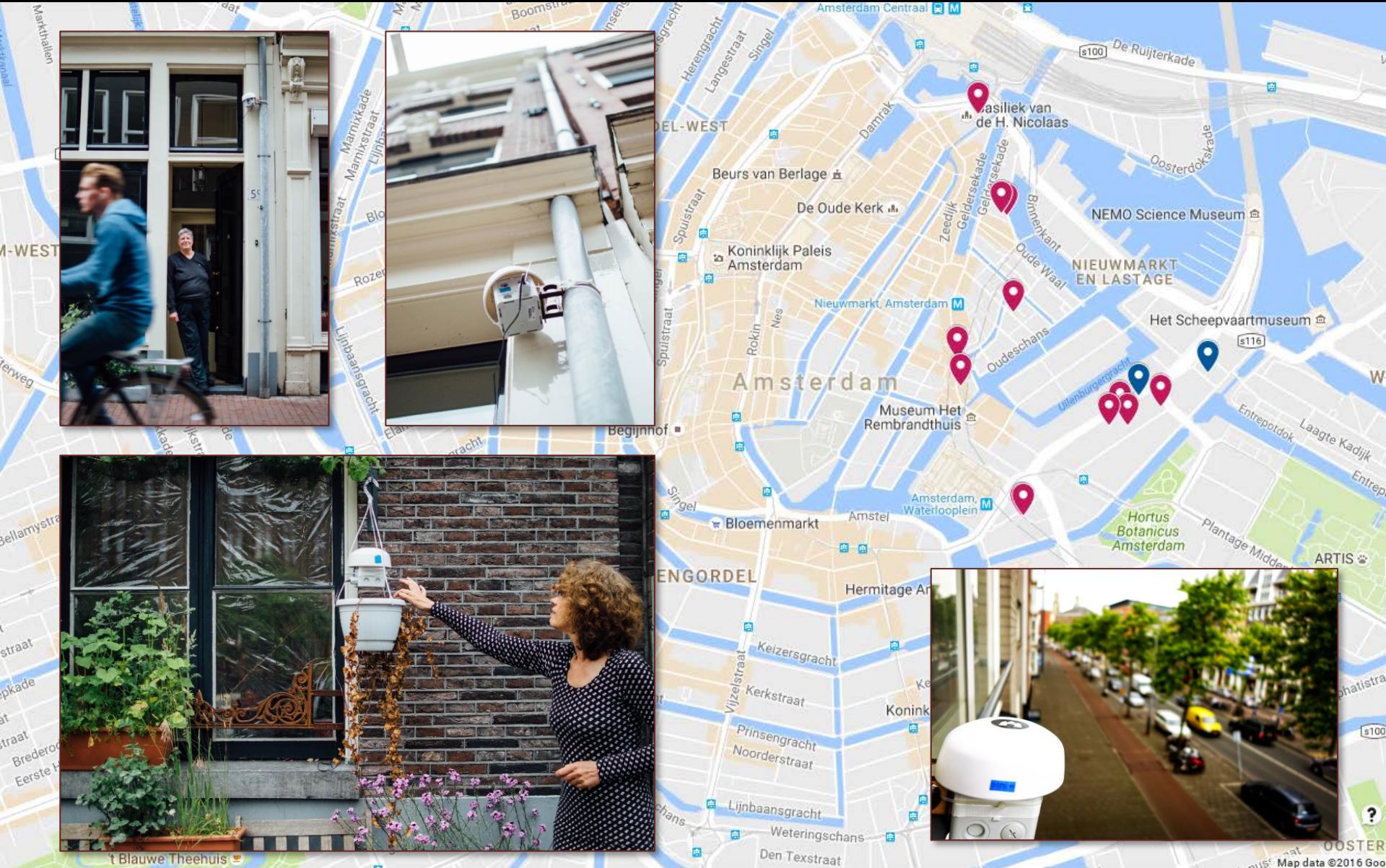




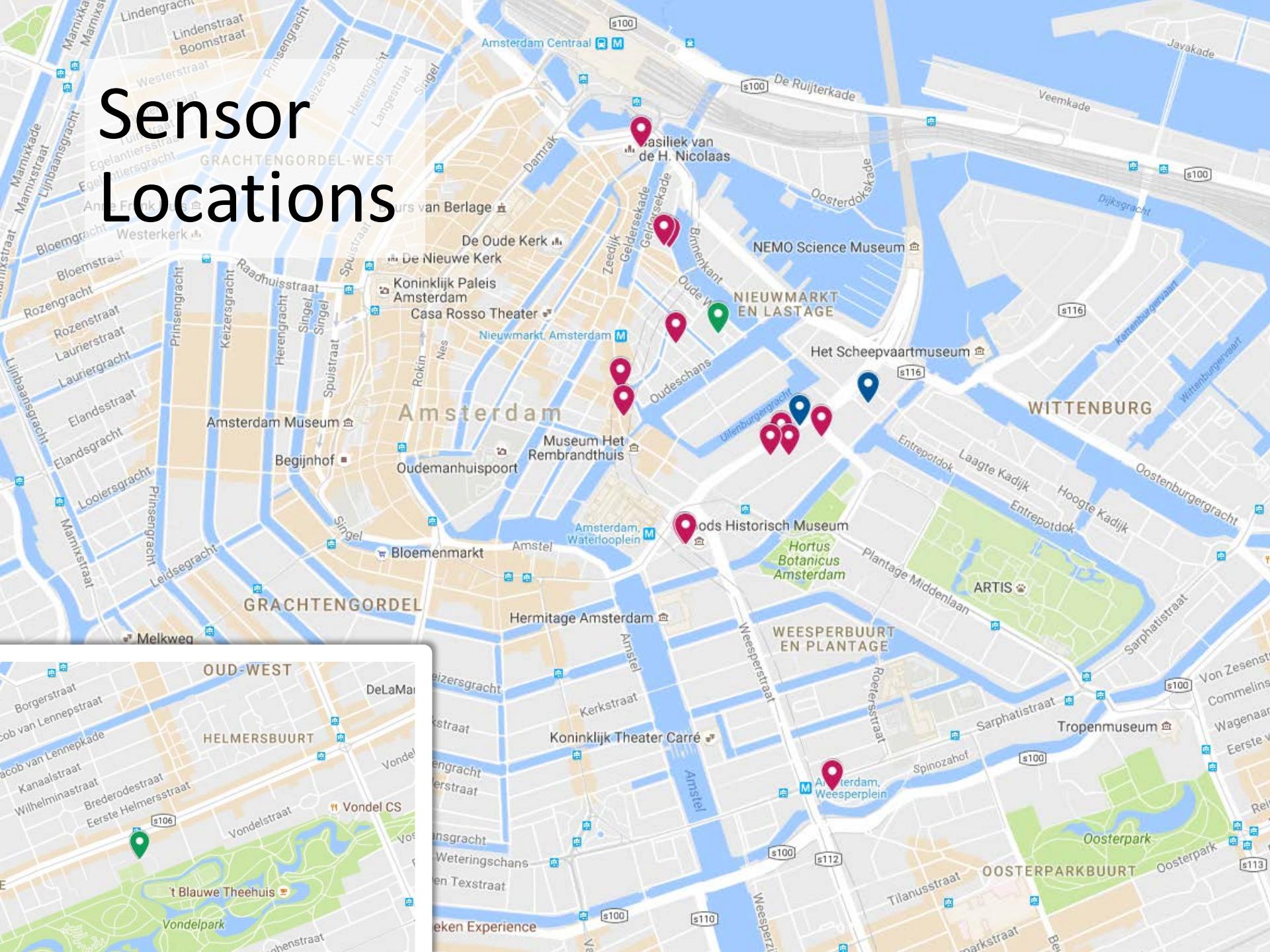




Urban AirQ campaign (June-August 2016)



Sensor Locations

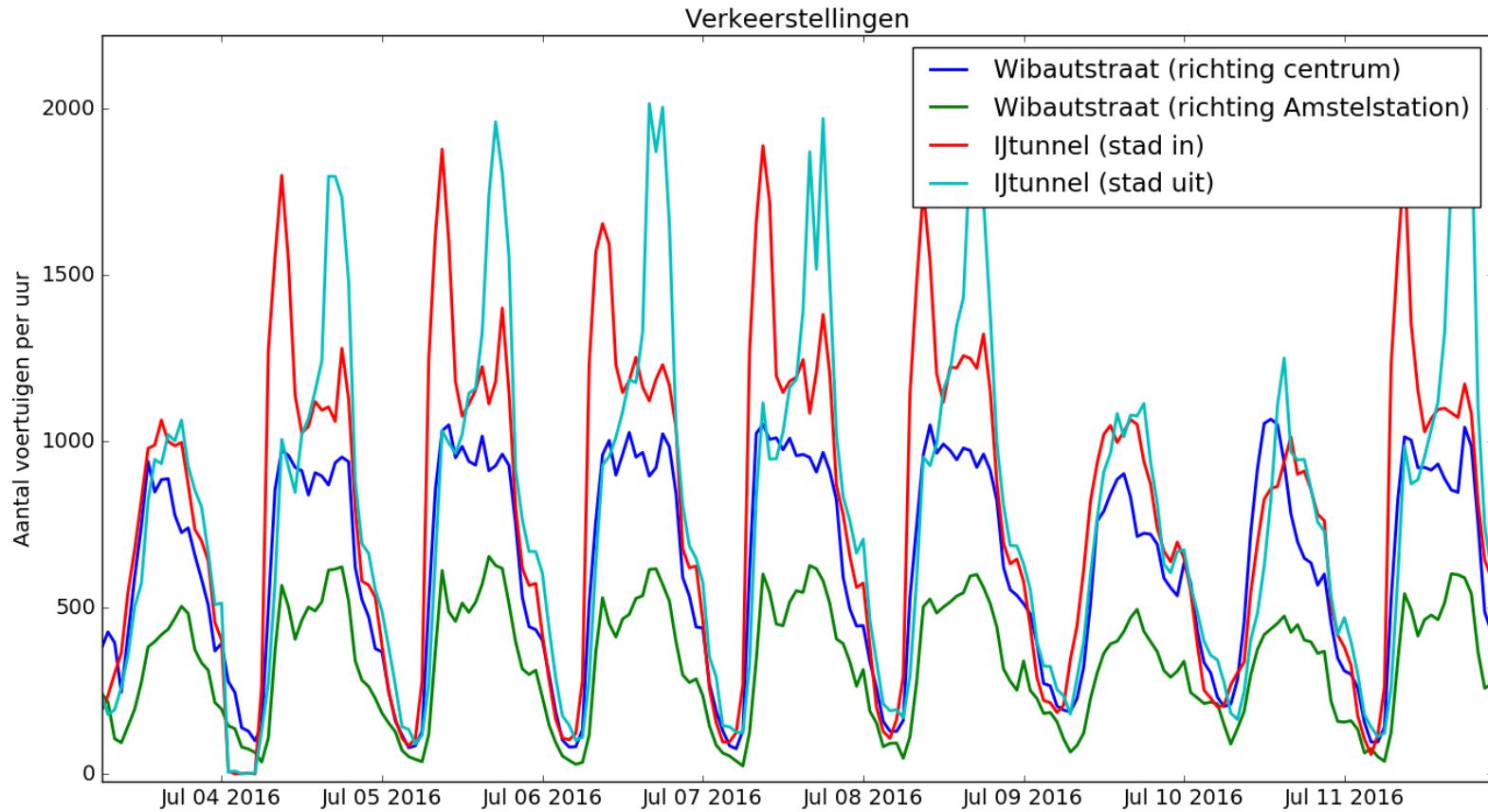


Vragen van deelnemers

- Effect van sluiting IJtunnel
- Straatkant versus achtertuin
- Hoofdstraat versus zijstraat
- Hoe hoger hoe schoner?
- Nachttaxi's naar de Wallen

