University of Stuttgart

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[UC]²: B-3DO

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TEST RESULTS OF LOW COST SENSORS FOR PARTICULATE MATTER AND GASES FOR THE DETERMINATION OF OUT DOOR AIR QUALITY

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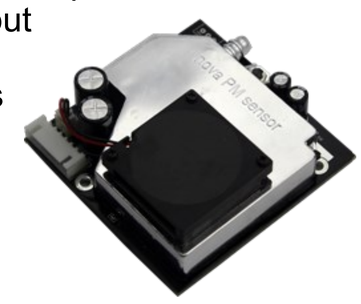
Introduction

Particulate Matter Low-cost sensors SDS011 and OPC-N2 and gas sensors

PM Low-cost sensor SDS011

Company Nova Fitness
Laser light scattering principle
PM10 and PM2.5 output
0.3—10 µm
Response time: < 10 s
0.0 — 999.9 µg /m^3
-10 ~ +50 °C
0 — 95 %RH
Costs: ~ 25 €



PM Low-cost sensor OPC-N2

Company Alphasense
Laser light scattering principle
PM10, PM2.5, PM1 output
16 channels for 1/volume
0.37 —17 µm
< 105 g
-10 ~ +50 °C
0 to 99 %RH
Costs: ~ 300 €

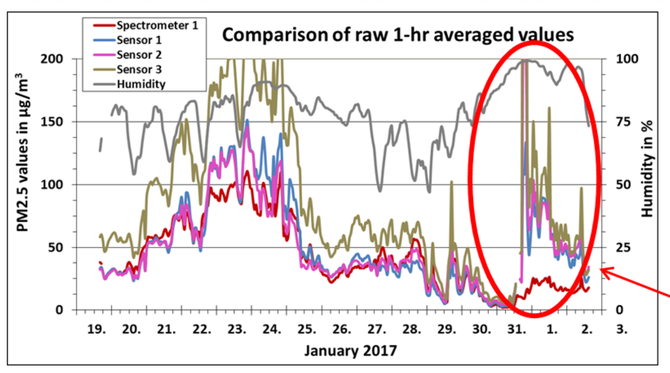
www.alphasense.com

Gas sensors

Company alphasense
Company Membrapor
Electrochemical cells
NO_2, NO, O_3, CO
Response time: < 60 s
-30 ~ +40 °C
15 to 85 %RH
Costs: ~ 50 € per sensor

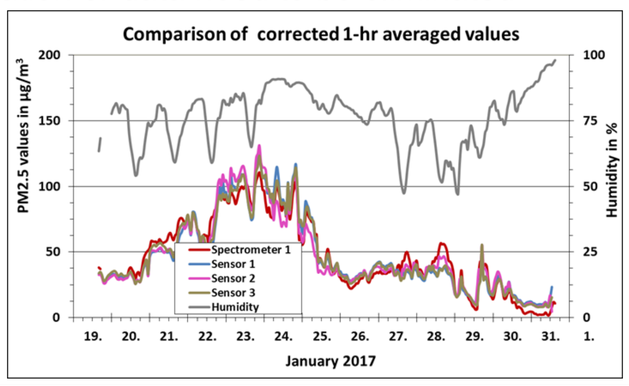
PM Low-cost sensors SDS011 versus aerosol spectrometer FIDAS 200, Palas

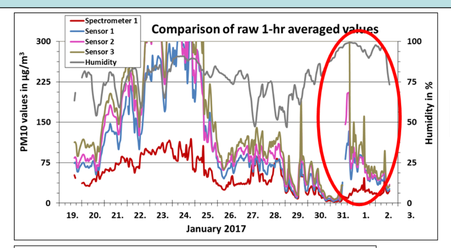
Low-cost sensors show same temporal course, but need to be corrected by comparing to aerosol spectrometer
Humidity has an enormous influence on the results -> either compensation or data need to be eliminated



