

#### Development of a new measuring bike for mapping dust levels in urban environments: the Aeroflex bike

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### **Presentation overview**

- Introduction
- Some history...
- The Aeroflex bike
- A case study in Mol
- Conclusions and future work



### Introduction

- Traffic related air pollution is one of the major concerns in most cities
  - Associations between living near major motorways and health effects have been demonstrated
  - In a city, people are exposed to higher concentrations because of the proximity of traffic
- Fixed Air Quality monitoring stations have several limitations to assess peoples real life exposure to (ultra) fine particles and other traffic related air pollutants
  - Limited number in a city
  - Reference monitors: high quality, relative long time resolution, cost
  - High spatial and temporal variation of ultrafine particles

Aeroflex measuring bike : A mobile measuring platform to measure a.o. PM, BC and UFP concentrations resulting in concentration maps. This is a complementary tool for (local) policy makers and researchers



## Some history...





- Synchronisation and plotting semi automatic (excell, macro, surfer)





transmission

### Aeroflex measuring bike



### Methodology



#### **User interface**





## **Aeroflex:** applications

- Applications
  - Personal exposure monitoring
  - Identifying hot spots: mapping in urban (and industrial) environments
  - The results can be used to support local policies: mobility plans and road infrastructure in relation to pollution issues
- Aims:
  - The tool can be used in research both by experts in the field as by others (e.g. local administrations)
  - The results can be used in communications to the general public



### Case study: aim

- To test the mobile dust mapping tool: integration and datacommunication, transmission
- To test the use of a combined mobile measuring device to assess the spatial variation of the air quality within a city and to measure personal exposure
- To evaluate the BC measuring device (µ Aethalometer, Magee) in this platform
- Evaluate if the mapping tool can be used by non-experts



### **Case study: measurement set-up**





Zone	color		Street
1	red	Major regional (access)road 13000vehicles per day Open location Cycling lane separated by parking lane 'heavy traffic'	Turnhoutsebaan
			Statiestraat
2	yellow	'streetcanvon' like	Laar
		Cycling lane on the road 'heavy traffic'	Graaf de Broquevillestraat
3	green	Similar to zone 2	Voogdijstraat
		Somewhat less traffic than 2 Cycling lane next to the road 'moderate traffic'	Rozenberg
4	purple	Less traffic than normal due to road works at the ring road 'Moderate to low' traffic	Molderdijk
5	orange	Open green location low traffic	Kleinendijk
			Rode Kruislaan
			Martelarenstraat
6	blue	Streetcanyon like (mostly)	Gasstraat
		moderate traffic	Gasthuisstraat
		(less than 2 and 3) Cycling lane next to road	Rondplein
			Corbiestraat
			Statieplein

### Case study: measurement set-up

- 20 datasets including 6 zones each
- 10 measurement days
- Duration of one trip: 41 59 minutes
- Various meteo conditions (measured at nearby monitoring site)
  - Wind direction: S, N, NE, W, E
  - T: 9 18 °C
  - RH: 35 93%
- Measurements were not performend during morning or evening rush hours
- PM, UFP (PNC), BC



### **One route: time profile**





### BC, UFP and $PM_{10}$ for different zones







## **Correlation of concentrations during 1 day**



### **Correlations of BC and PM<sub>2.5</sub> vs PNC**



 $\rightarrow$  A better R<sup>2</sup> with PNC was found for BC compared to PM<sub>2.5</sub>



# Conclusions and on-going work

- Measuring bike showed to have a good potential for screening and hot spot mapping in urban environments
  - Extension with BC monitor was succesfull
  - A smartphone as platform is replaced by netbook
- Case study showed:
  - High spatial variation of BC and UFP, more regional contribution of PM<sub>10</sub>, PM<sub>2.5</sub>
  - Correlation between BC and UFP
- Current and future work:
  - Integration of other sensors (sound level monitor and acceleration sensor) and AQ sensors
  - Improving non-expert availability
  - Web-based application
  - Further development of measurement methodology



## **THANK YOU !**

