GGD
Amsterdam

Kwaliteit van alternatieve meetmethoden.

Oscar Reinders

6 december 2017

Introductie

- Screenen van alternatieve methoden voor het meten van luchtkwaliteit.
  - Sensors.
  - Smart sensors.

- Wordt per sensor gekeken naar:
  - Onderlinge correlatie.
  - Correlatie met referentiemethode.
  - Onderhoud en kosten.

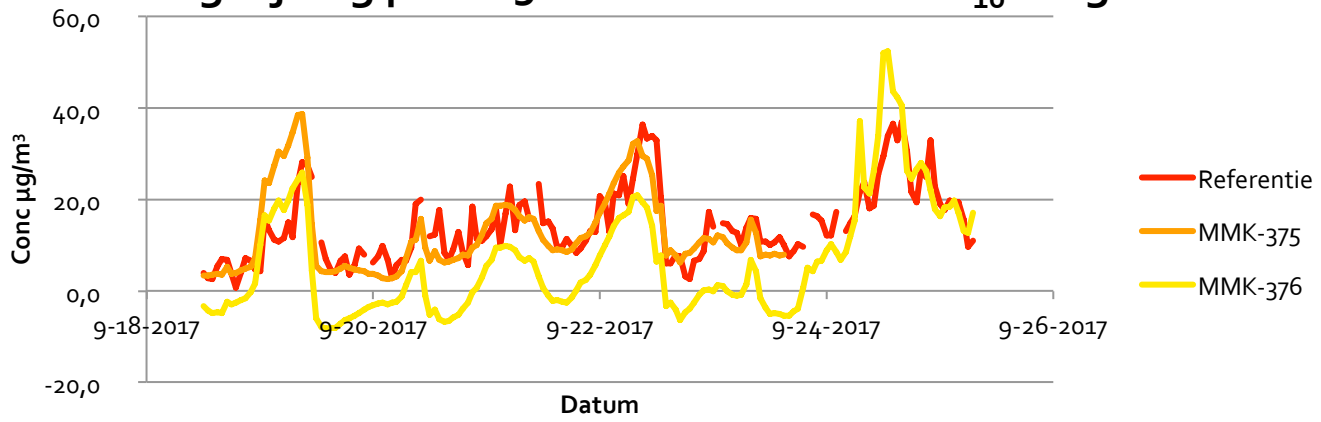
- Sensoren van:
  - GGD, DCMR en RIVM.
  - Universiteiten, stagiairs.

Thermo pDR-1500.

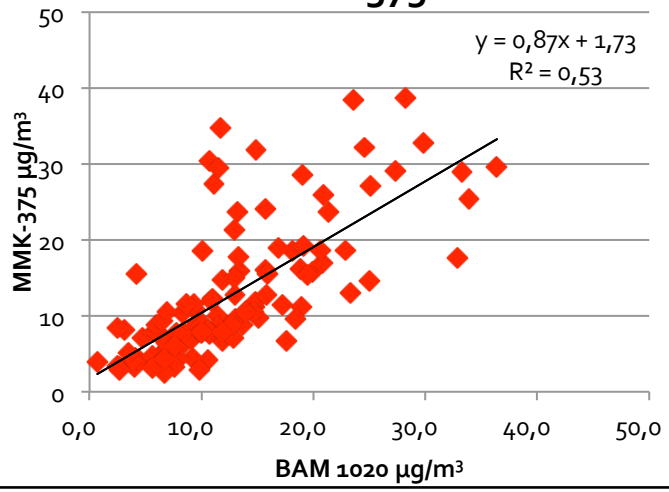
- Fijnstofmeter (PM_{10}, $PM_{2,5}$).
- €3500,-
- Geen smart sensor.
- Eenvoudig onderhoud.

Thermo pDR-1500.

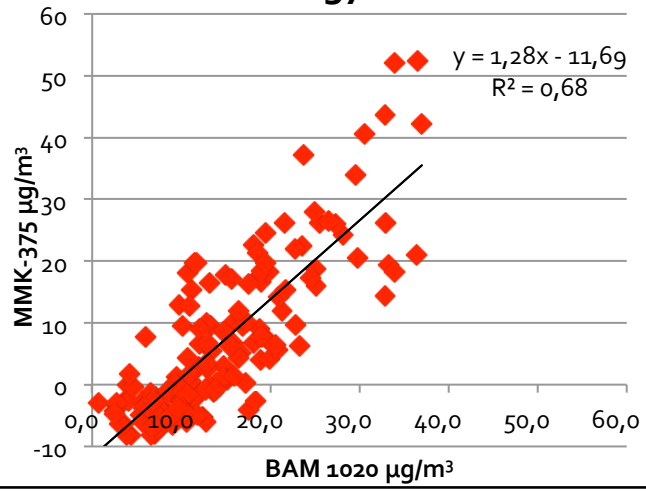
Vergelijking pDR-1500 met BAM 1020 PM_{10} uurgem.



Correlatie BAM 1020 met MMK-375.

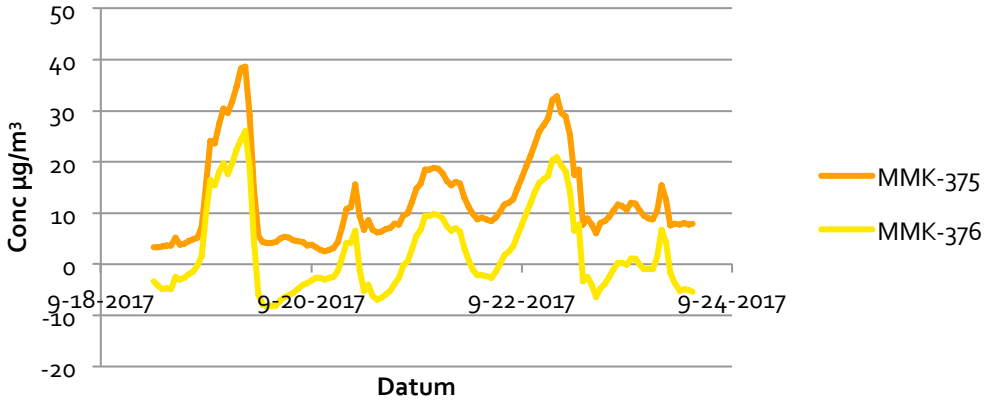


Correlatie BAM 1020 met MMK-376.

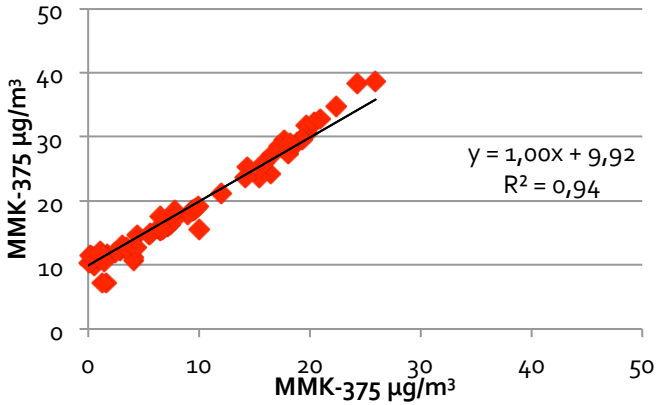


Thermo pDR-1500.

Vergelijking pDR-1500 onderling uurgem.



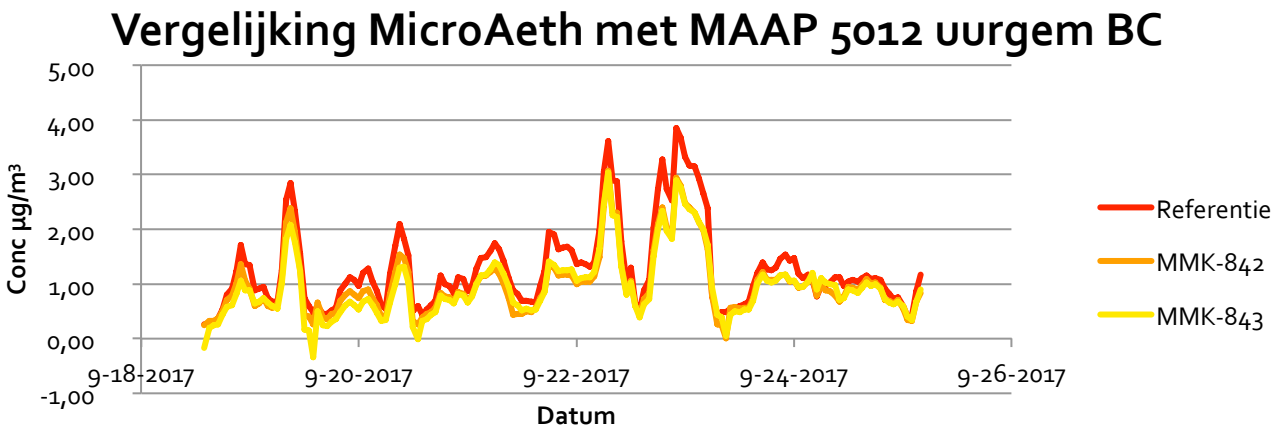
Correlatie MMK-375 en MMK-376.