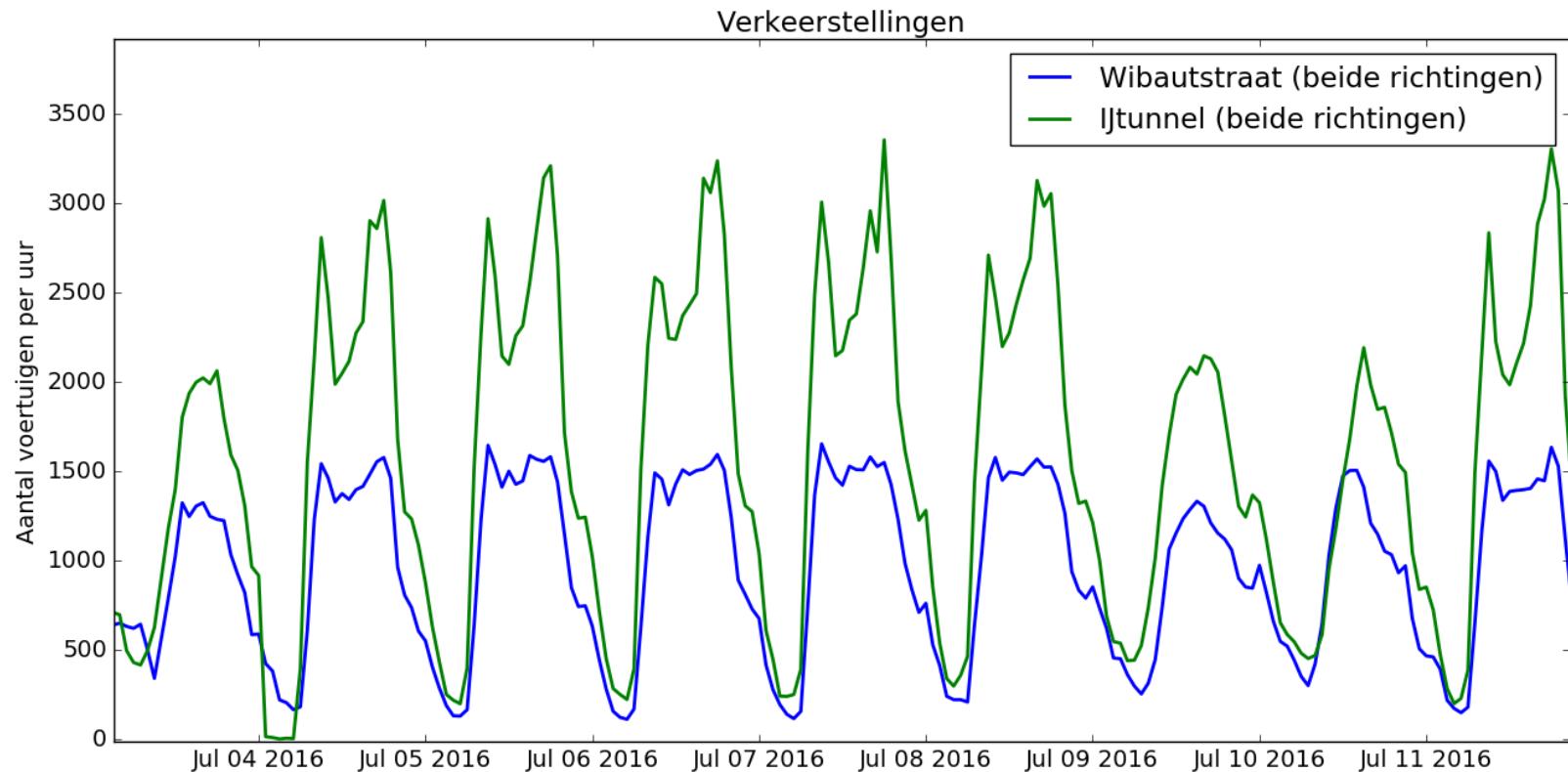


Traffic intensity



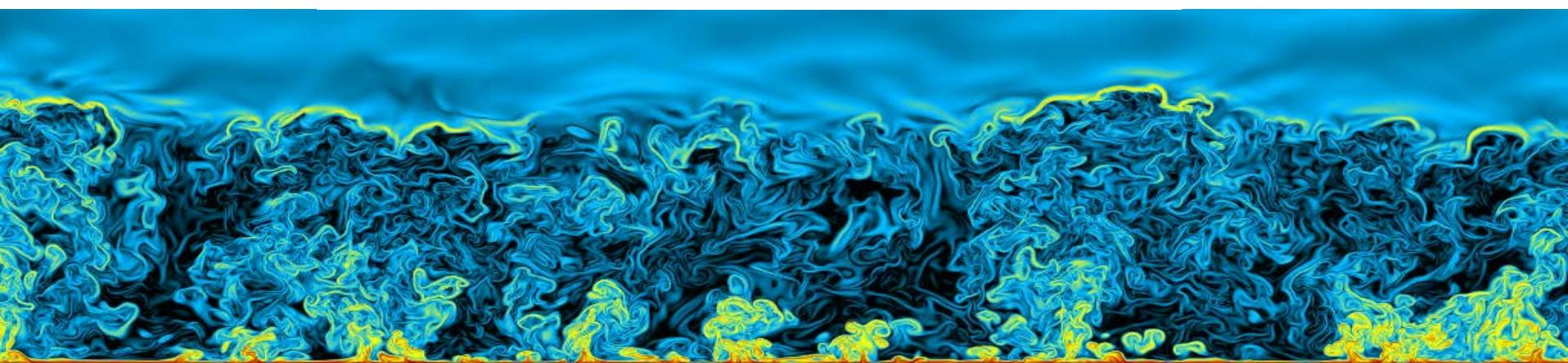
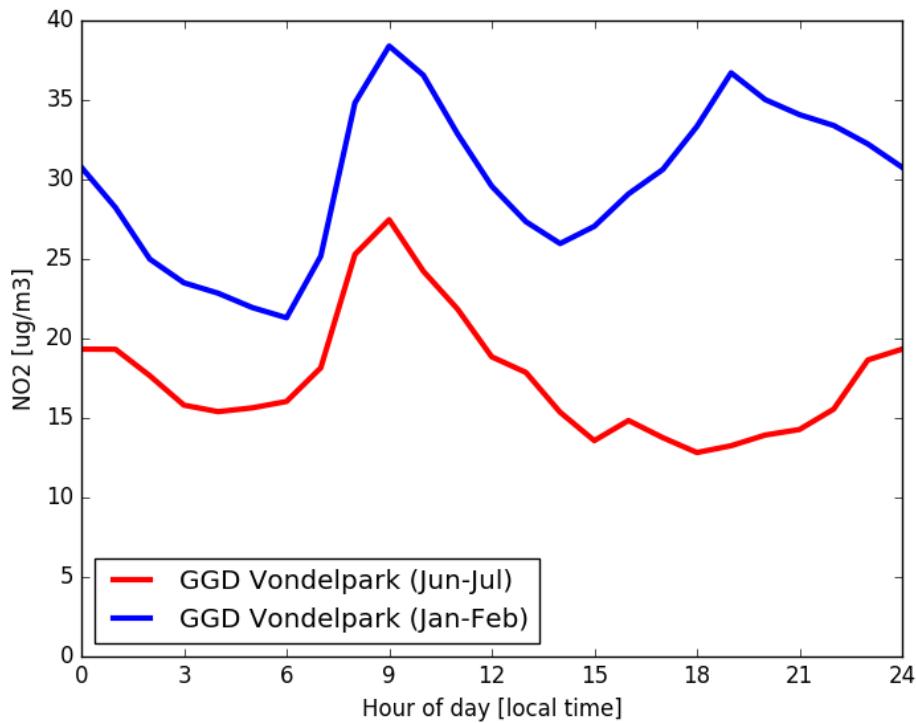
(Data via Gemeente Amsterdam, afd. Verkeer en Openbare Ruimte)

Traffic intensity



	June 2016	August 2016	reduction
Wibautstraat	680,425	550,805	-19%
IJ-tunnel	1,120,394	98,459	-91%

