An Alternative Techniques to Estimate Road Traffic Emissions

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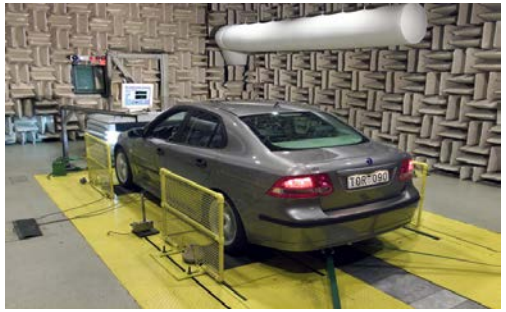
Vehicle emissions monitoring

Exhaust pipe flux

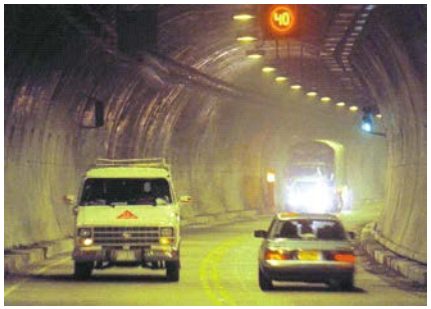


Dynamometer

On-board

- Expensive
- Limited number of pollutants
- Small vehicles sample

Ambient concentrations



Tunnel

Inverse modelling

- Site specific
- Uncertainties associated to the dispersion model used

Motivation

Road traffic is one of the main sources of pollution in cities

Existing methods to assess road traffic emissions are expensive and not always accurate

It results difficult for a developing country to afford the existing techniques

Objective

The aim of this work was to develop and to implement an alternative and cost effective techniques to estimate road traffic emission factors

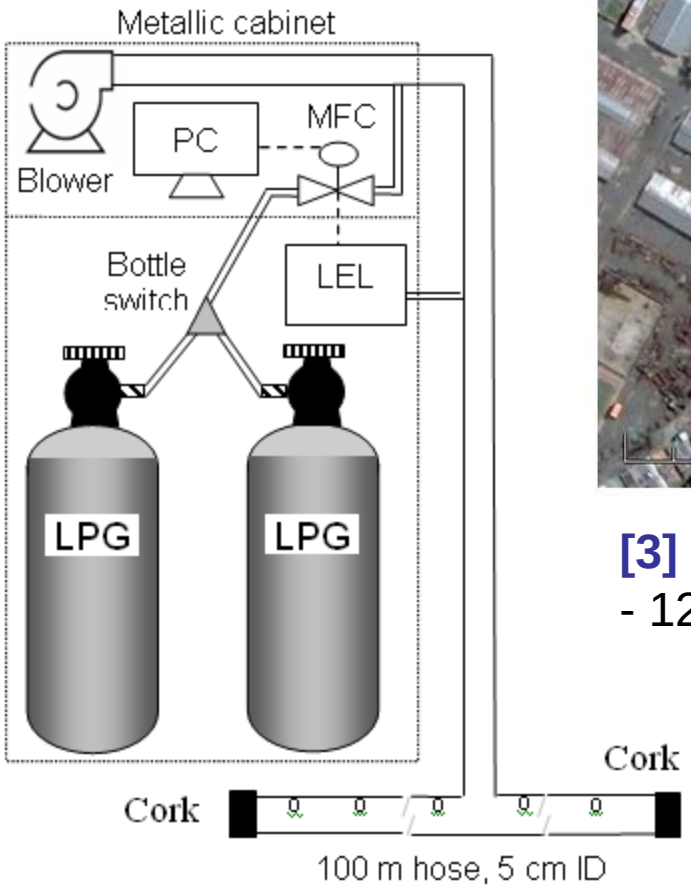
Measuring site: Ba Thang Hai street (BTH); Ho Chi Min City, Vietnam

14 000 motorcycles / hour (95% of the fleet)

Ho Chi Minh City (HCMC) campaign, January - March 2007

[1] Tracer liberation

- n-propane from LPG
-12 h /day; 30 days



[3] Traffic flow video recording

- 12 h /day; 30 days

[4] Meteorology

[2] Monitoring station

- NO, $PM_{2.5}$
- 19 VOCs

Estimation of road traffic emission factors From a tracer study in HCMC

Estimation of road traffic emission factors

Emission factor [mg veh^{-1}Km^{-1}]