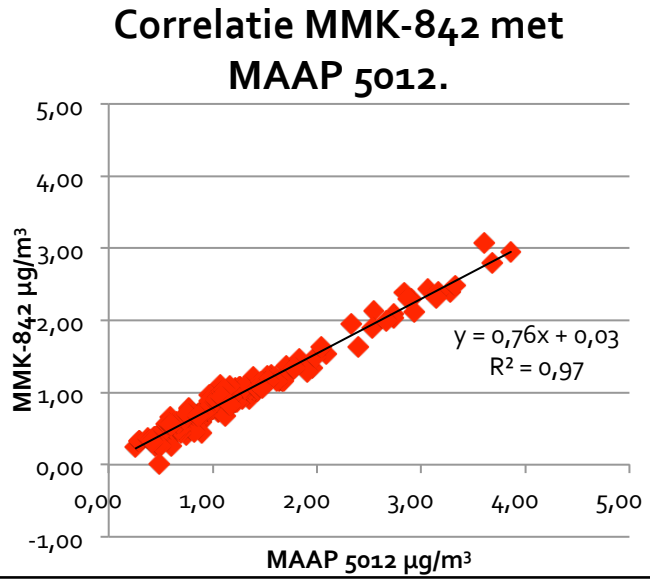


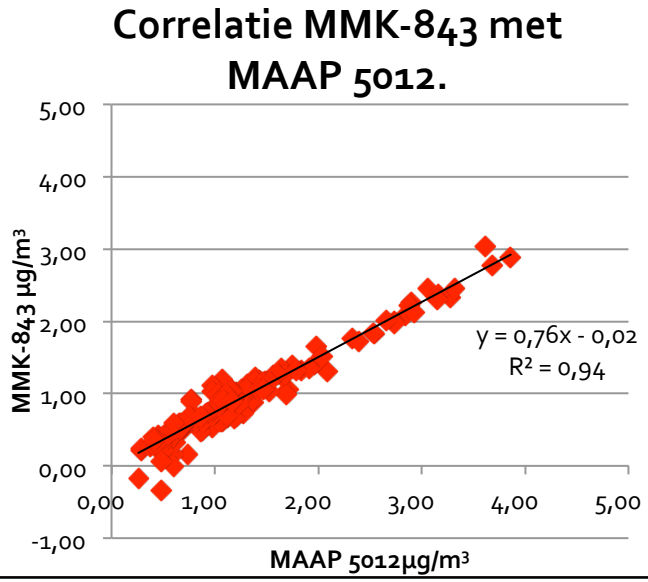
MicroAeth AE51 black carbon monitor.

- Roetmonitor.
- Gebruikt filters bij metingen.
- €6000,-
- Onderhoud.
- Geen smart sensor

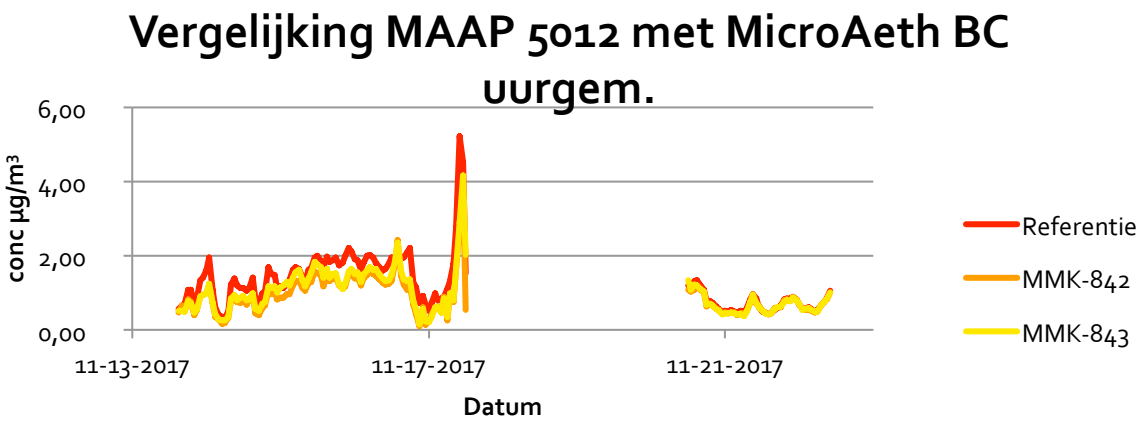
MicroAeth AE51 black carbon monitor.



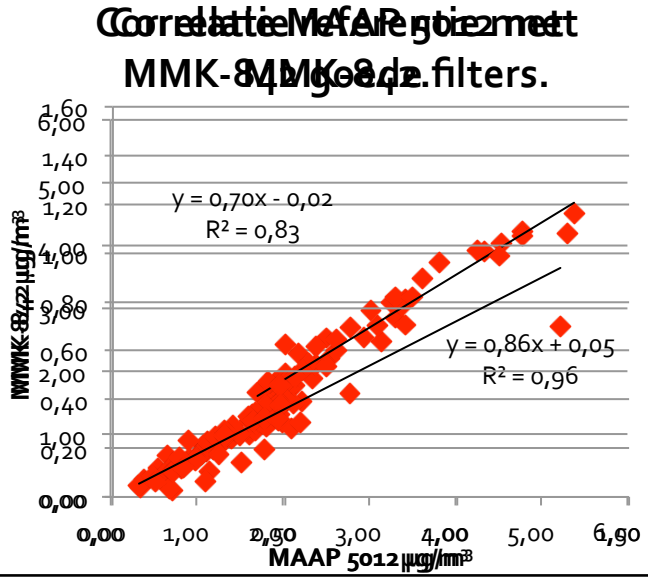


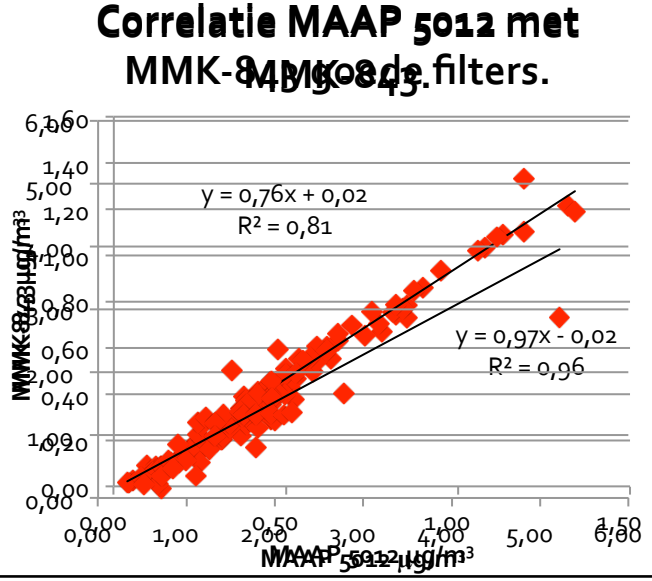


MicroAeth AE51 black carbon monitor.



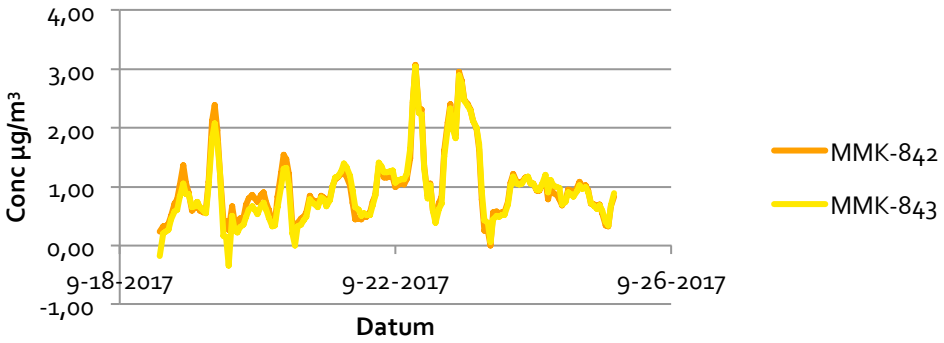
Metingen met vervuilde filters



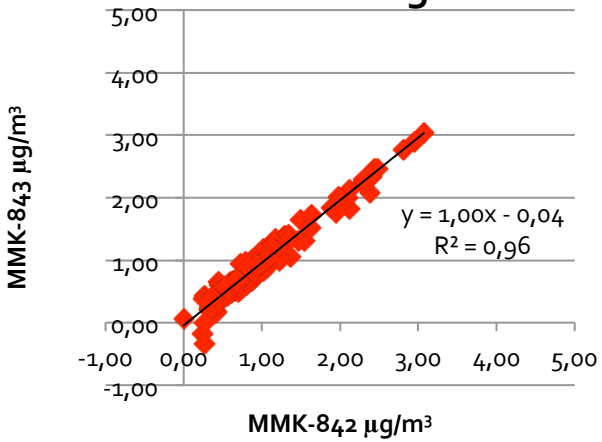


MicroAeth AE51 black carbon monitor.

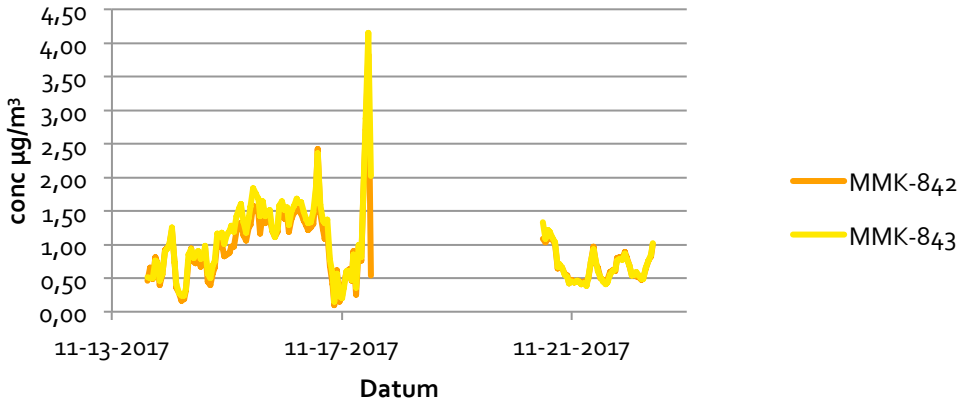
Vergelijking MicroAeth onderling BC uurgem.