Daily cycle of NO₂ by season





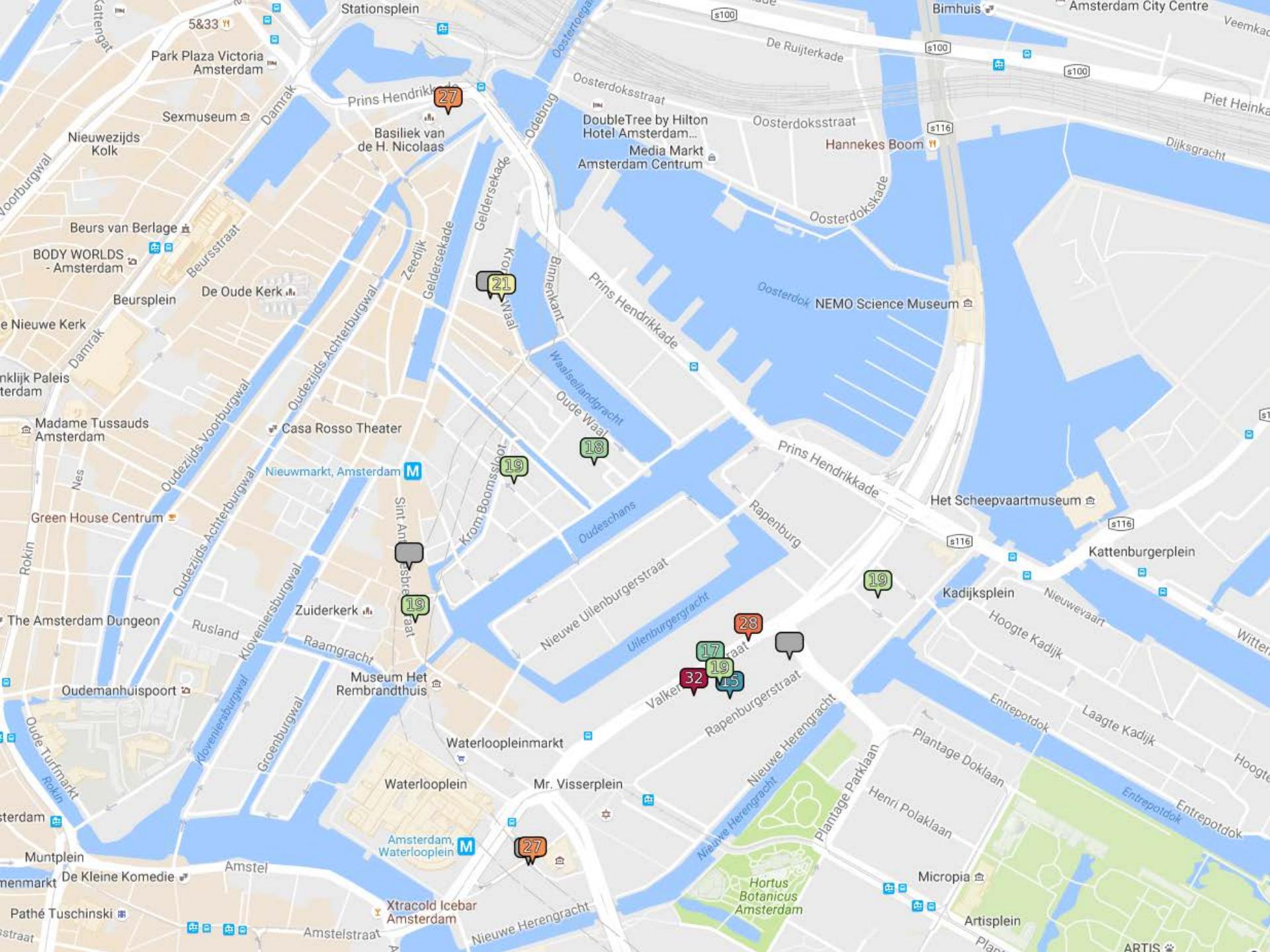
NO₂ limit values

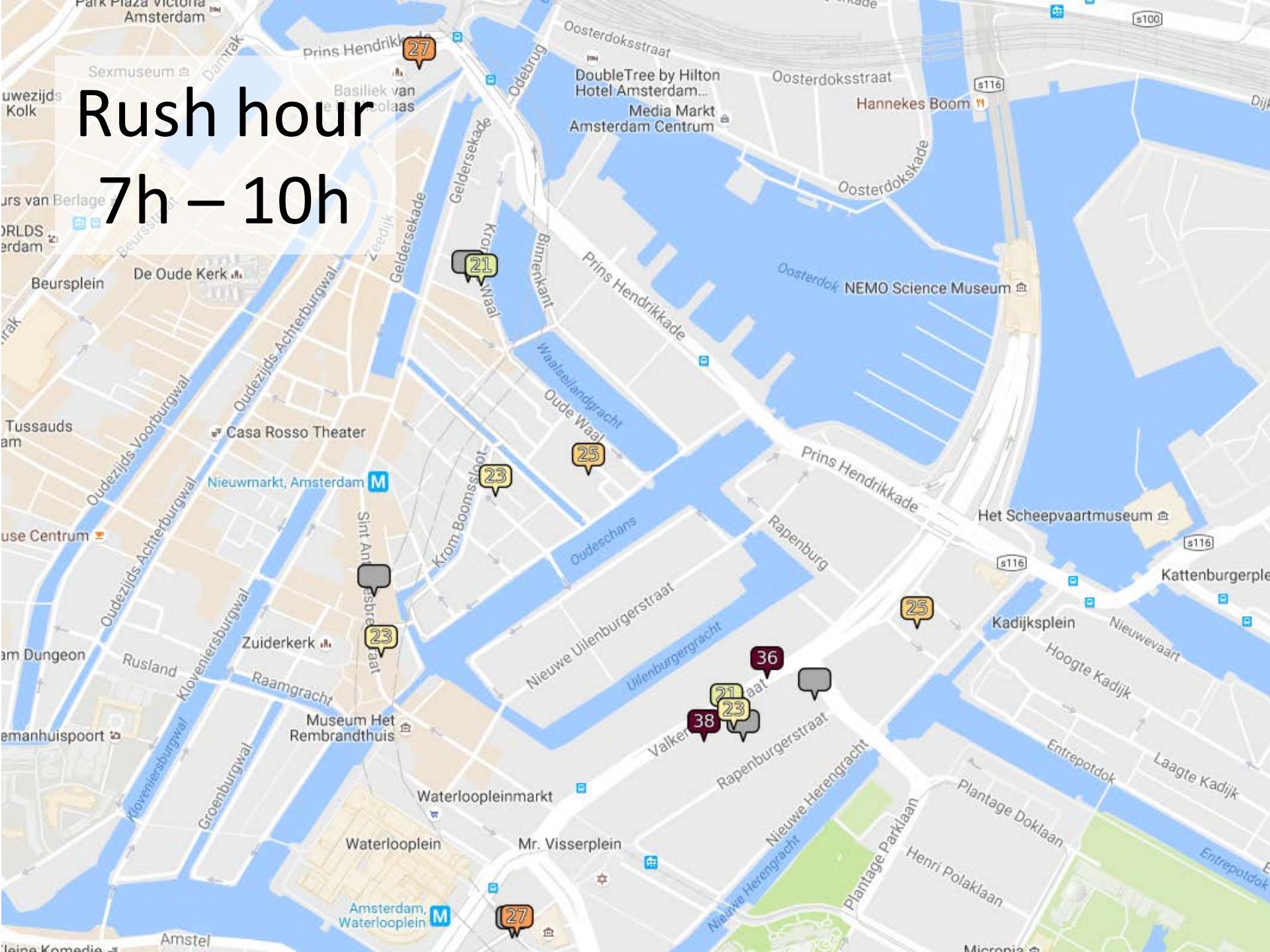


- Annual average: 40 µg/m³
- Hourly:
 - Limit value: 200 µg/m³
max. 18 hours of exceeding this limit value allowed per year
 - Alert threshold: 400 µg/m³
When exceeded for 3 consecutive hours in an area of at least 100 km²

Cleanest and dirtiest spot: Long-term averages of Waag sensors

- Many data gaps
- Make selection of sensors with simultaneous measurements
- 13 June – 16 August 2016: 48% of time