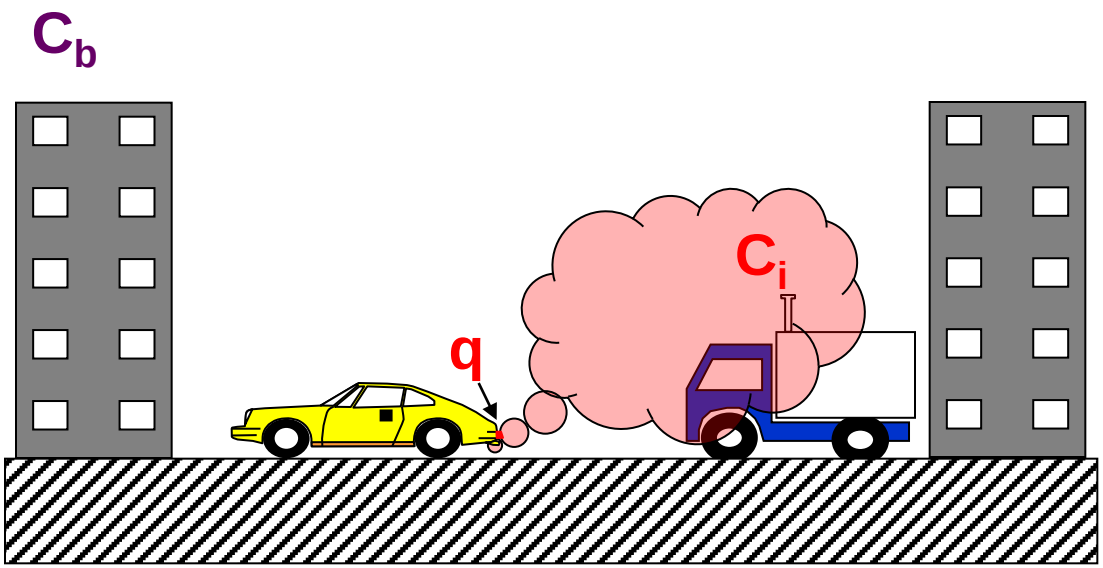
Number of vehicles [veh s^{-1}]

Measured concentration [µg m^{-3}]

$$C_i = q * F_i * N_i + C_b$$

Background concentration [µg m^{-3}]

Dispersion factor [s m^{-2}]



Estimation of road traffic emission factors from a tracer study

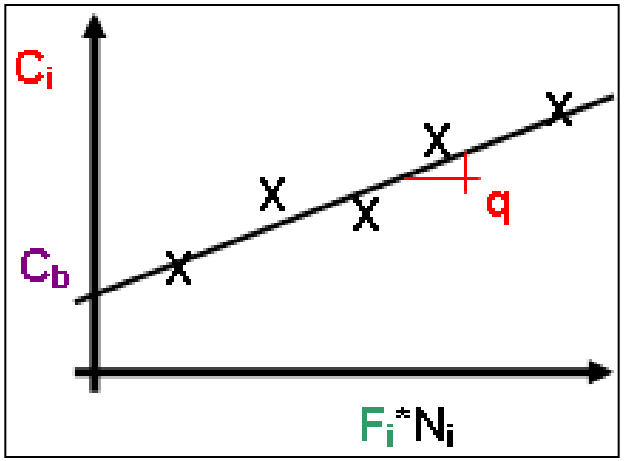
Tracer concentration [µg m^{-3}]