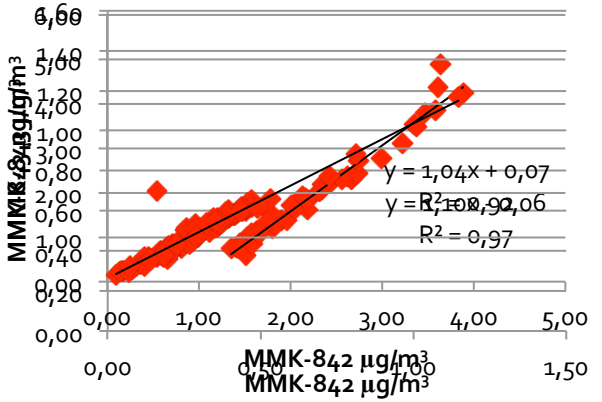
Correlatie MicroAeth onderling.



Vergelijking MicroAeth onderling BC uurgem.



Correlatie MicroAeth onderling gelijke filters.

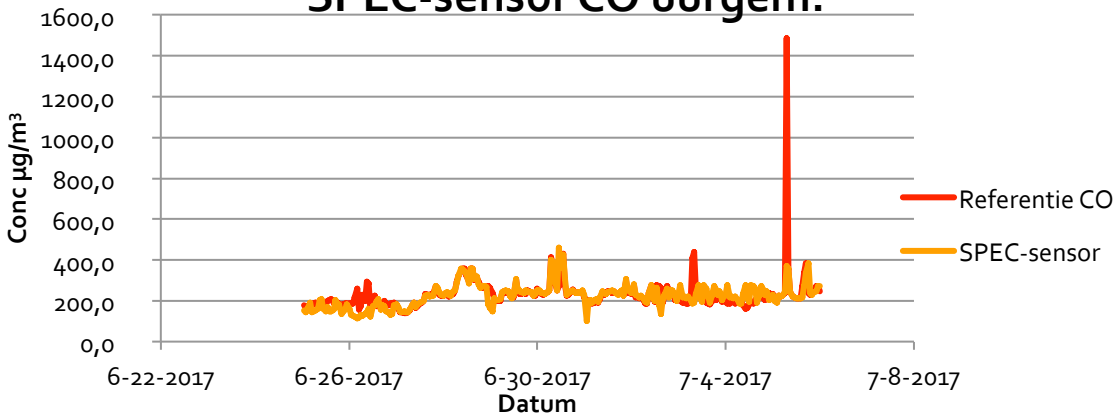


SPEC-sensor.

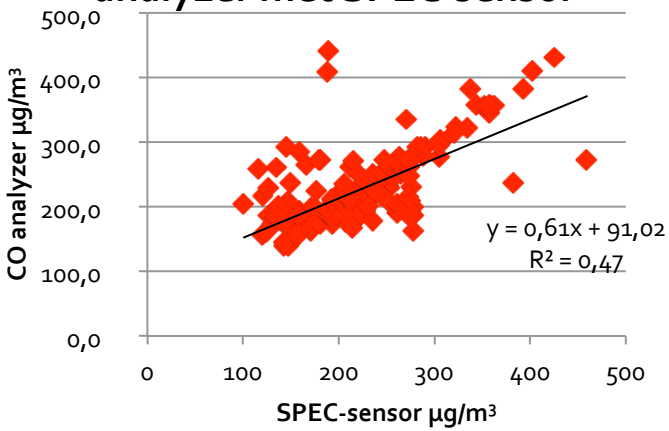
- Fontys greentechlab Venlo.
- Flexibel inzetbare sensor.
- Gemeten componenten:
  – CO, NO_2, O_3, $PM_{2,5}$, PM_{10}
- Smart sensor.

SPEC-sensor.

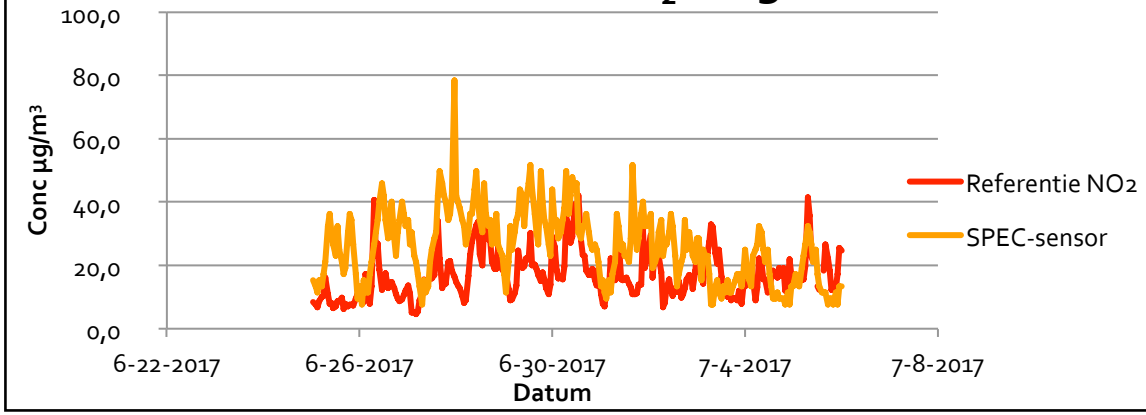
Vergelijking TELEDYNE CO analyzer met SPEC-sensor CO uurgem.



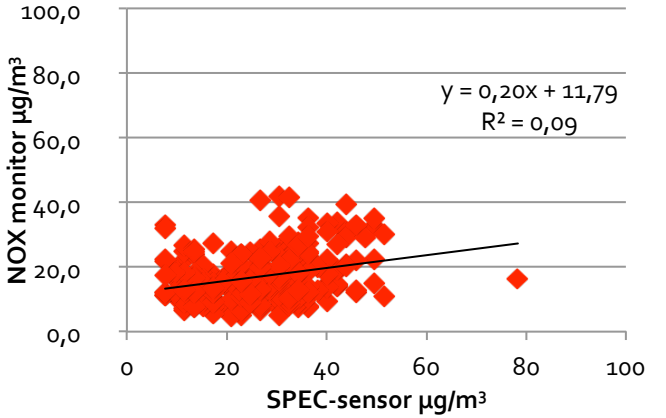
Correlatie TELEDYNE CO analyzer met SPEC-sensor



Vergelijking Envitec NOX monitor met SPEC-sensor NO_2 uurgem.

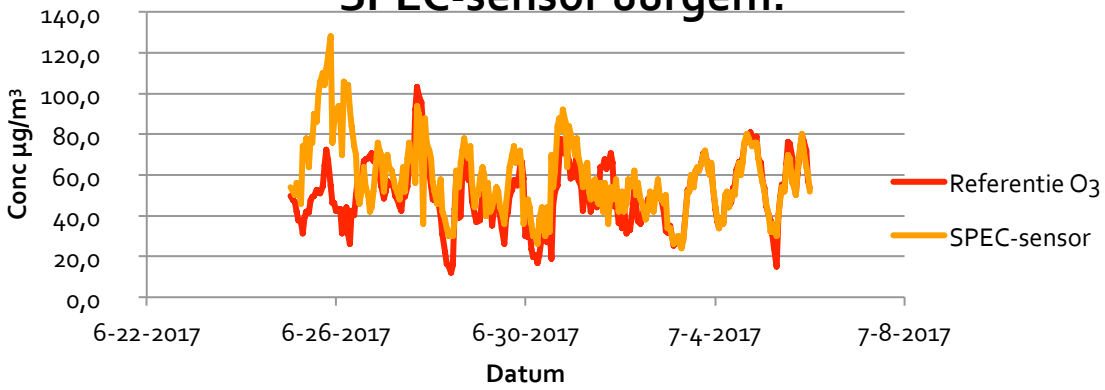


Correlatie Envitec NOX monitor met SPEC-sensor.

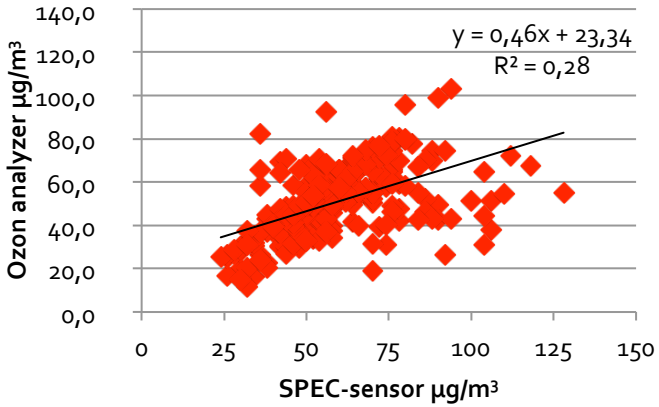


SPEC-sensor.

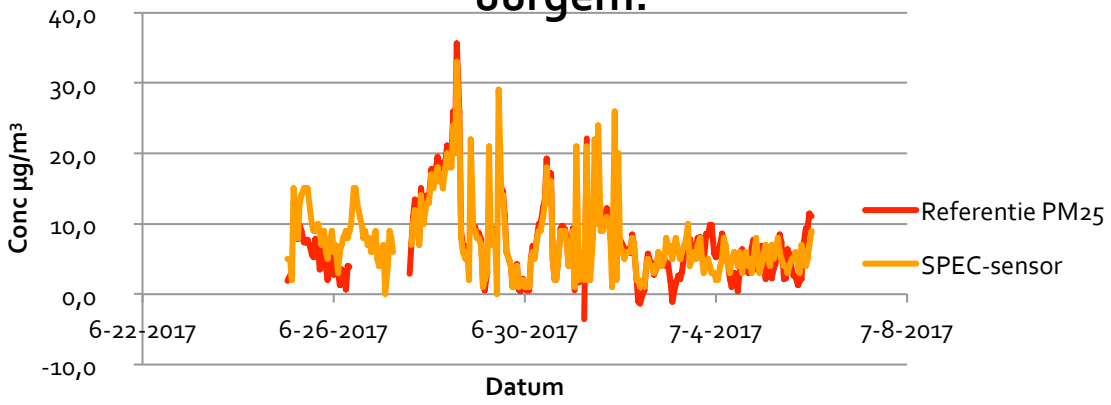
Vergelijking Thermo ozon analyser met SPEC-sensor uurgem.