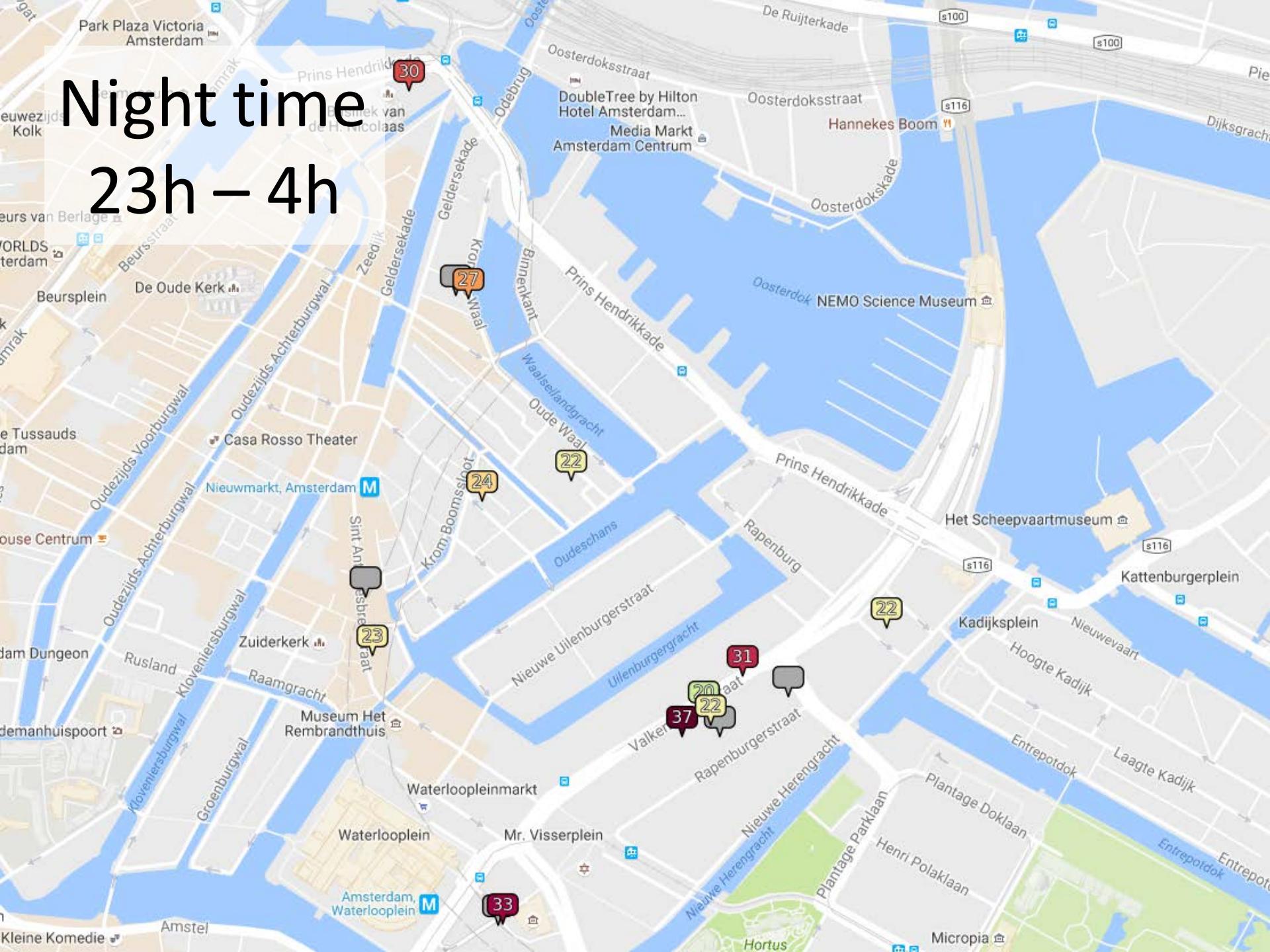


Rush hour

7h – 10h

Night time

23h – 4h

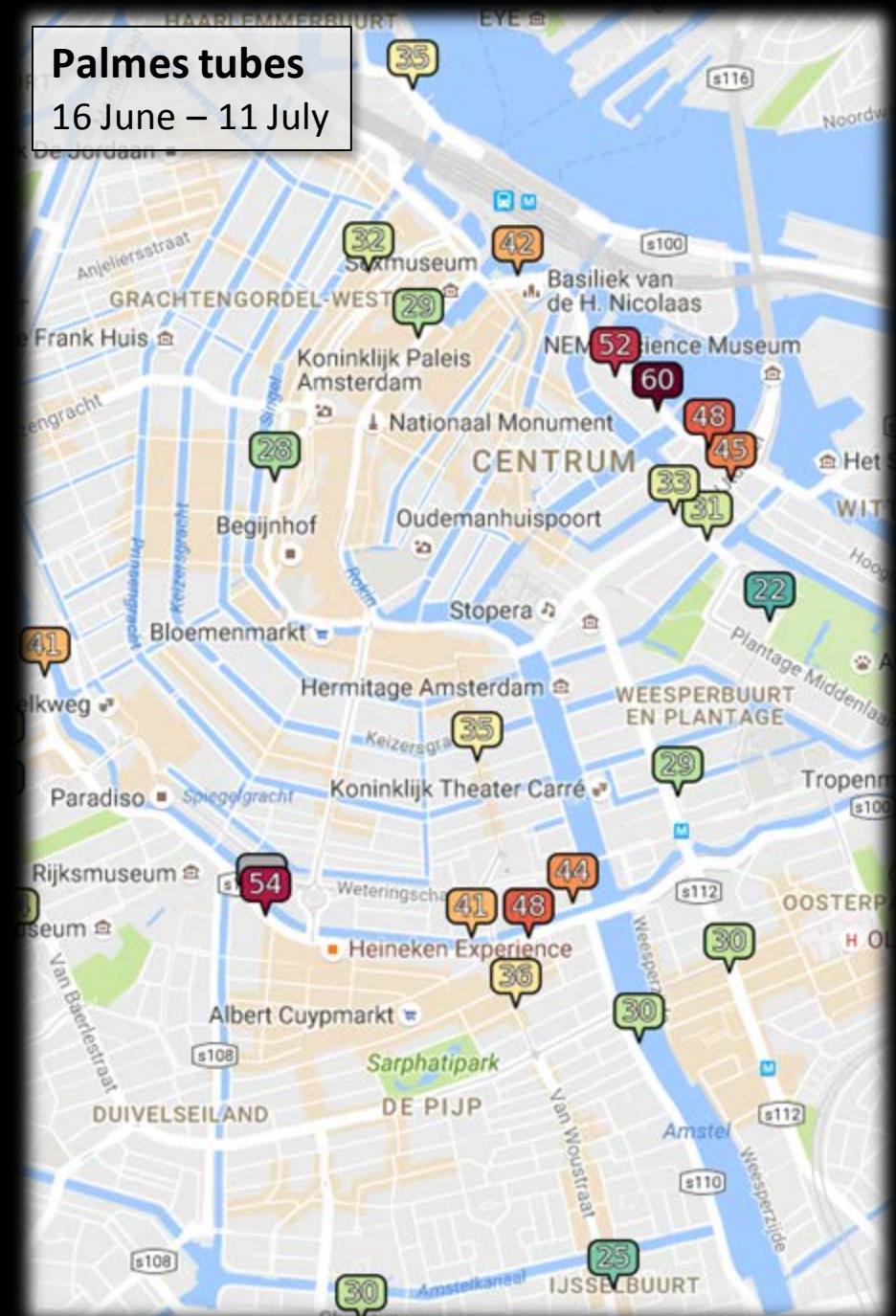


Closure IJ-tunnel

- Tunnel closed from 16 July to 29 August 2016
- School holidays from 16 July to 29 August 2016