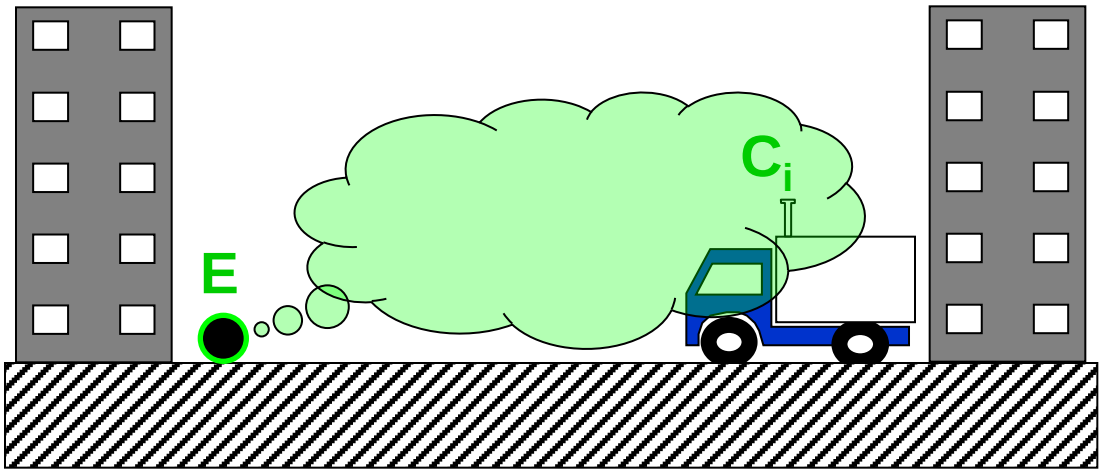
$$F_i = C_{t,i} / E$$

Tracer emission [µg m^{-1} s^{-1}]

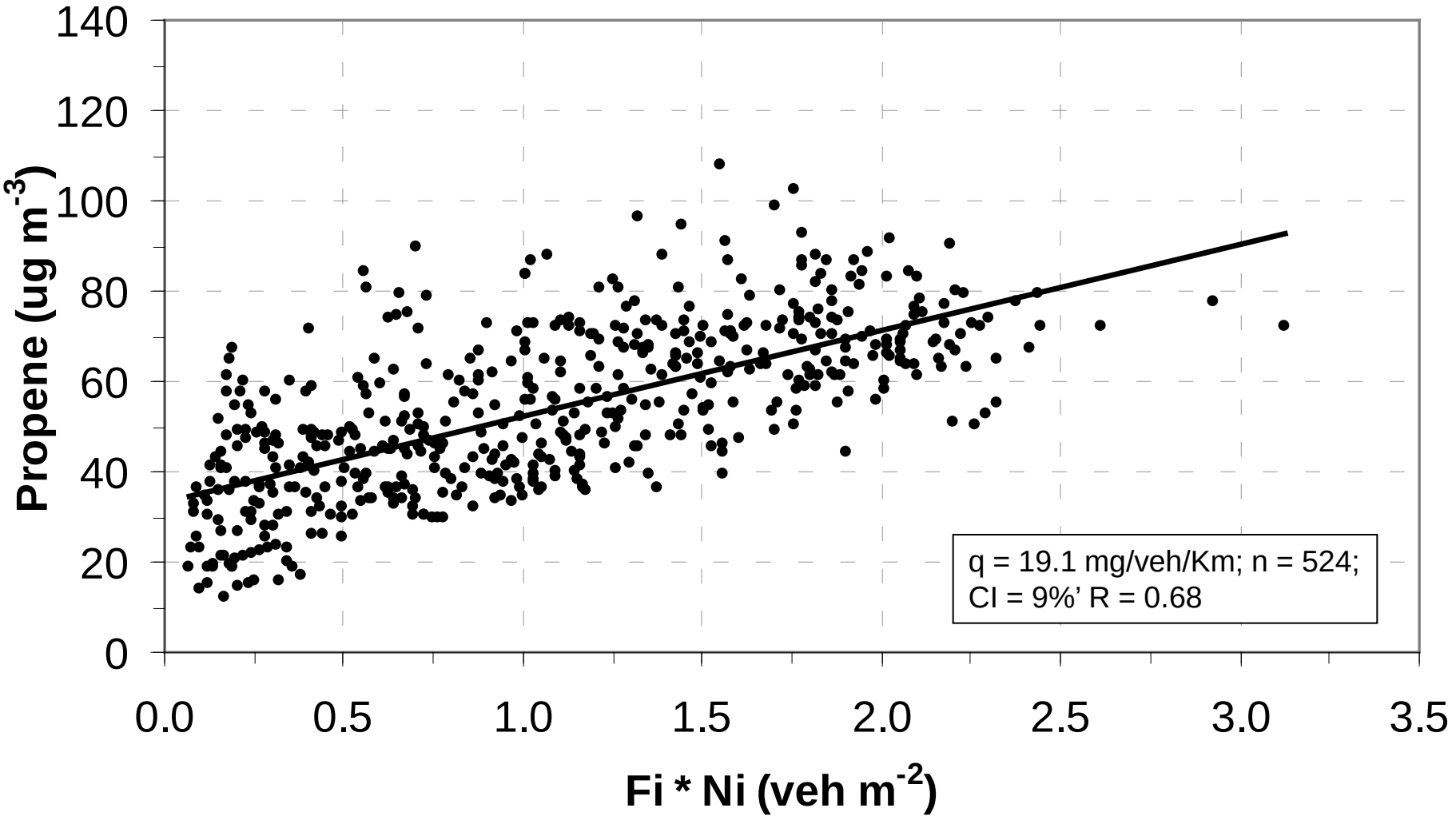
Dispersion factor [s m^{-2}]