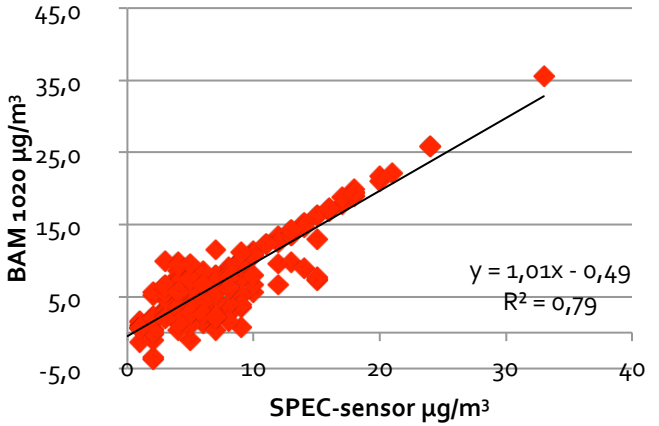
Correlatie Thermo ozon analyzer met SPEC-sensor.



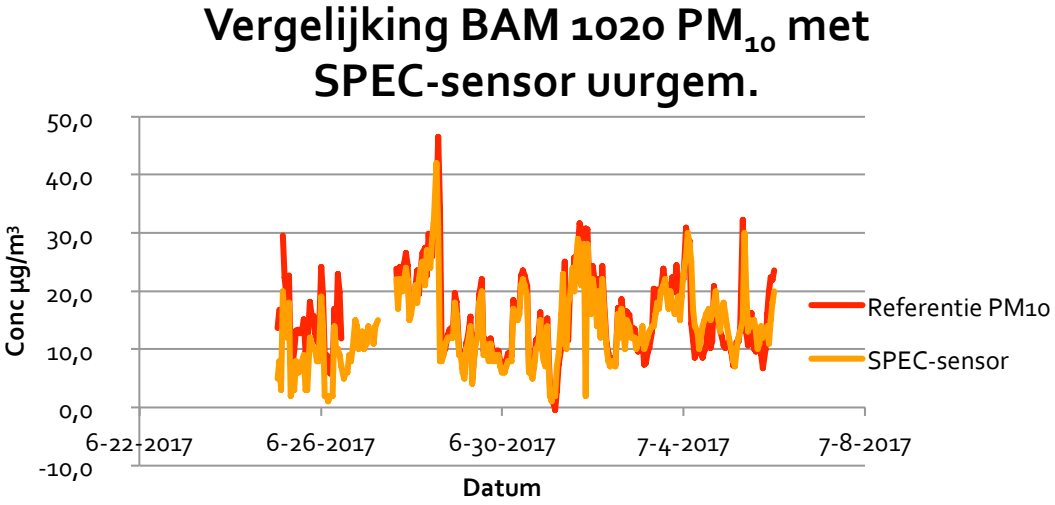
Vergelijking BAM 1020 $PM_{2,5}$ SPEC-sensor uurgem.

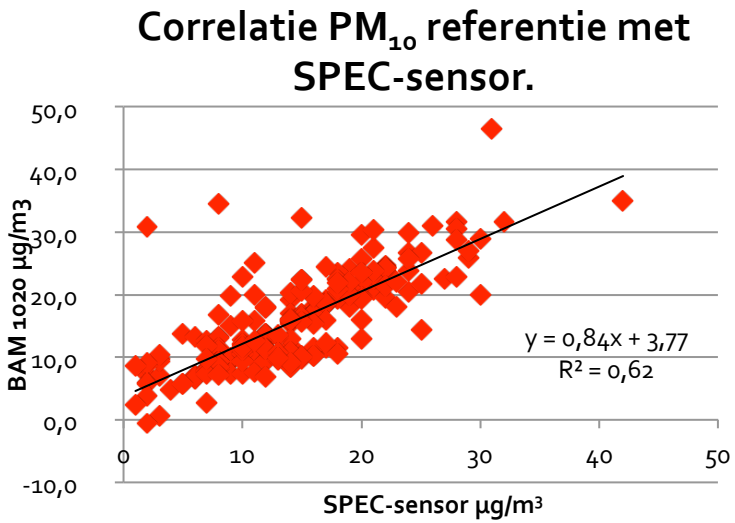


Correlatie BAM 1020 $PM_{2,5}$ referentie met SPEC-sensor.



SPEC-sensor.


Vergelijking BAM 1020 PM10 met SPEC-sensor uurgem.
Conc µg/m³
50,0
40,0
30,0
20,0
10,0
0,0
-10,0
6-22-2017
6-26-2017
6-30-2017
7-4-2017
7-8-2017
Datum
Referentie PM10
SPEC-sensor

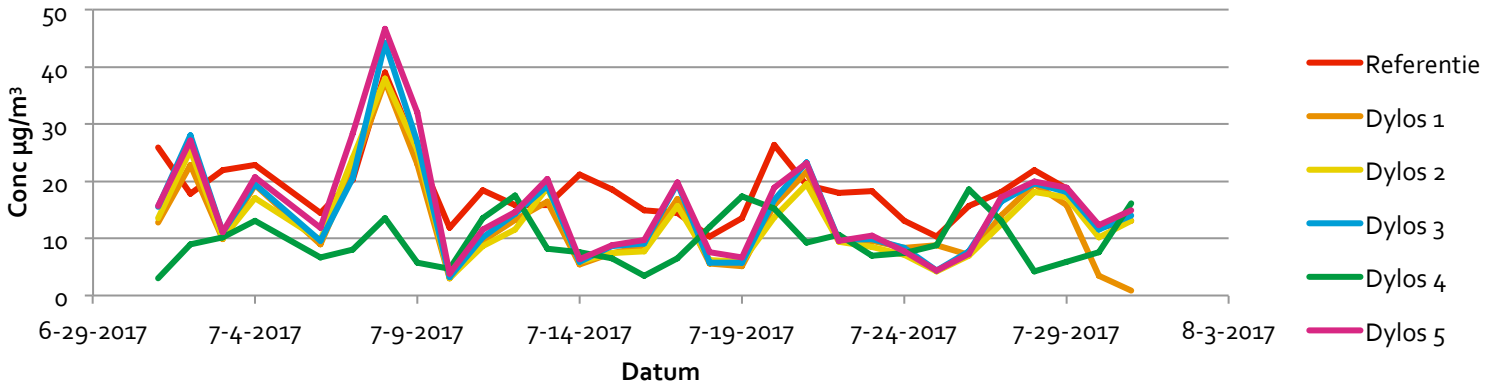

Correlatie PM10 referentie met SPEC-sensor.
BAM 1020 µg/m3
50,0
40,0
30,0
20,0
10,0
0,0
-10,0
0
10
20
30
40
50
SPEC-sensor µg/m³
y = 0,84x + 3,77
R² = 0,62

Dylos DC-1700

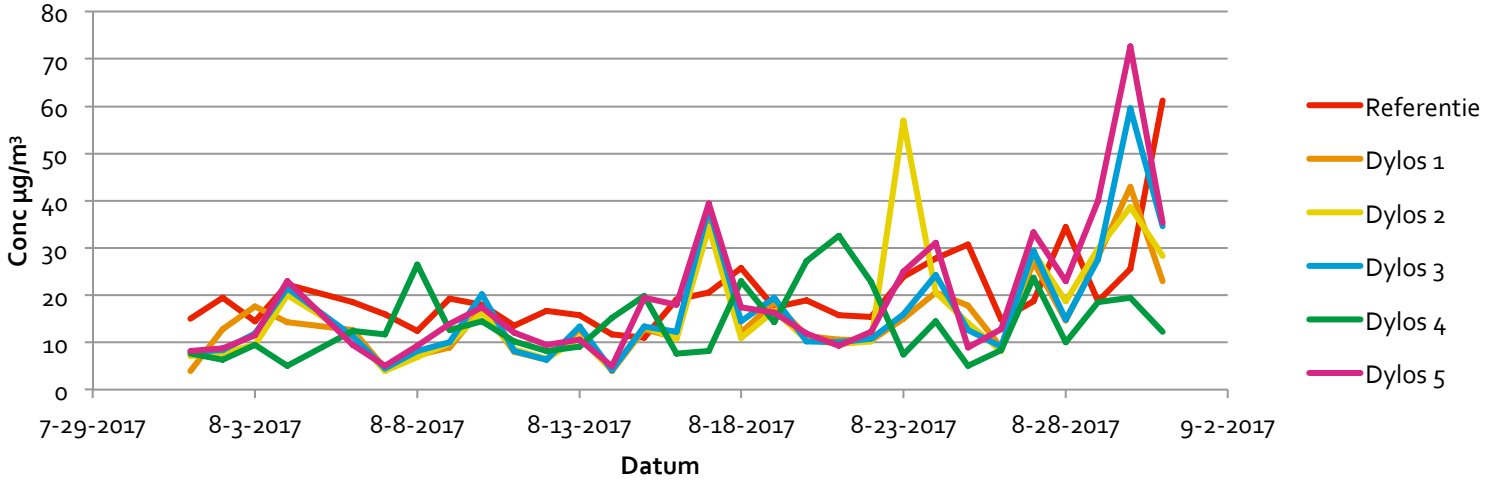
- DCMR.
- Fijstofmeter $PM_{2,5}$
- €750,-
- Onderhoud.
- Smart sensor.

Dylos DC-1700.

Vergelijking Dylos met kfg filters juli 2017 daggem $PM_{2,5}$.