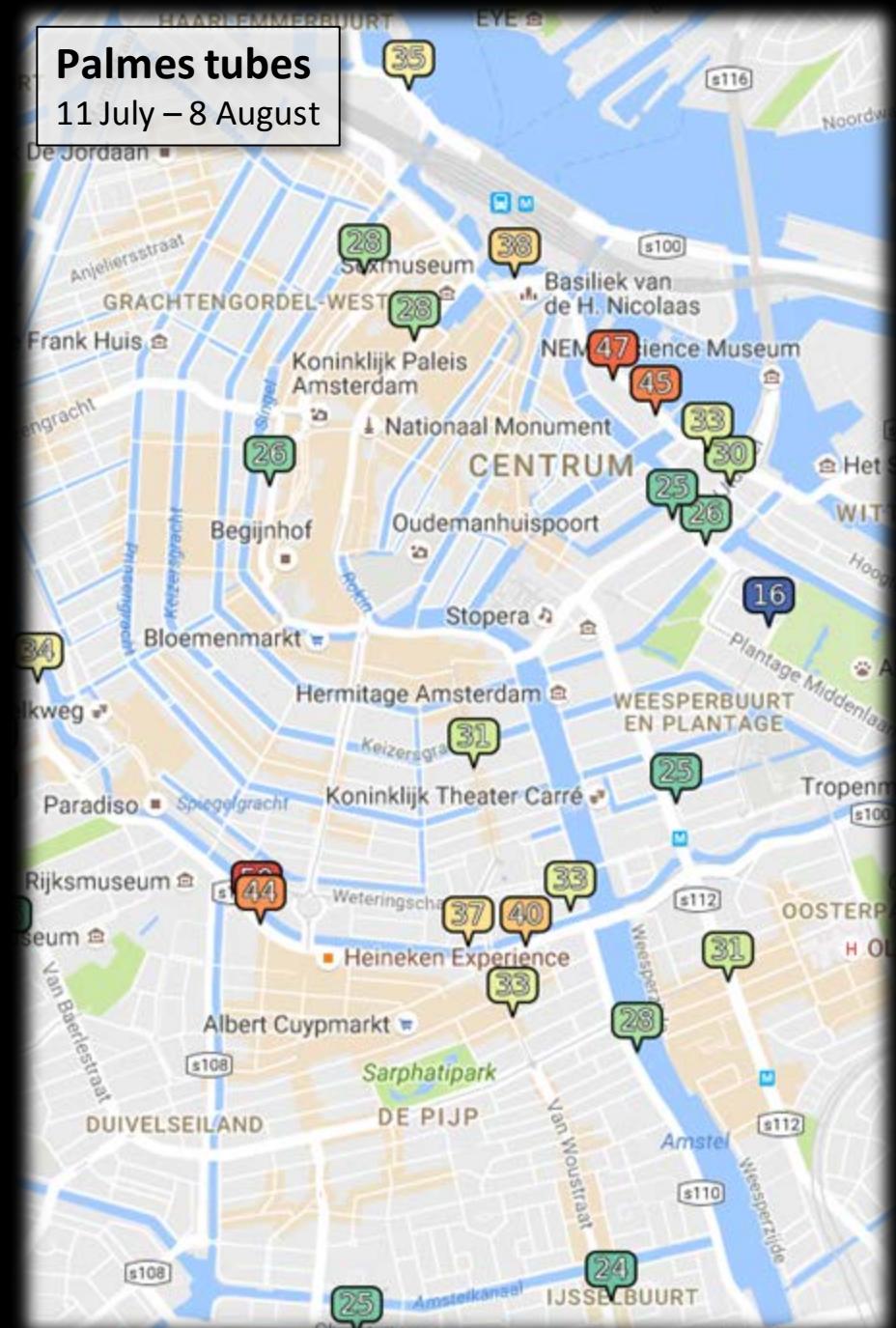
Palmes tubes

16 June – 11 July



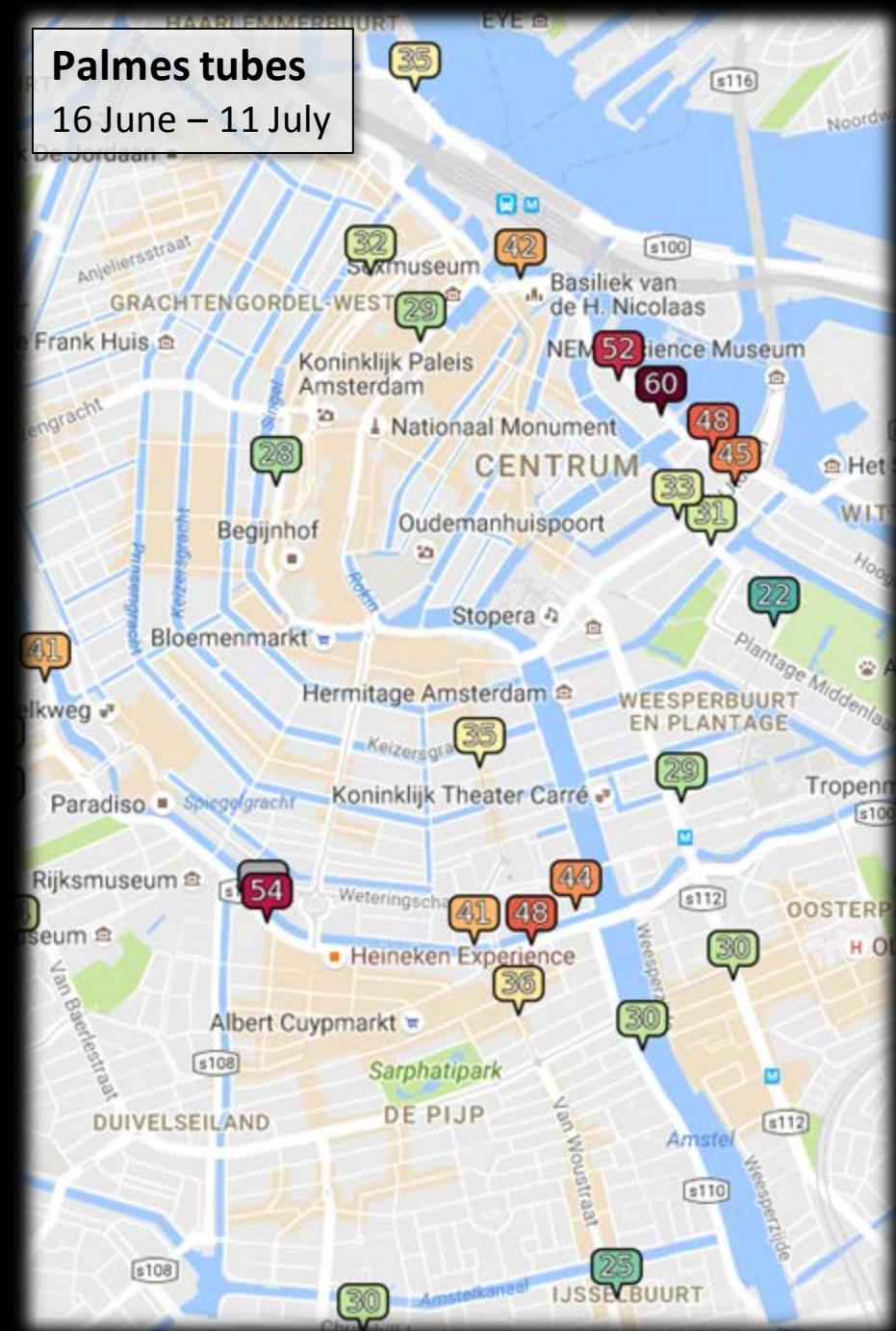
Palmes tubes

11 July – 8 August



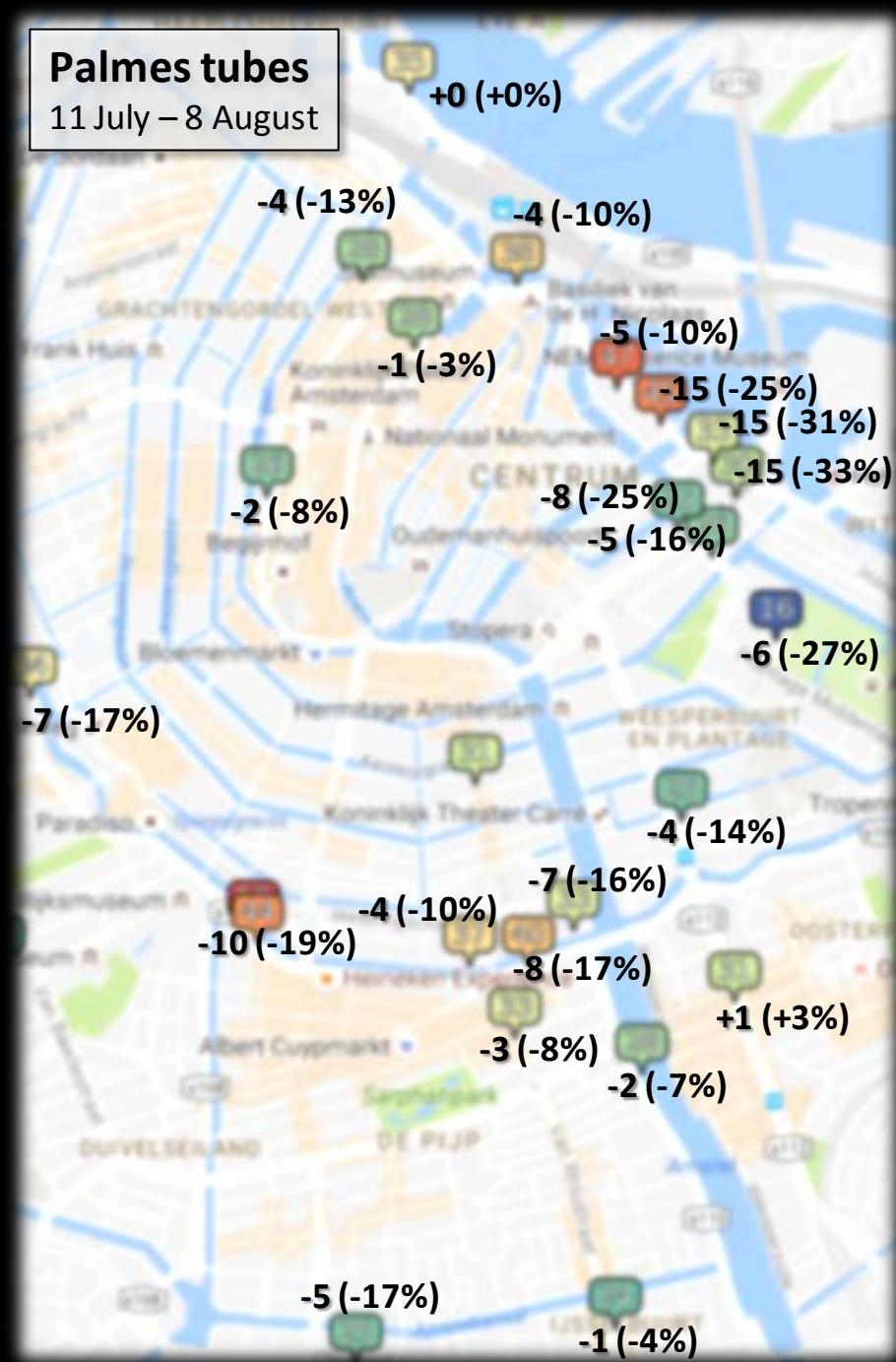
Palms tubes

16 June – 11 July



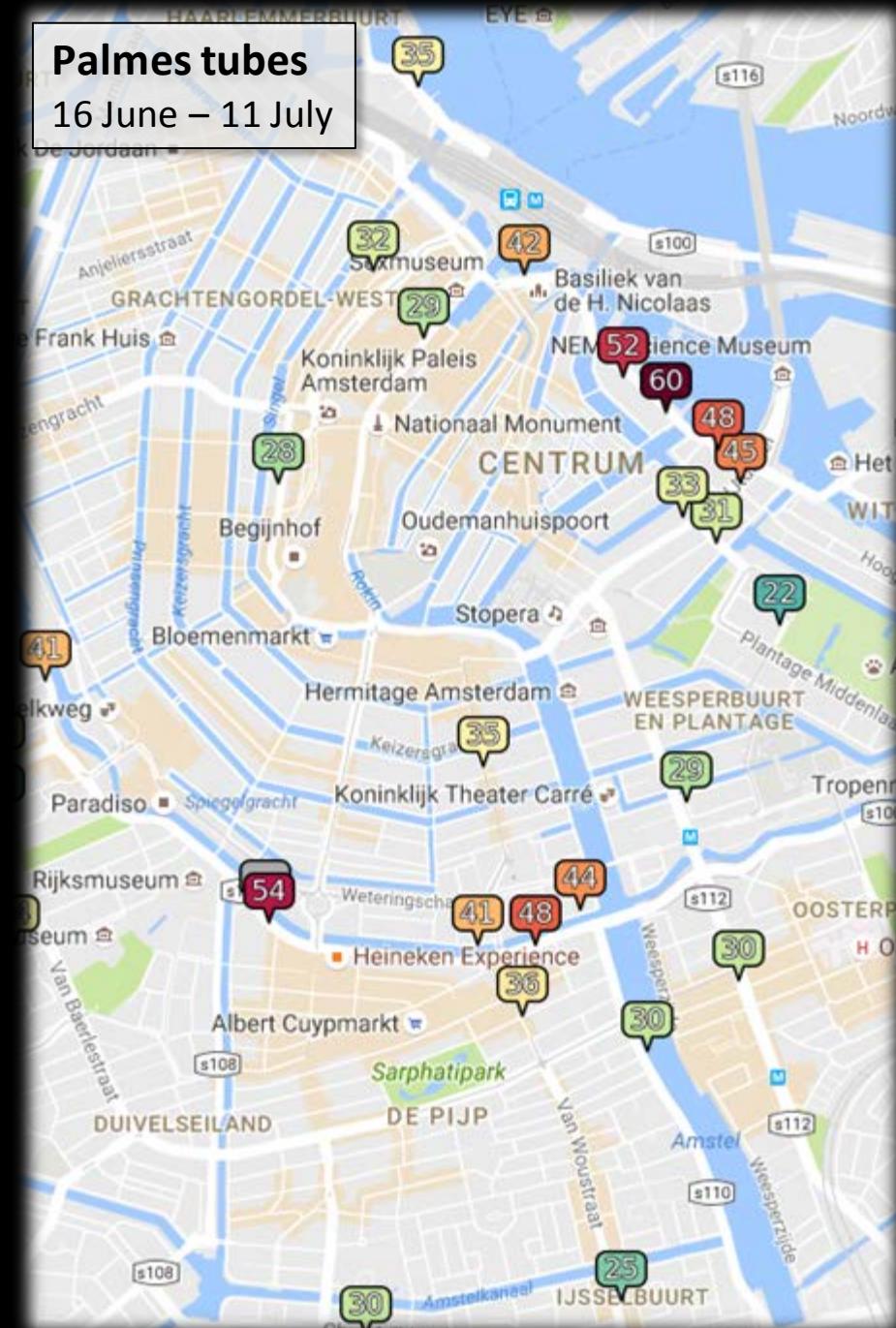
Palms tubes

11 July – 8 August



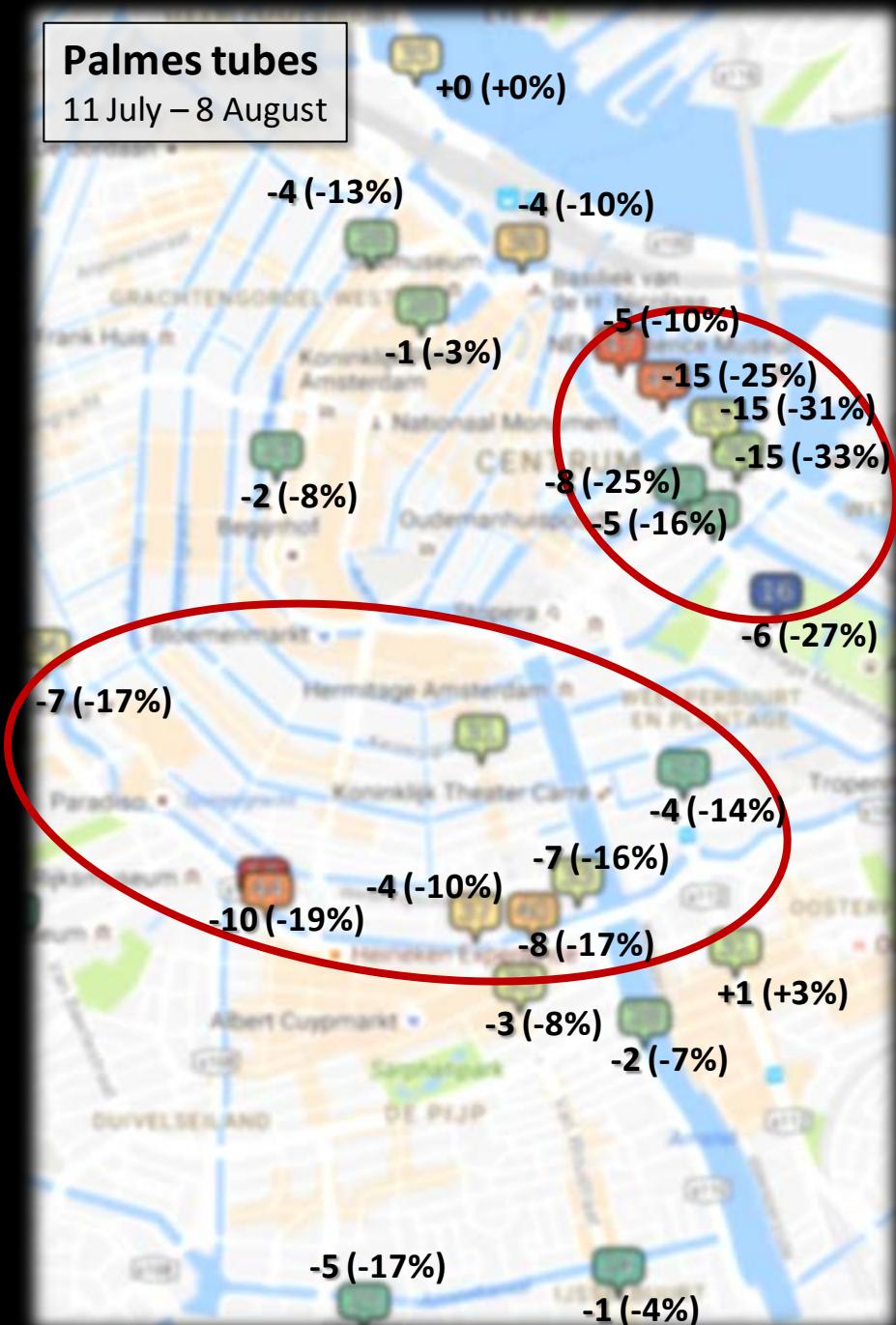