$$C_i = q * F_i * N_i + C_b$$

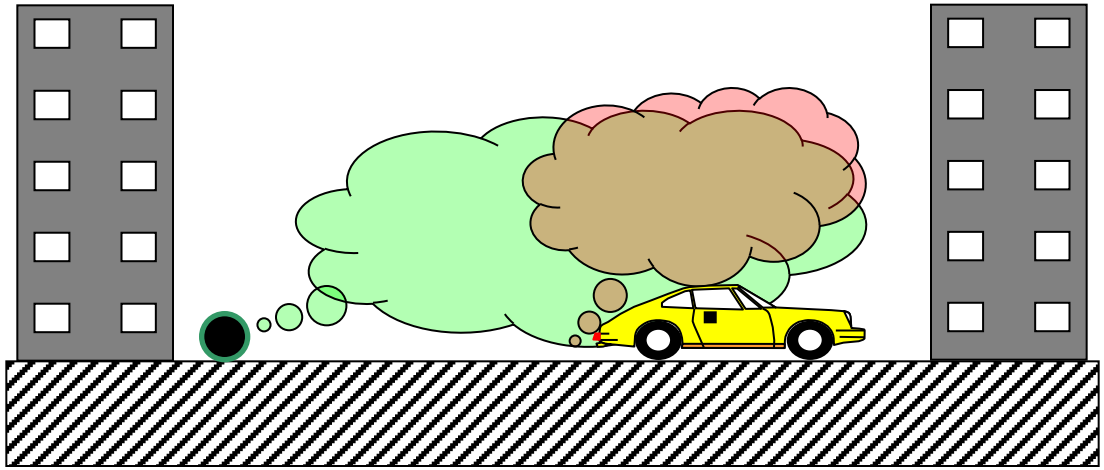


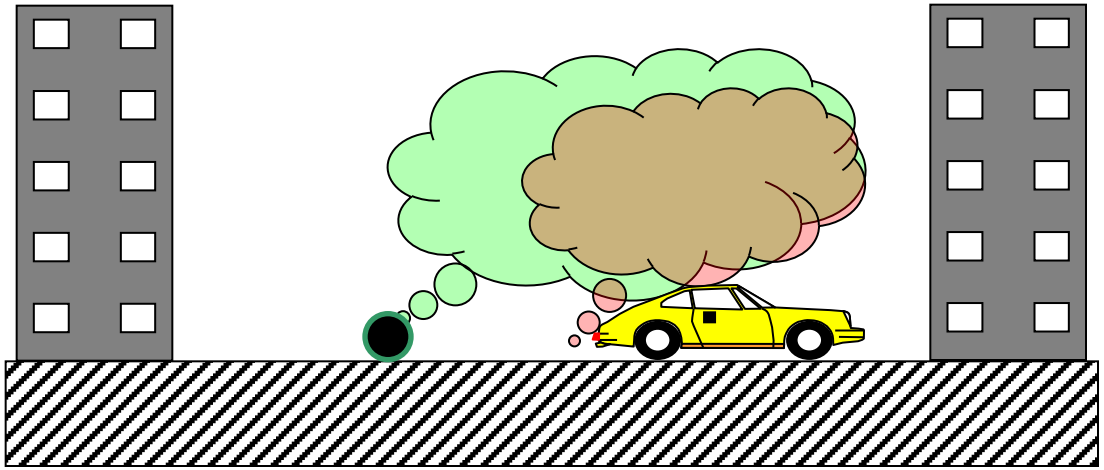


Estimation of road traffic emission factors From a tracer study in HCMC