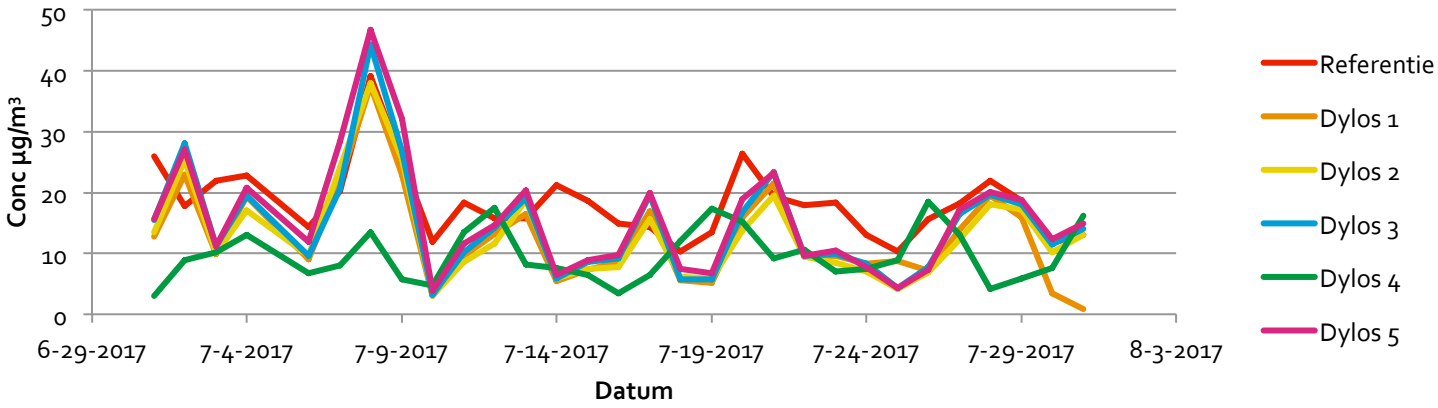


Vergelijking Dylos met kfg filters aug 2017 daggem $PM_{2,5}$.



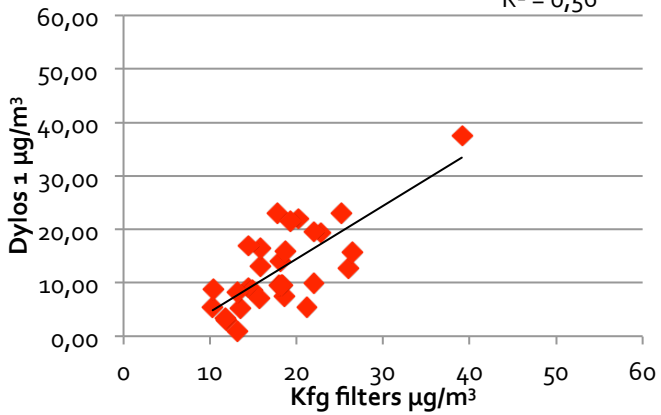
Dylos DC-1700.

Vergelijking Dylos met kfg filters juli 2017 daggem $PM_{2,5}$.



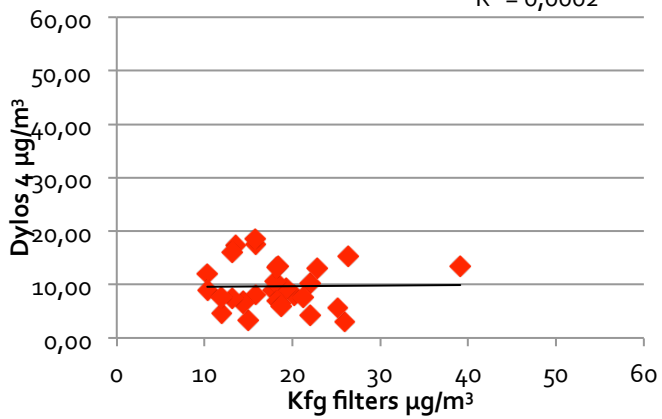
Correlatie kfg filters met Dylos 1

y = 0,99x - 5,37
R^2 = 0,56



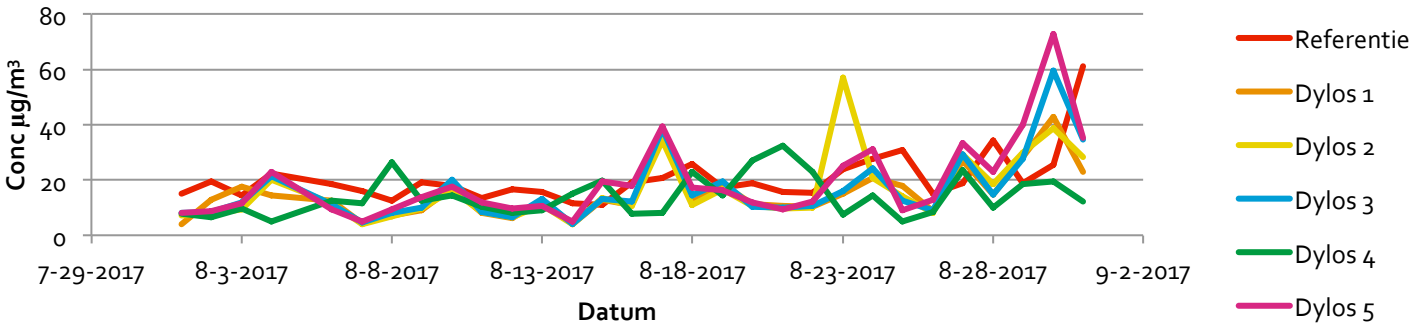
Correlatie kfg filters met Dylos 4

y = 0,011x + 9,46
R^2 = 0,0002

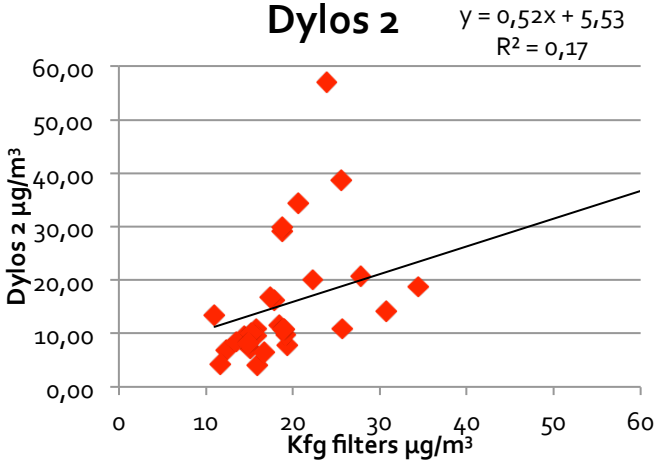


Dylos DC-1700.

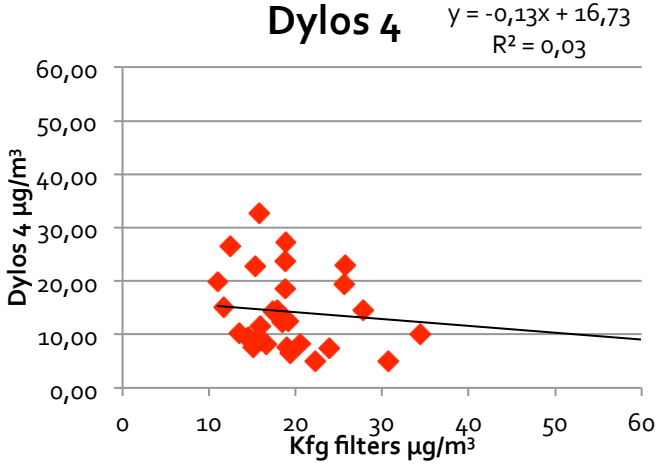
Vergelijking Dylos met kfg filters aug 2017 daggem $PM_{2,5}$.



Correlatie kfg filters met Dylos 2



Correlatie kfg filters met Dylos 4

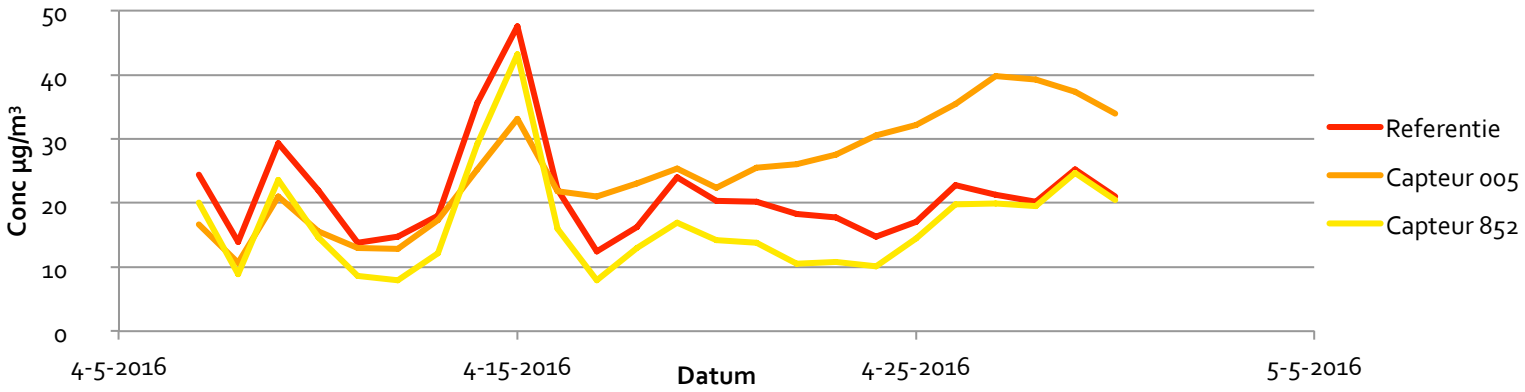


Cairpol.