PM2,5

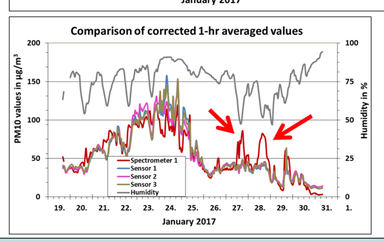
Influence of humidity





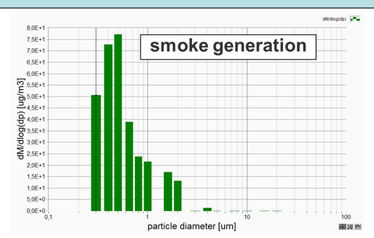
PM10

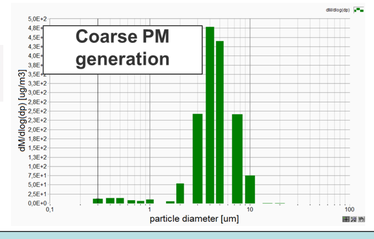
Influence of humidity

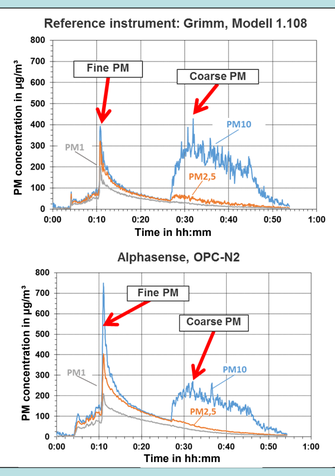


Results

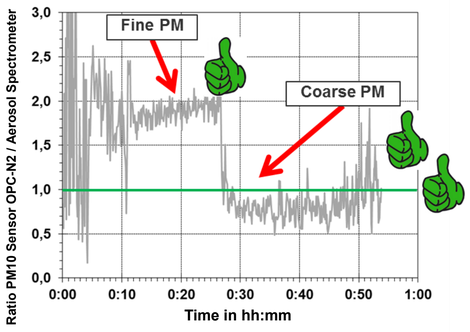
PM Low-cost sensors OPC-N2 versus aerosol spectrometer 1.108, Grimm

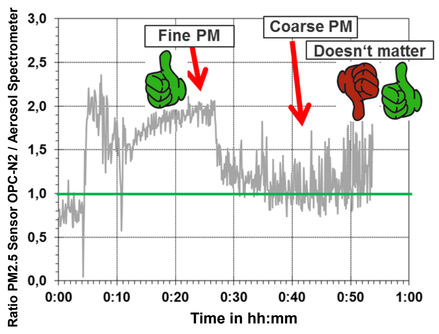


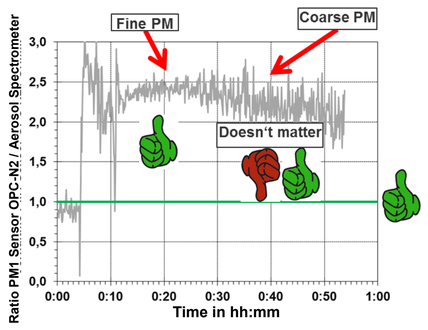




OPC-N2 is very suitable for making measurements, but need to be corrected by comparing to aerosol spectrometer. Influence of humidity!

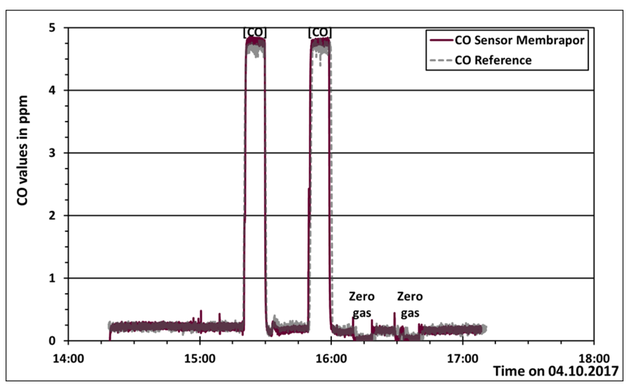




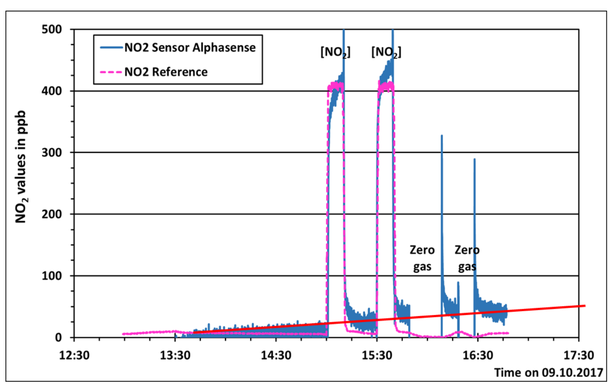


Gas sensors versus reference instruments-NDIR, chemiluminescence, UV absorption

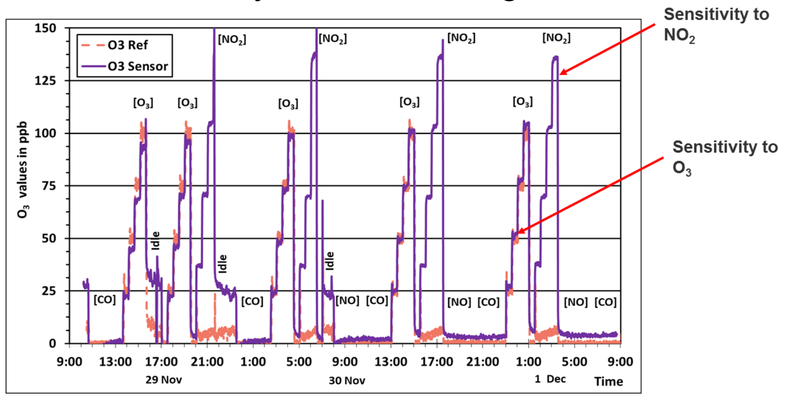
Good agreement for CO sensor



Drift of NO_2 sensor



Cross sensitivity of O_3 sensor against NO_2



Conclusions / Further work

- SDS011 can be used for PM2.5, but not for PM10 measurements
- OPC-N2 is very suitable for PM measurements
- PM sensors: Humidity influence need to be eliminated: drier?
- Gas sensors: Cross sensitivities to other gases and dependencies of the signals from temperature, humidity and pressure need to be determined.

Acknowledgements

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