Dispersion factor





$$F_{vehicles} \neq F_{tracer}$$

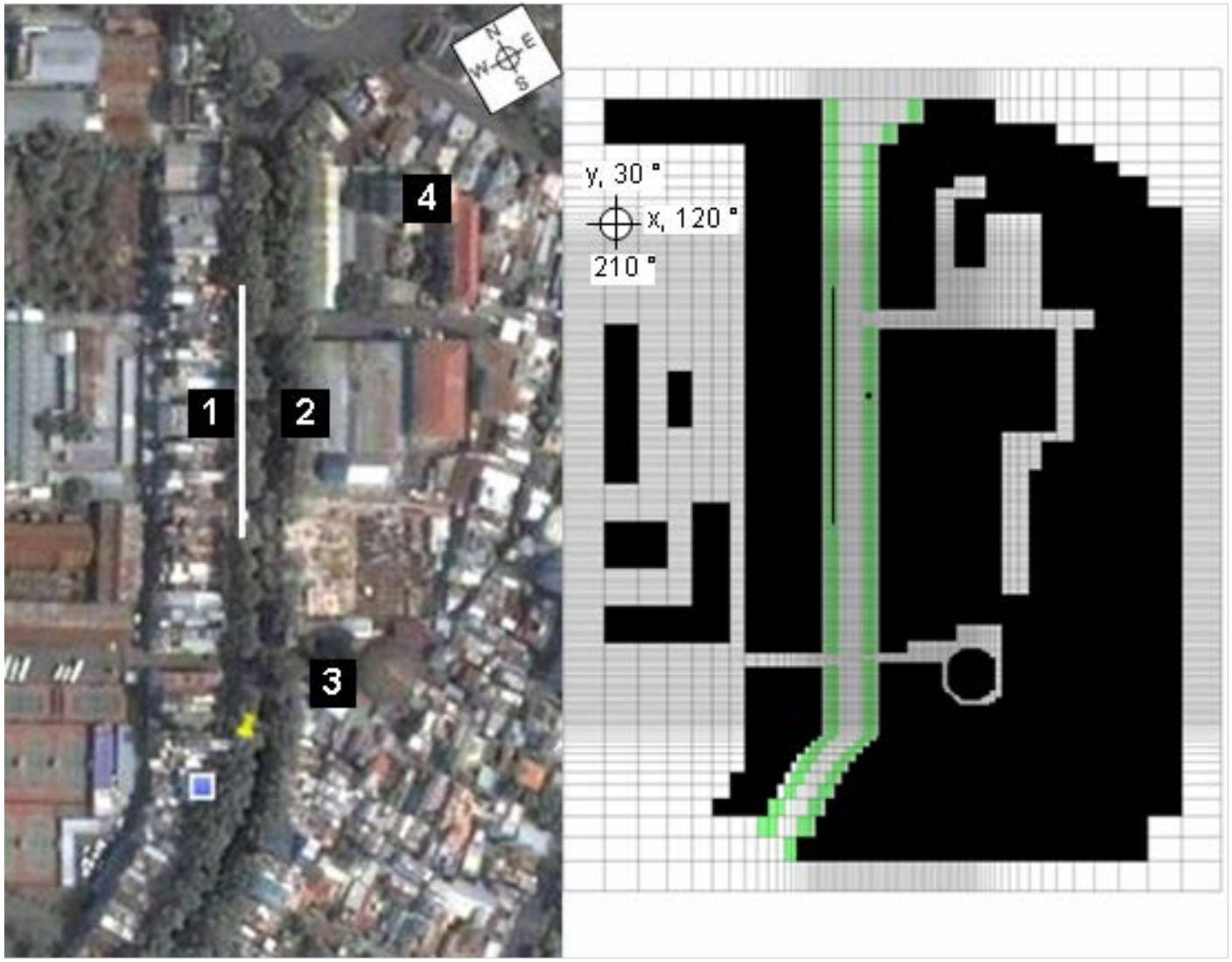
EFFECT OF THE EMISSION SOURCE POSITION

-To use the tracer study to validate a CFD model