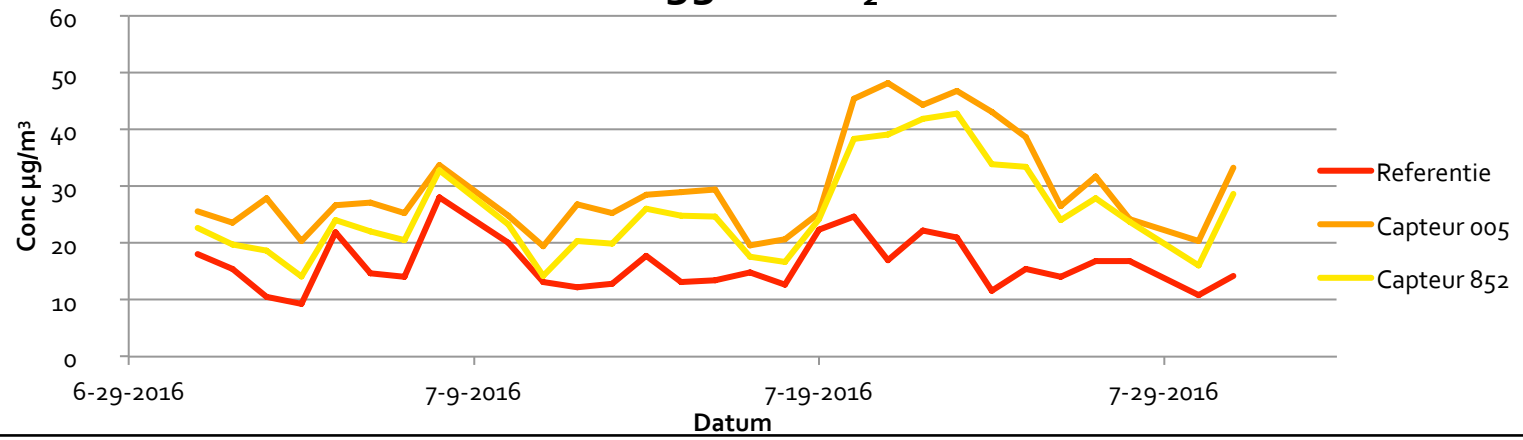
- Cairpol.
- Flexibel inzetbare sensor.
- Componenten gemeten:
  – NO_2, VOC, H_2S
- €3500,-
- Smart sensor.

Cairpol.

Vergelijking Cairpol met Envitec NOX monitor april 2016 daggem NO_2.

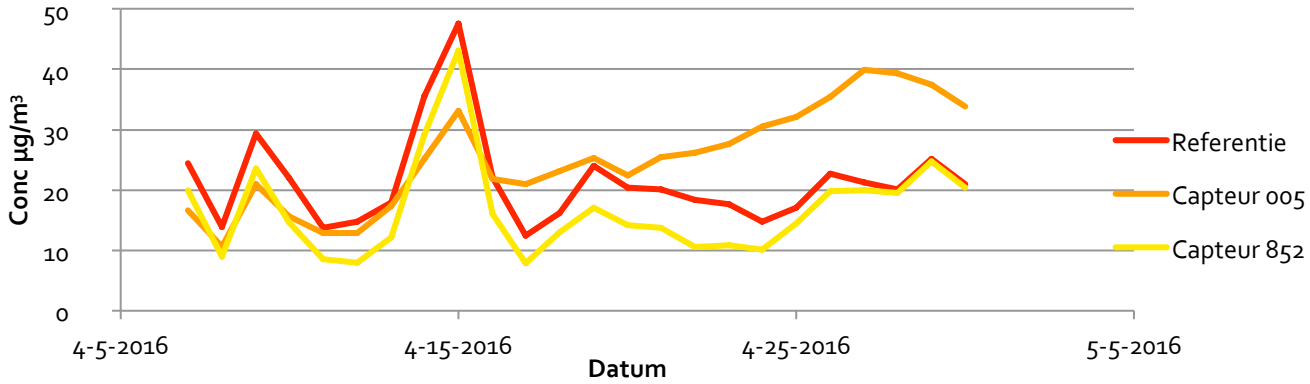


Vergelijking Cairpol met Envitec NOX monitor juli 2016 daggem NO_2.

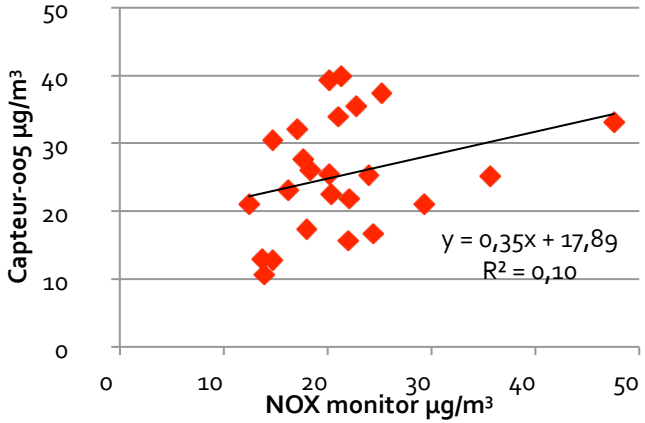


Cairpol.

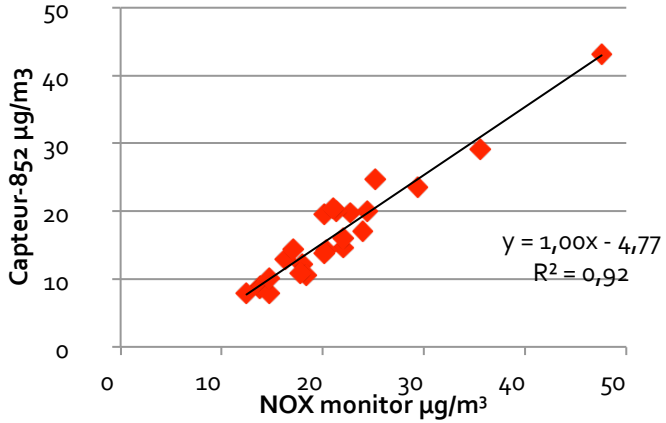
Vergelijking Cairpol met Envitec NOX monitor april 2016 daggem NO_2.



Correlatie Capteur-005 met Envitec NOX monitor.

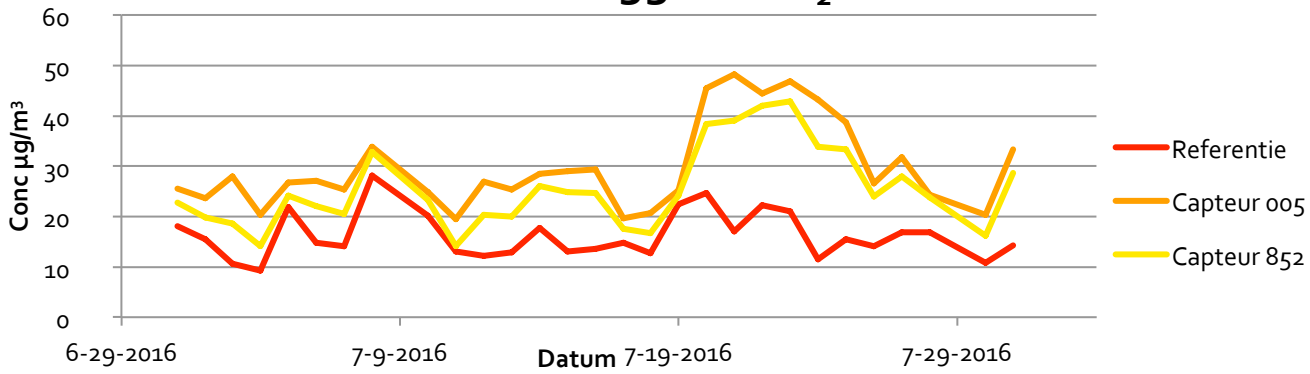


Correlatie Capteur-852 met Envitec NOX monitor.

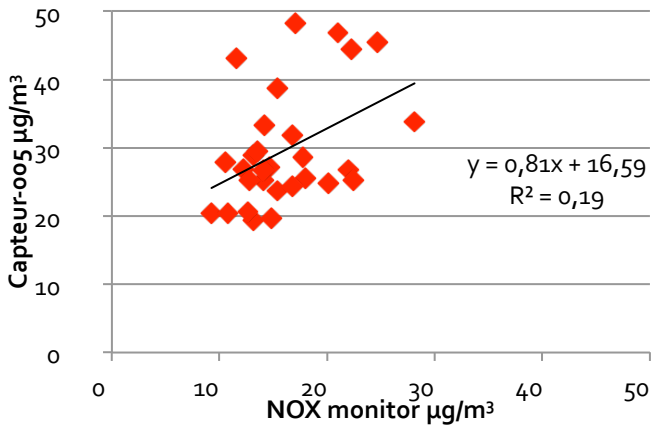


Cairpol.

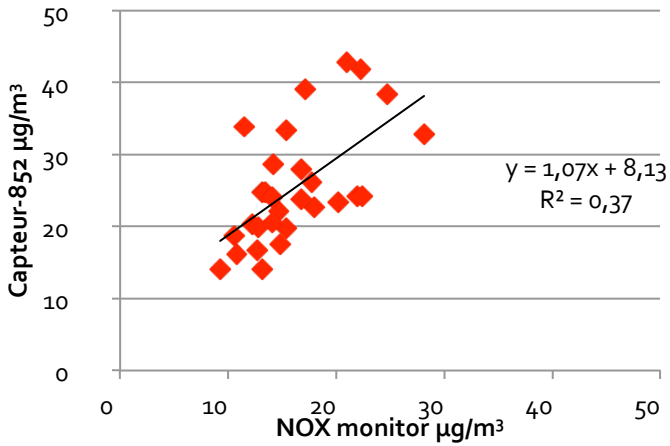
Vergelijking Cairpol met Envitec NOX monitor juli 2016 daggem NO_2.