Palms tubes

16 June – 11 July



Palms tubes

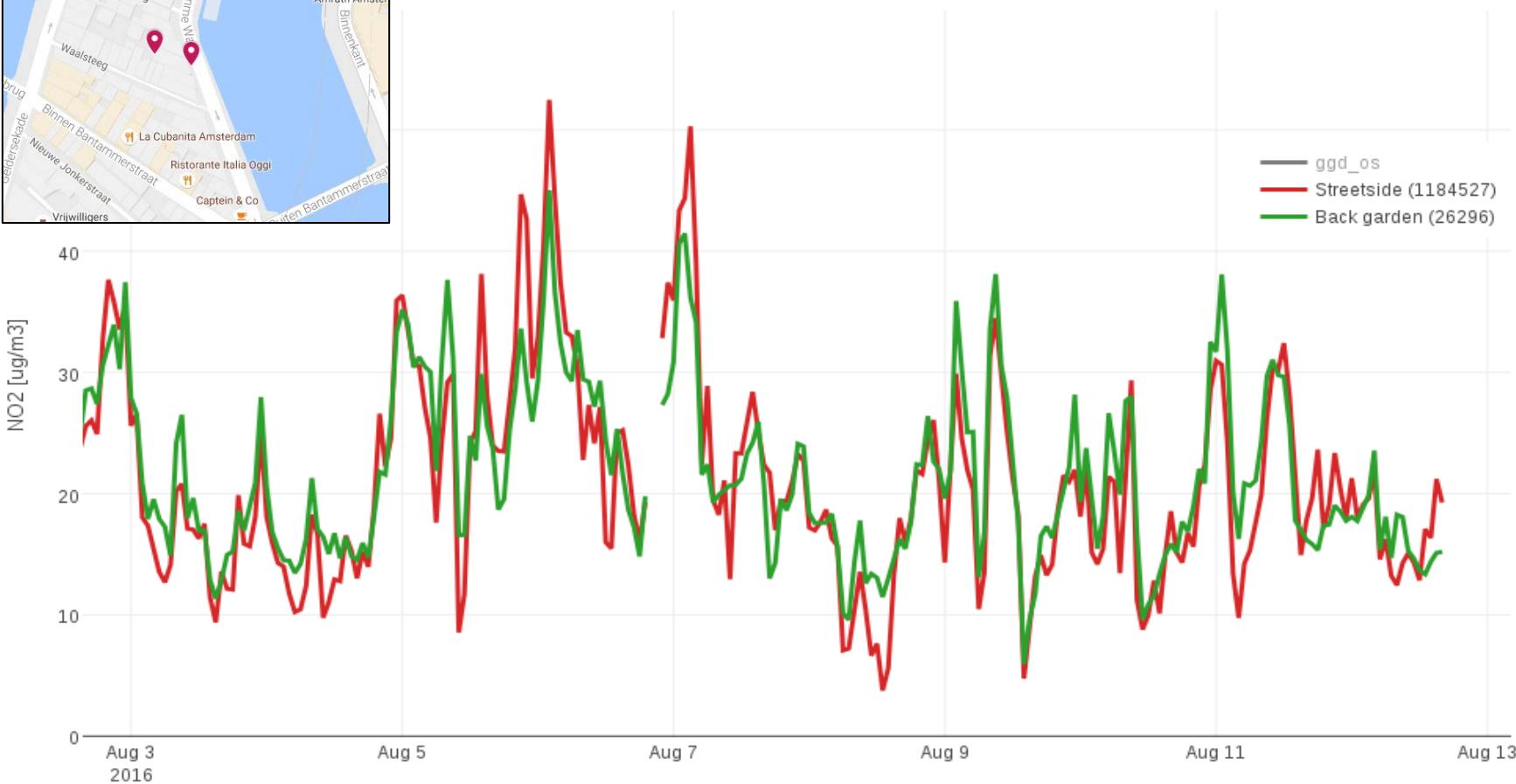
11 July – 8 August





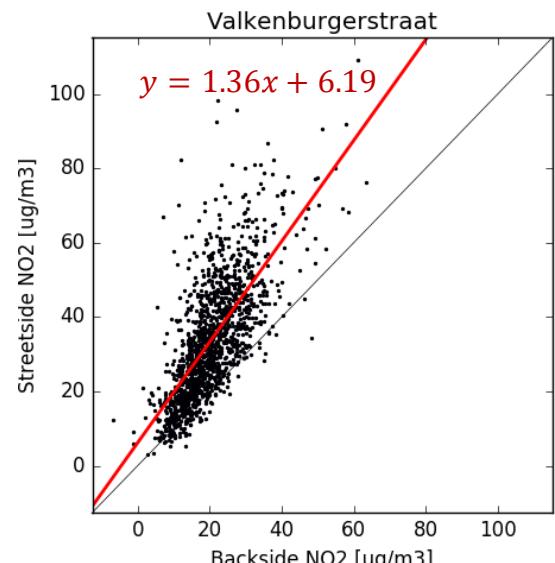
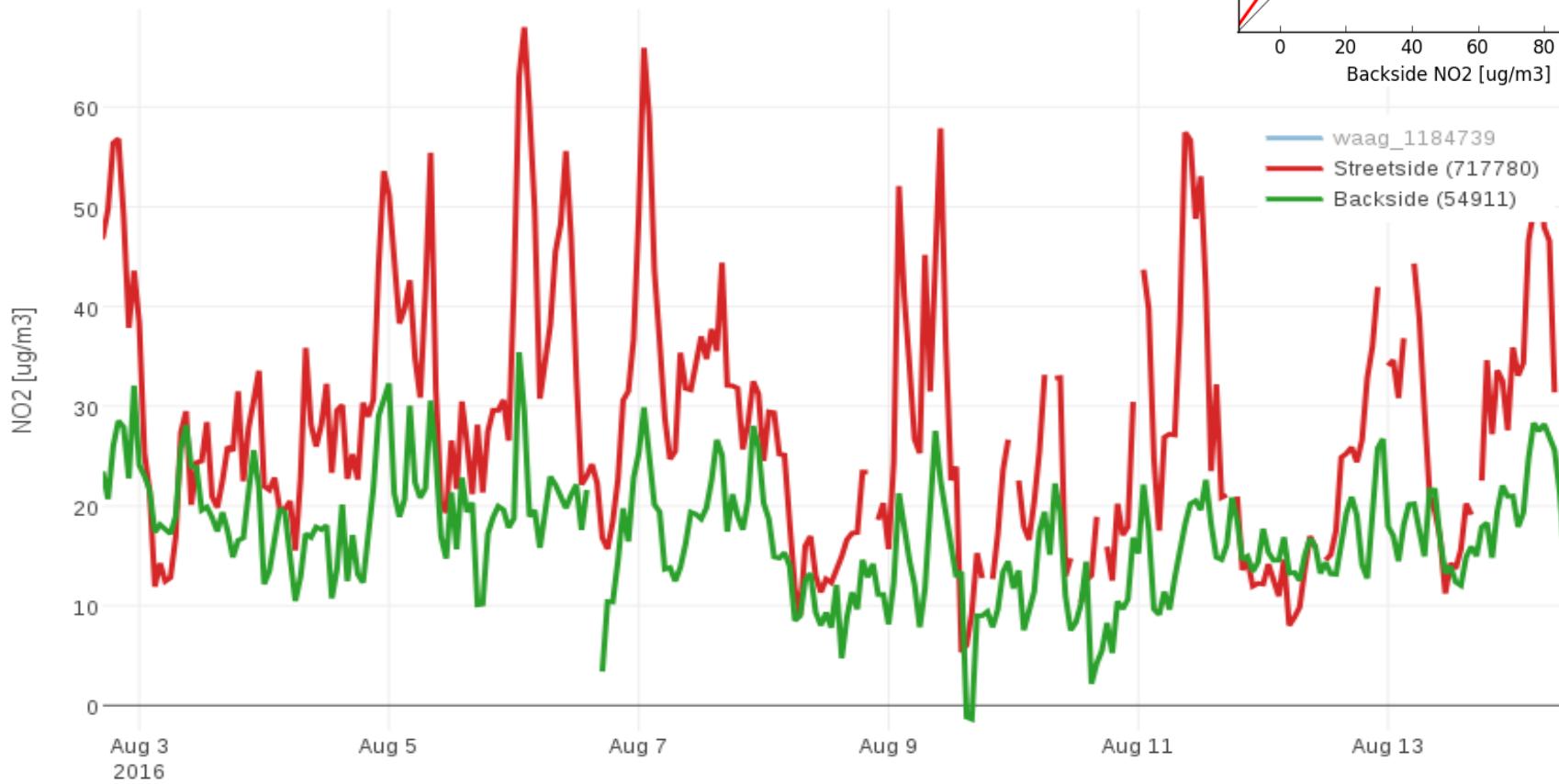
Streetside vs Backside (1)

Kromme Waal 30

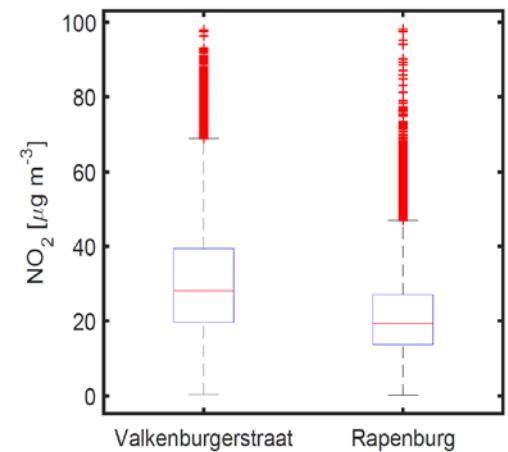
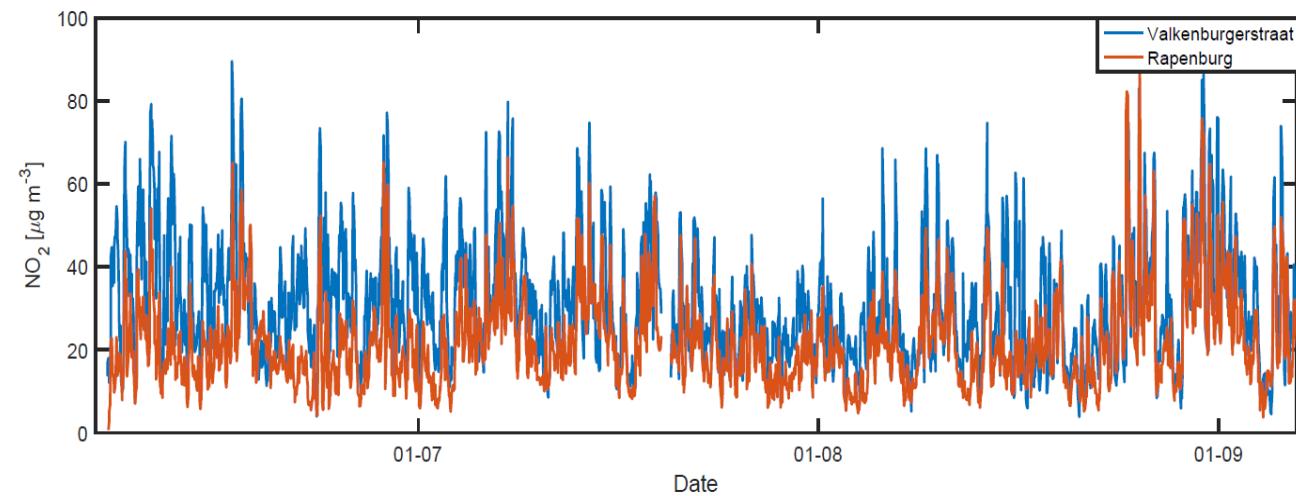


Streetside vs Backside (2)

