Investigation of "hot-spot"concentrations of particulate matter and NO_2 for city districts by means of a mobile van

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Motivation

Problem in urban areas:

Compliance of current and future EC-limits for PM10 and NO_2 are difficult to met for city districts

Reasons for EC-limits:

→ *People's health protection*

PM10	24 h	50 µg/m³
NO_2	1 year	40 µg/m³

→**Aim:** fast and simple method to identify the polluters

Equipment of a mobile van

1. Particulate matter detection technique:

- **PM10 and PM2.5**:
  collection on quartz filters
  - total mass
  - organic content by CO_2-pyrolysis
  - pattern analysis
- **Electrical low pressure impactor (ELPI)**:
  - 13 stages: 30 nm < r < 10 µm
  - determination of the mass
  - time resolution: 5 -10 s

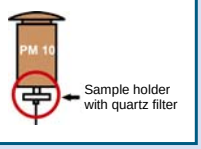
2. Gas phase detection technique:

- **NO and NO_2**: Chemiluminescence
- **Ozone**: Chemiluminescence
- **CO**: UV-absorption
- **Total VOC**: Micro-FID
- **Spec. VOC**: collection with silco-steel bottles, analysis via GC

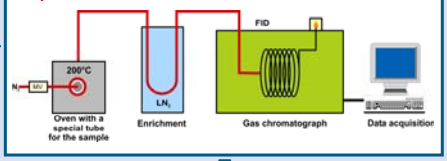
Diesel soot analysis

Investigation of diesel exhaust contributions to total particulate matter using a specific GC-technique:

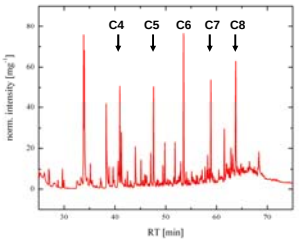
Collection of PM10-samples on quartz filters



Heating and gas chromatographic analysis of the PM10 quartz filters



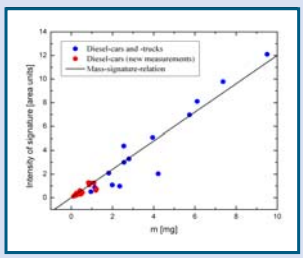
Identification of the characteristic peaks of the chromatogram



Procedure of diesel soot analysis

1. Collection of samples on quartz filters
2. Heating and gas chromatographic analysis of the filters
3. Identification and determination of the contribution of diesel soot by signature analysis

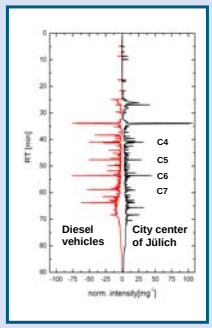
Signature-mass-correlation for the determination of the diesel soot fraction



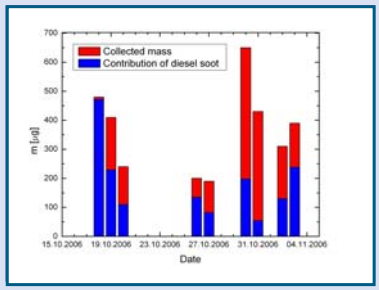
Analysis of the emissions of diesel vehicles of different types and different age

→ **Proportionality** between the collected diesel soot mass and the intensity of the signature

Transferability of the signature-mass-correlation to ambient air measurements

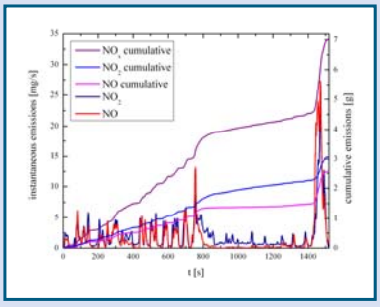


City center of Jülich: 45 % diesel soot



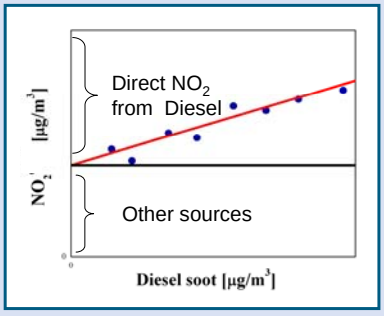
NO_2-contributions from diesel cars

Dynamometer study, Mercedes Benz C220 CDI (EURO 3), Mobinet Cycle



Direct NO_2-emissions from **diesel cars** equipped with oxidation catalysts:

- 30–60 % of total NO_x is emitted in the form of NO_2
- NO_x emissions of modern diesel cars are 3 - 5 times higher than those of modern gasoline cars



Idea

The contribution of direct NO_2-emissions from diesel cars could be calculated using concurrent measure-ments of diesel soot and NO_2 for city center districts

Climatology of PM_x- and NO_x- concentrations

Working plan:

Weekly measuring tours in an exemplary urban center (Düsseldorf, starting July 2008)

➔ Correlation analysis between different species (particulate matter, O_3, NO_2, NO, CO and hydrocarbons and meteorological parameters)

➔ Construction of „concentration fields" from the obtained data sets for a city district

Aims (in collaboration with EURAD):

- Corroboration of the measured relations by means of the used modelling approach
- Input for modelling studies for „Chemical weather forecast" purposes of PM_x- and NO_2- concentrations

First Results

High resolution measurements (5 s averages) of particulate matter and ozone while driving round „Tagebau Hambach"