Correlatie Capteur-005 met Envitec NOX monitor.

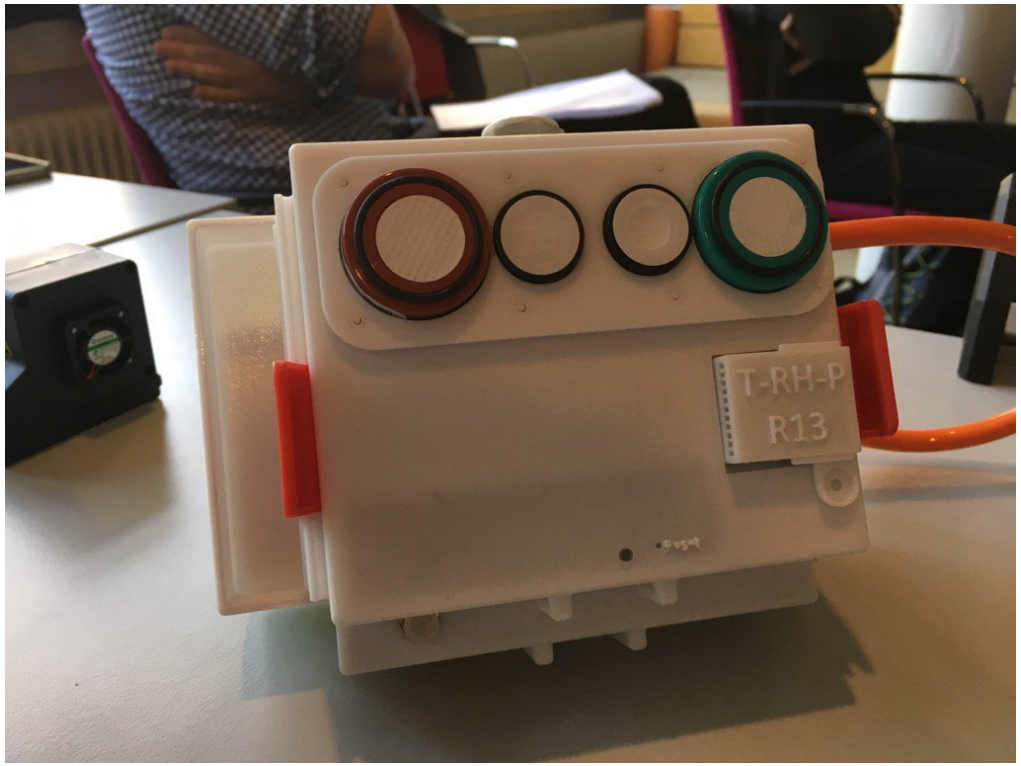


Correlatie Capteur-852 met Envitec NOX monitor.

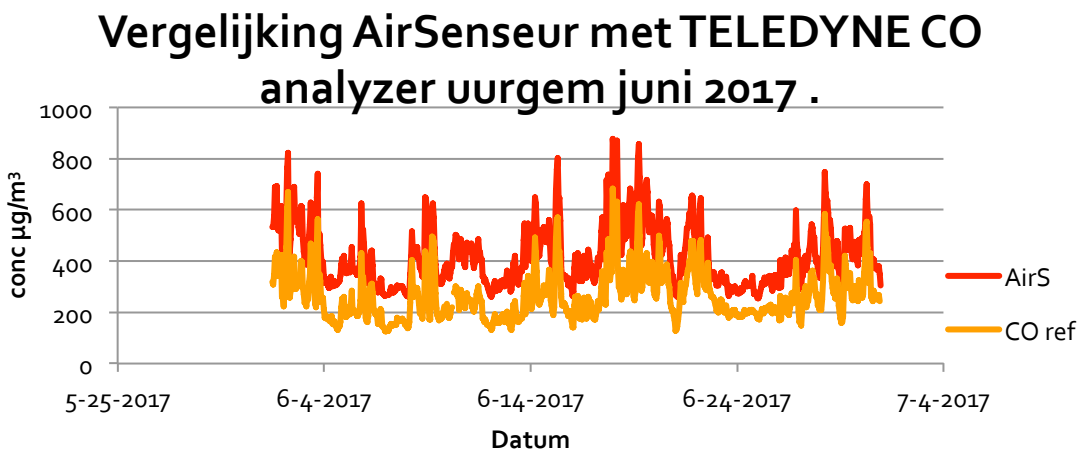


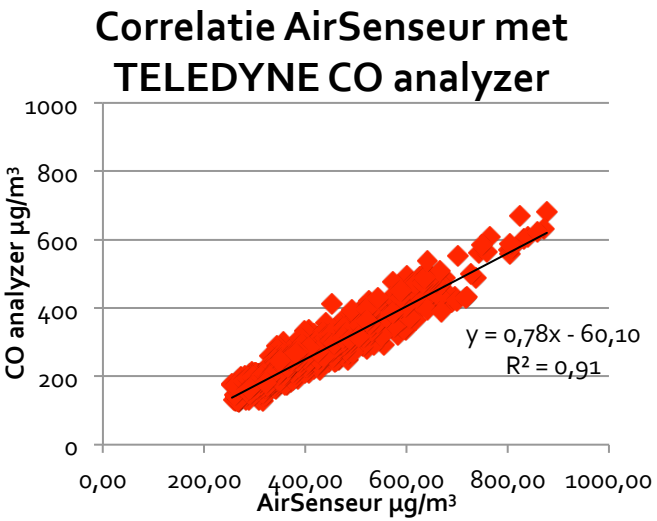
AirSenseur.

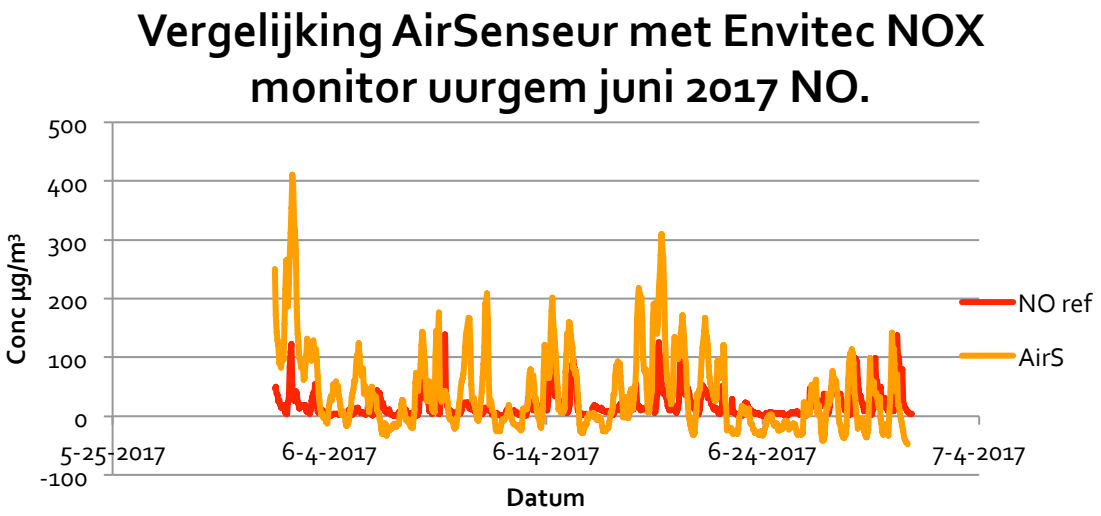
- RIVM.
- Flexibel inzetbare sensoren.
- €1200,-
- Onderhoud.
- Smart sensor.

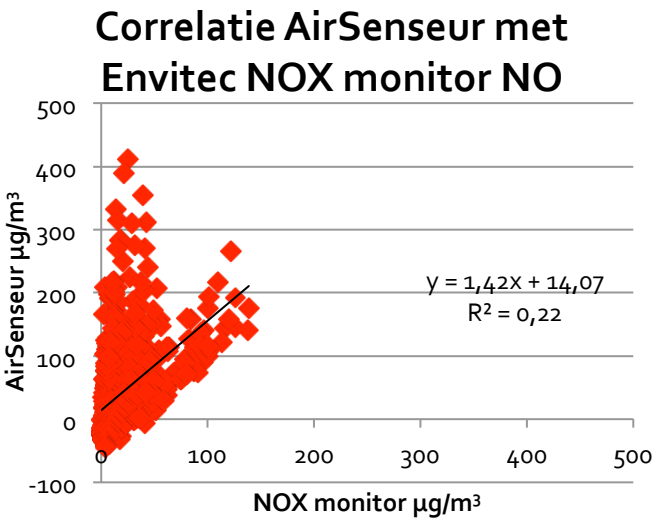


AirSenseur.