Valkenburgerstraat

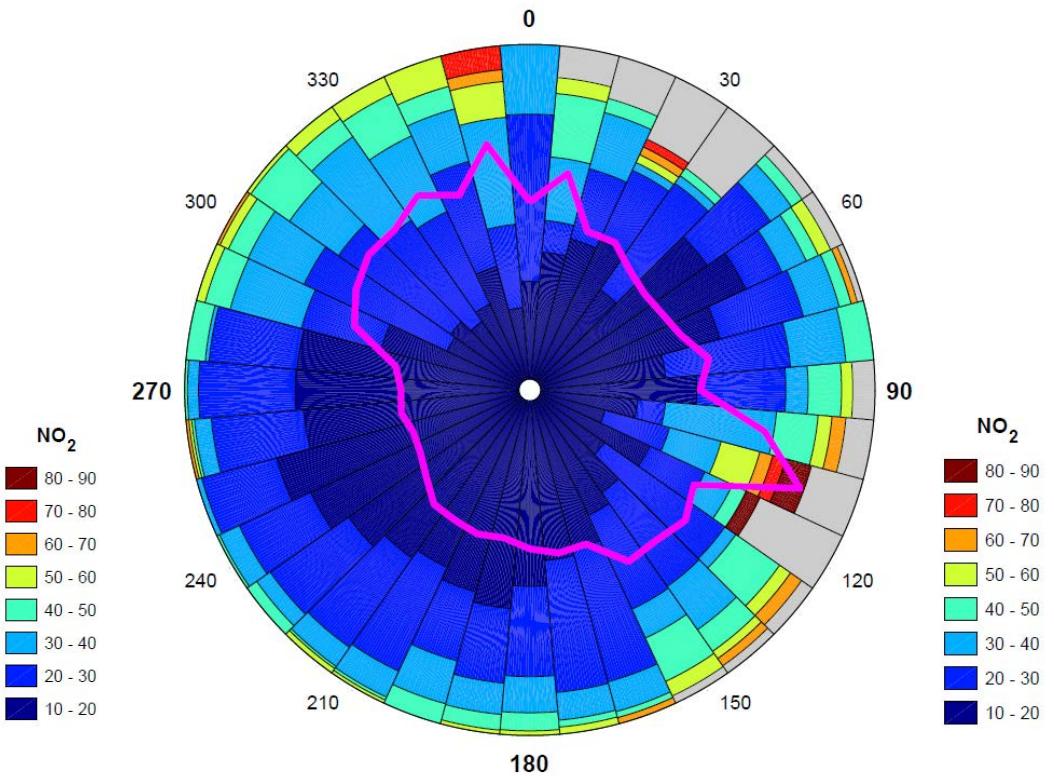
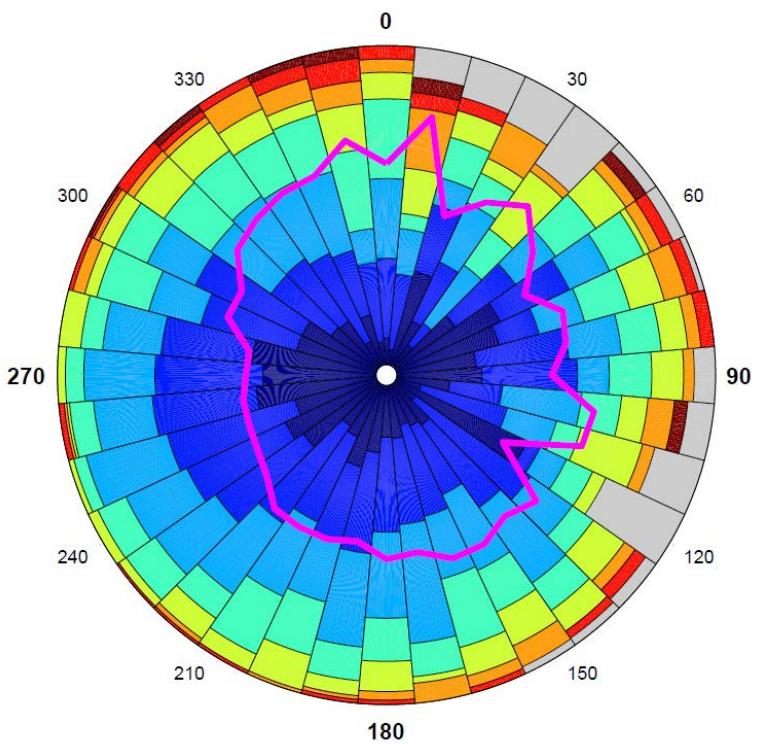
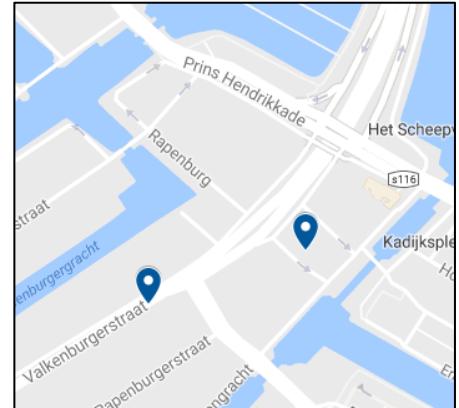


Main road / side road

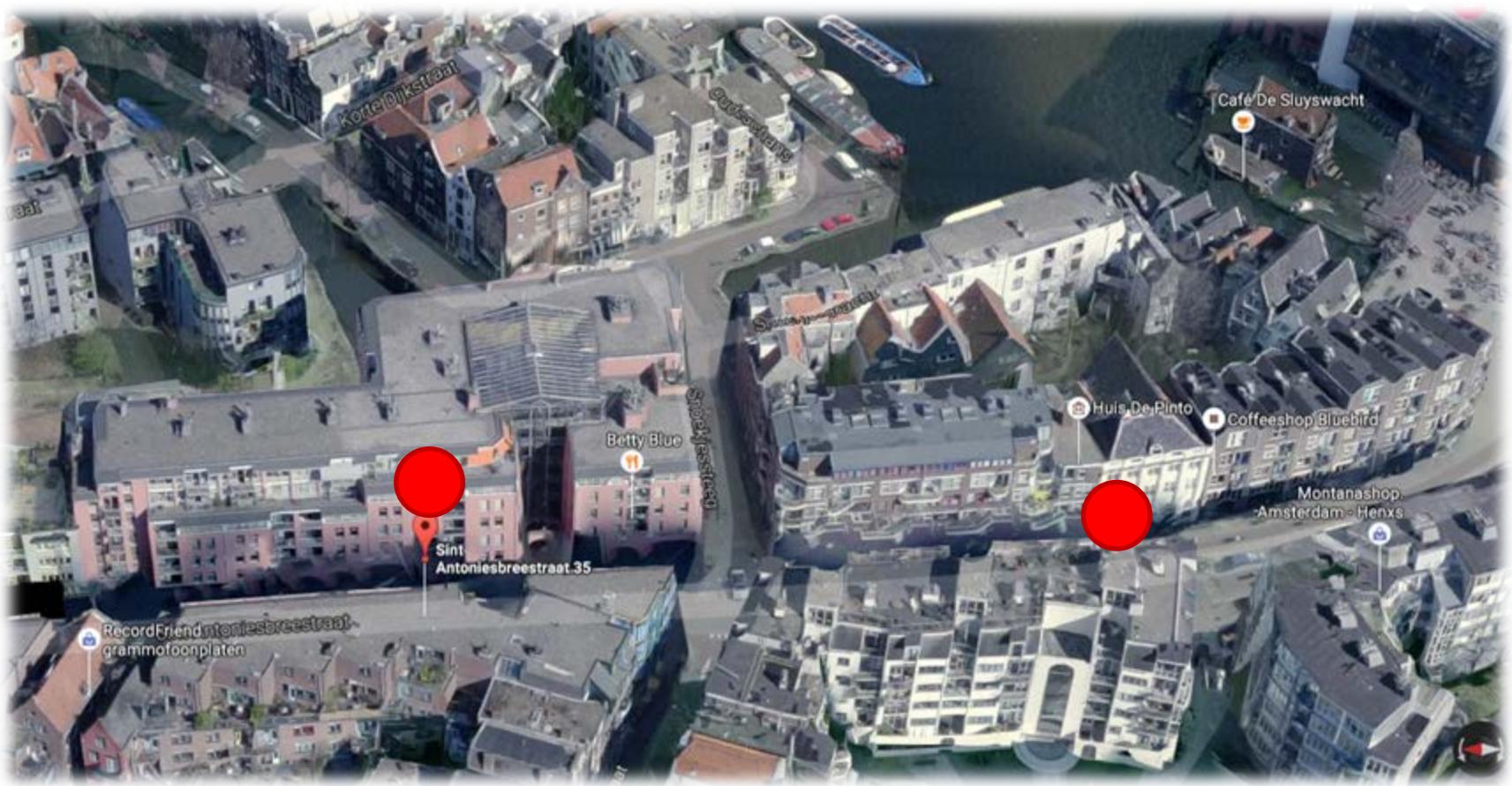


Main road / side road

Effect of wind direction



Height dependency?



St. Antoniesbreestraat 35M (6 hoog voor)
St. Antoniesbreestraat 69 (1 hoog achter)

St. Antoniesbreestr 69 (1 hoog achter) St. Antoniesbreestr 35M (6 hoog voor)