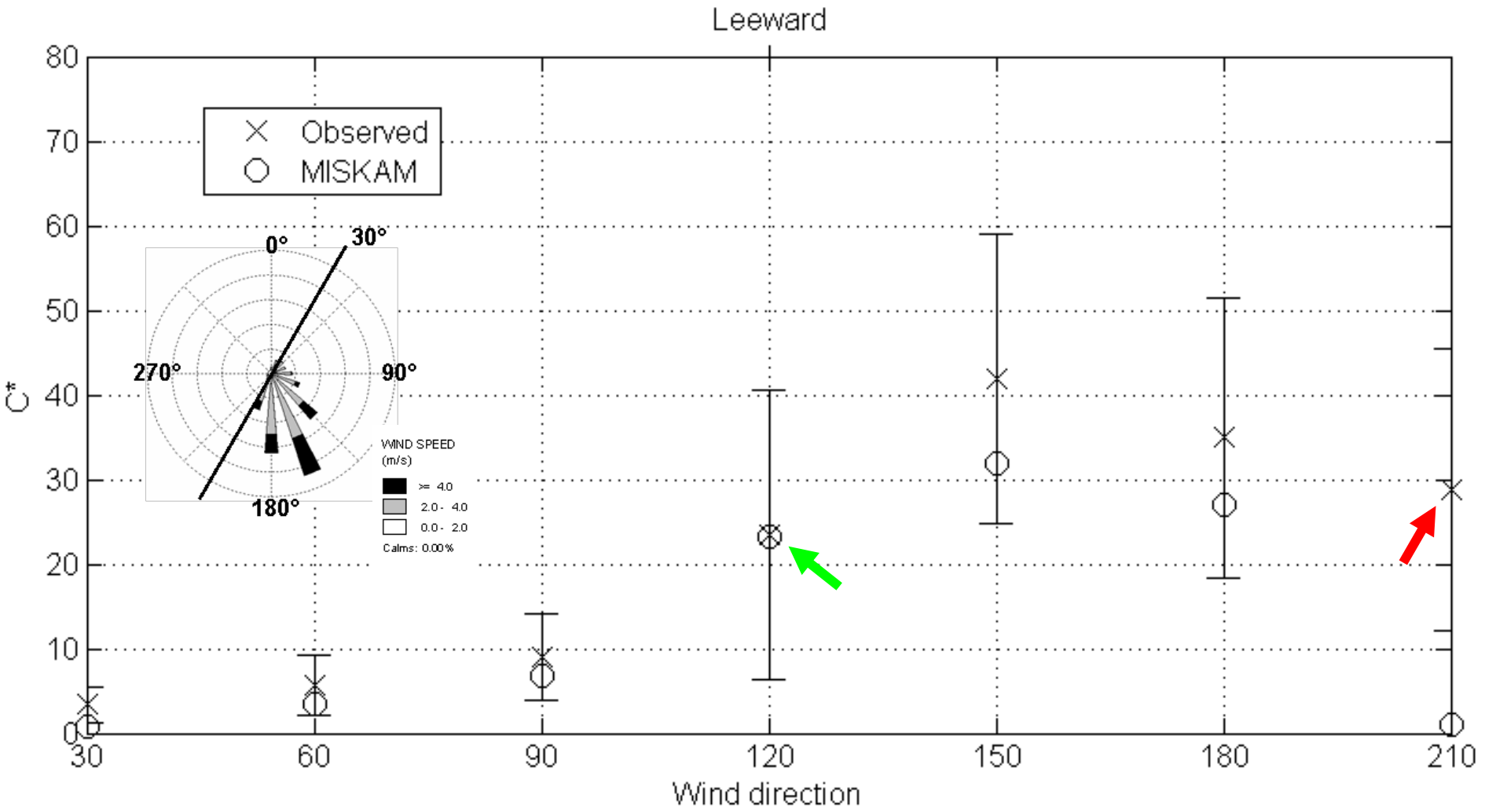
-To use the CFD model to calculate the error produced by the source position used in HCMC and to correct the Efs