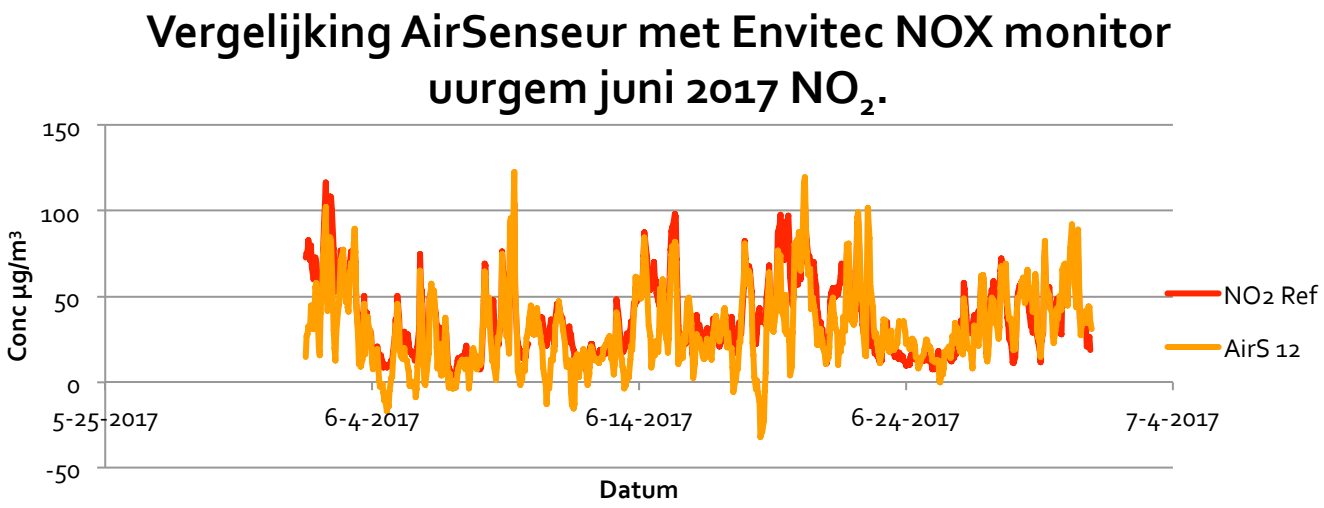

Vergelijking AirSenseur met TELEDYNE CO analyzer uurgem juni 2017 .
conc µg/m³
1000
800
600
400
200
0
5-25-2017
6-4-2017
6-14-2017
6-24-2017
7-4-2017
Datum
AirS
CO ref

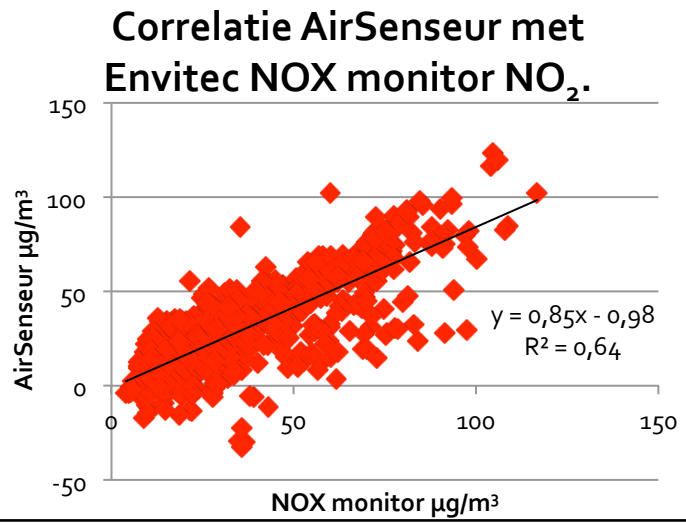

Correlatie AirSenseur met TELEDYNE CO analyzer
CO analyzer µg/m³
1000
800
600
400
200
0
0,00
200,00
400,00
600,00
800,00
1000,00
AirSenseur µg/m³
y = 0,78x - 60,10
R² = 0,91


Vergelijking AirSenseur met Envitec NOX monitor uurgem juni 2017 NO.
Conc µg/m³
500
400
300
200
100
0
-100
5-25-2017
6-4-2017
6-14-2017
6-24-2017
7-4-2017
Datum
NO ref
AirS


Correlatie AirSenseur met Envitec NOX monitor NO
AirSenseur µg/m³
500
400
300
200
100
0
-100
0
100
200
300
400
500
NOX monitor µg/m³
y = 1,42x + 14,07
R² = 0,22

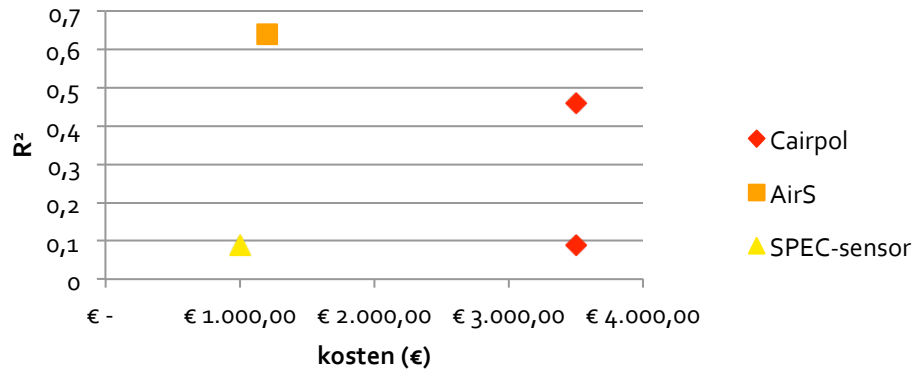
AirSenseur


Vergelijking AirSenseur met Envitec NOX monitor uurgem juni 2017 NO_2.
150
100
50
0
-50
Conc µg/m³
5-25-2017
6-4-2017
6-14-2017
6-24-2017
7-4-2017
Datum
NO2 Ref
AirS 12


Correlatie AirSenseur met Envitec NOX monitor NO_2.
150
100
50
0
-50
AirSenseur µg/m³
0
50
100
150
NOX monitor µg/m³
y = 0,85x - 0,98
R² = 0,64

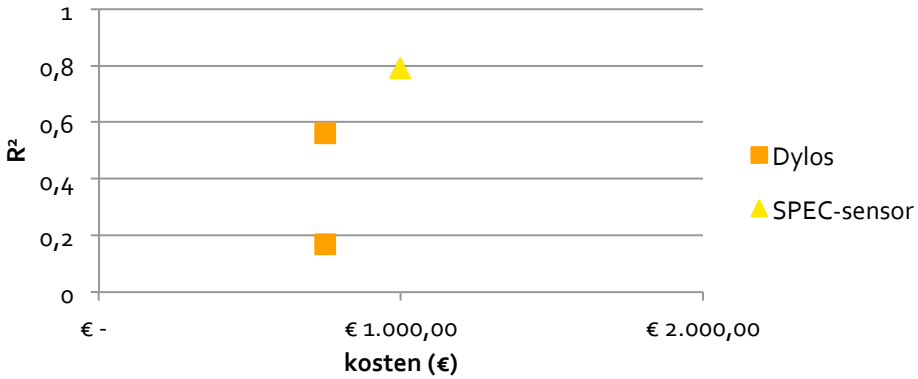
Vergelijking van sensoren.

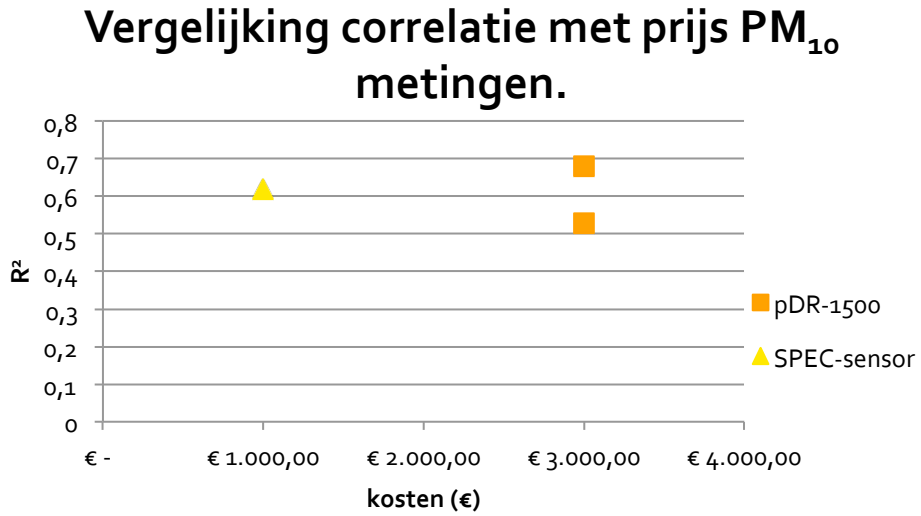
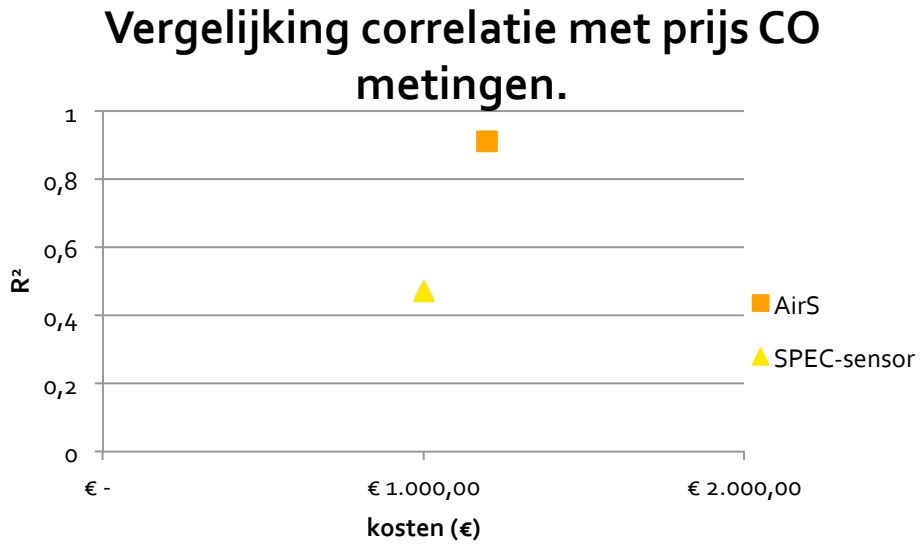
Vergelijking correlatie met prijs NO_2 metingen.



Range Cairpol na een maand: 0,46-0,09
Gemiddelde per sensor met eerste maand:
Capteur-005: 0,10
Capteur-852: 0,37

Vergelijking correlatie met prijs $PM_{2,5}$ metingen.



Range Dylos na eerste maand zonder Dylos 4: 0,14-0,56

Vergelijking van sensoren