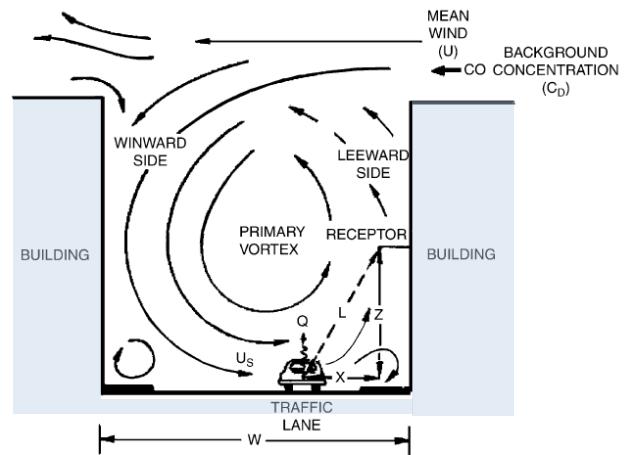
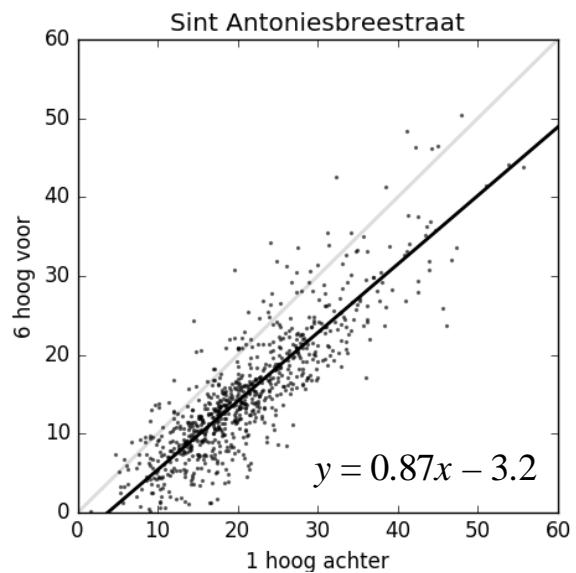
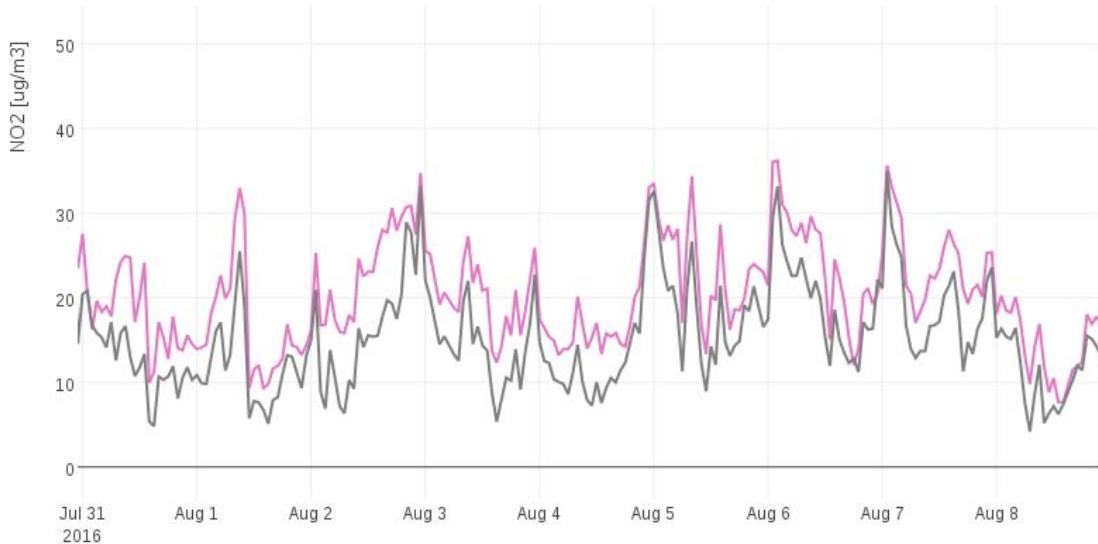
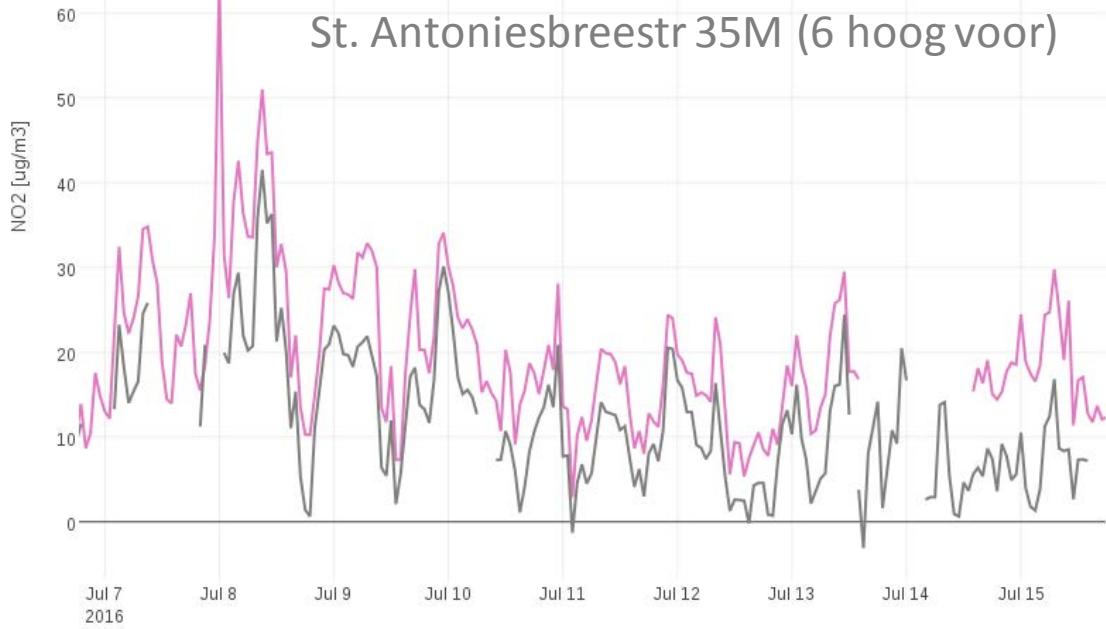
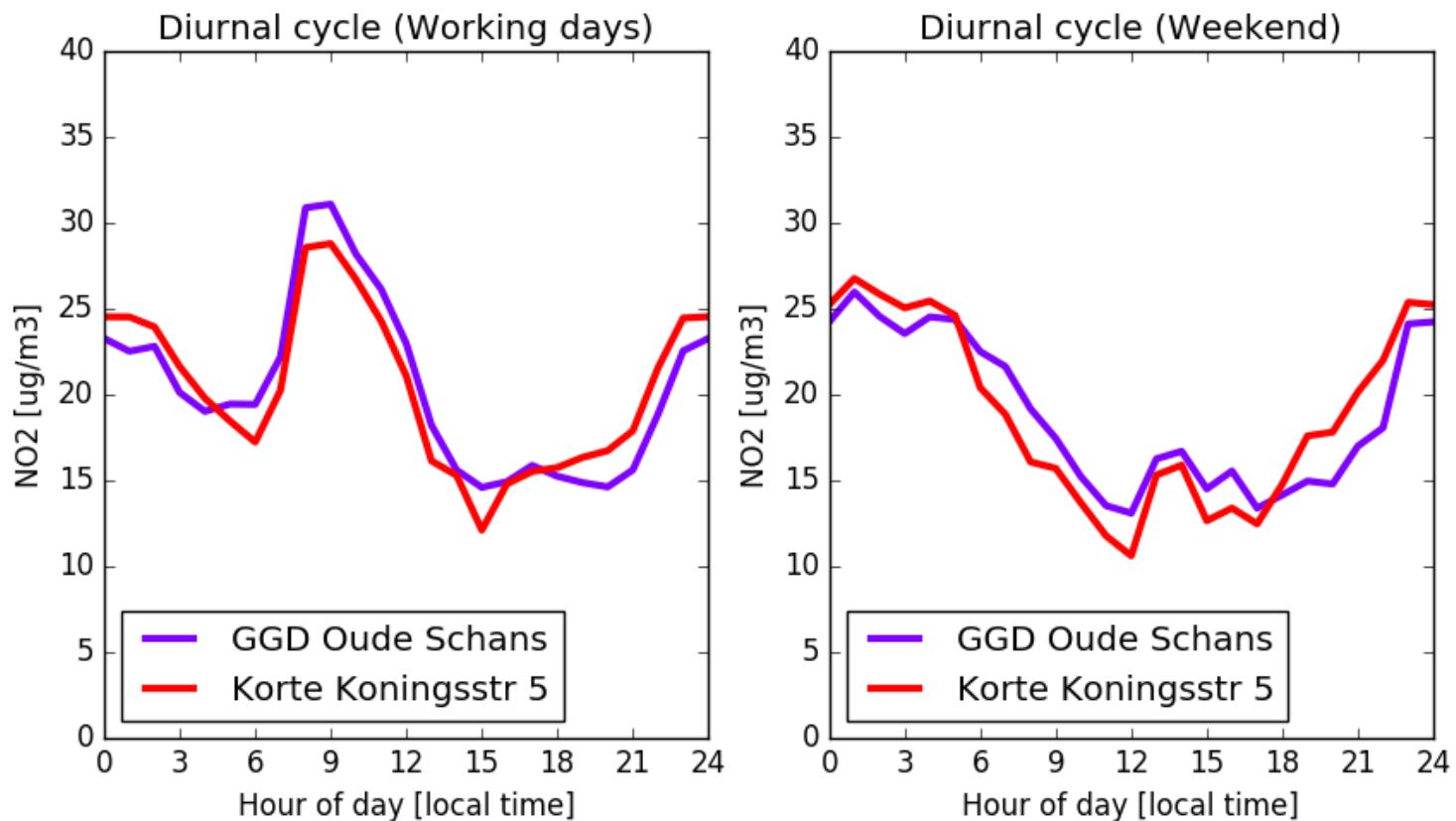
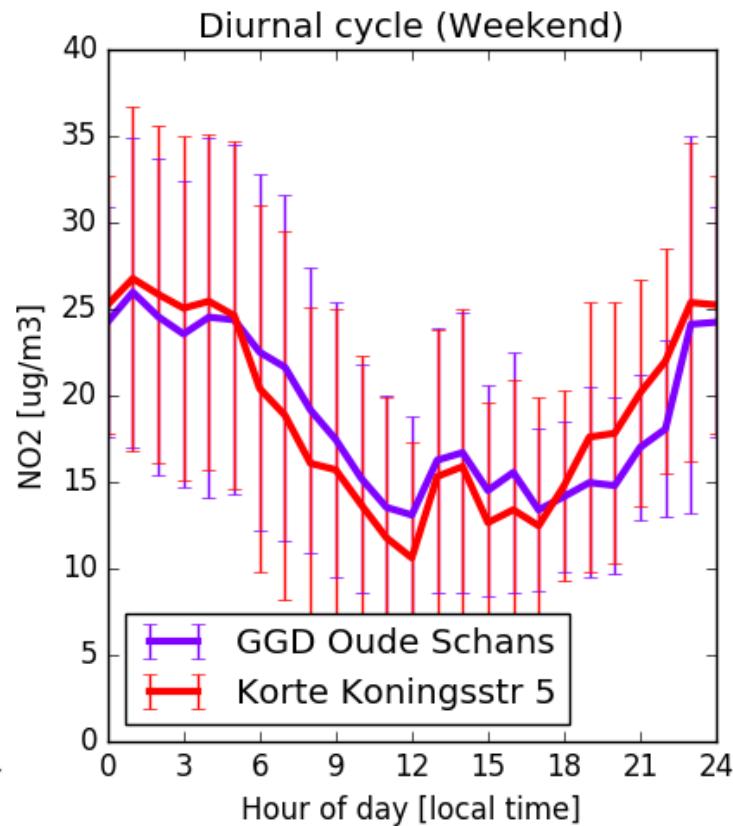
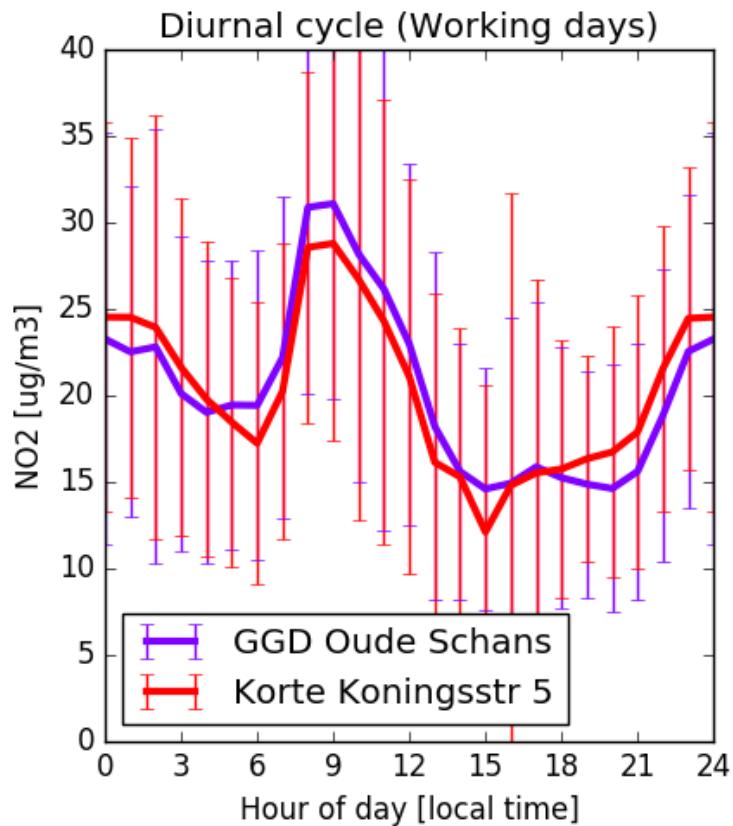


Fig. 1. Pollutant dispersion in a regular street canyon (Dabberdt et al., 1973).

Night time taxis



Night time taxis



Thank you!

Time for (more) questions

and discussion

and...

Try for yourself!

the sensor data can now be downloaded