-To find a source configuration that better represent the vehicle emissions

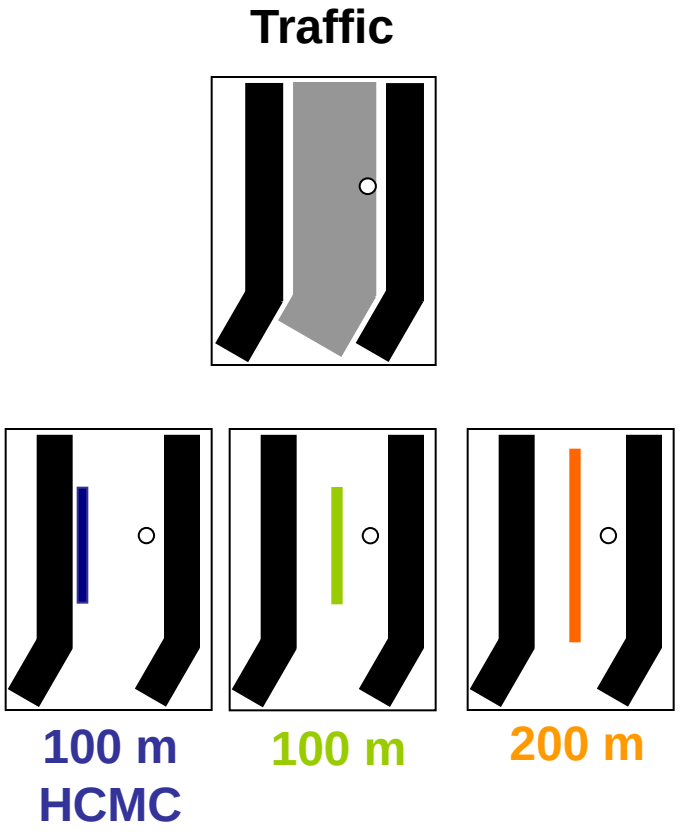
WinMiskam CFD model domain

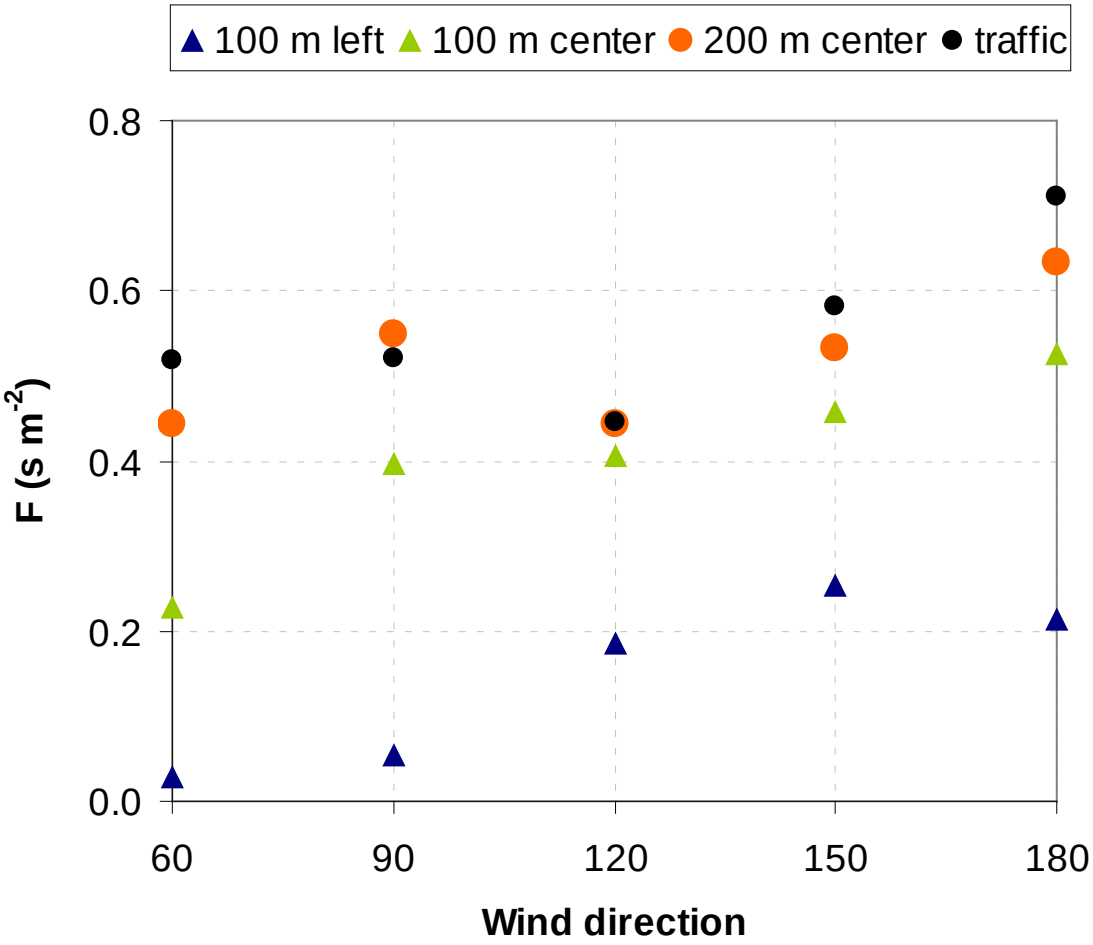


CFD model validation

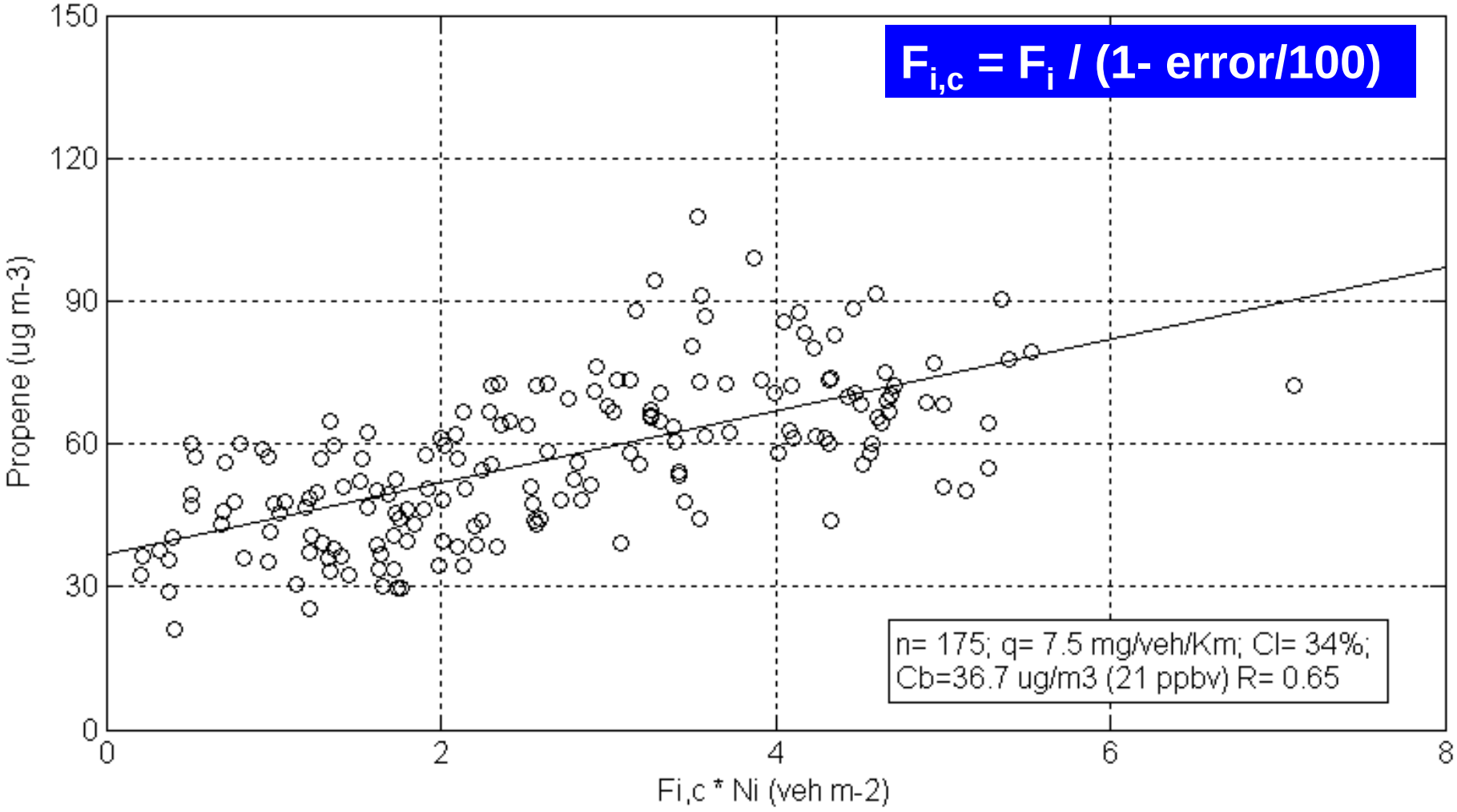


Evaluation of different source configurations





Correction of the HCMC EFs



Conclusions and perspectives

The developed methodologies may serve different purposes at the same time and their use can provide useful information for the urban air quality assessment:

- Estimation of EFs under real urban conditions
- Dispersion models validation
- Pollutants source identification
- Exposure studies

Thank you very much