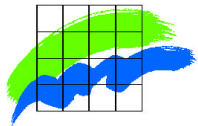


**Experimental studies of size distributions of ultrafine particles:
Emissions and concentrations
in streets, indoor along streets and in urban background**

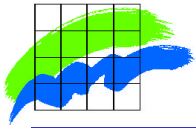
Finn Palmgren and Peter Wåhlin

National Environmental Research Institute, Denmark



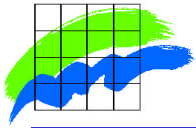
Background

- Traffic particulates, i.e. direct exhaust and particles from road, tires, brakes, re-suspension etc.
- On-road measurements of emissions and air quality from the actual car fleet
- Input to models for air quality and human exposure
- Ultrafine (nano) particles important in relation to health
- Limit values for PM_{10} or ?



Aims

- To characterise the geographic and temporal variability in particle composition and size distributions in Danish ambient air.
- To determine particle emission factors for various vehicle categories.
- Determine indoor - outdoor relationships for building along busy streets.
- Determine the role of traffic emissions in formation of indoors particulate irritants.



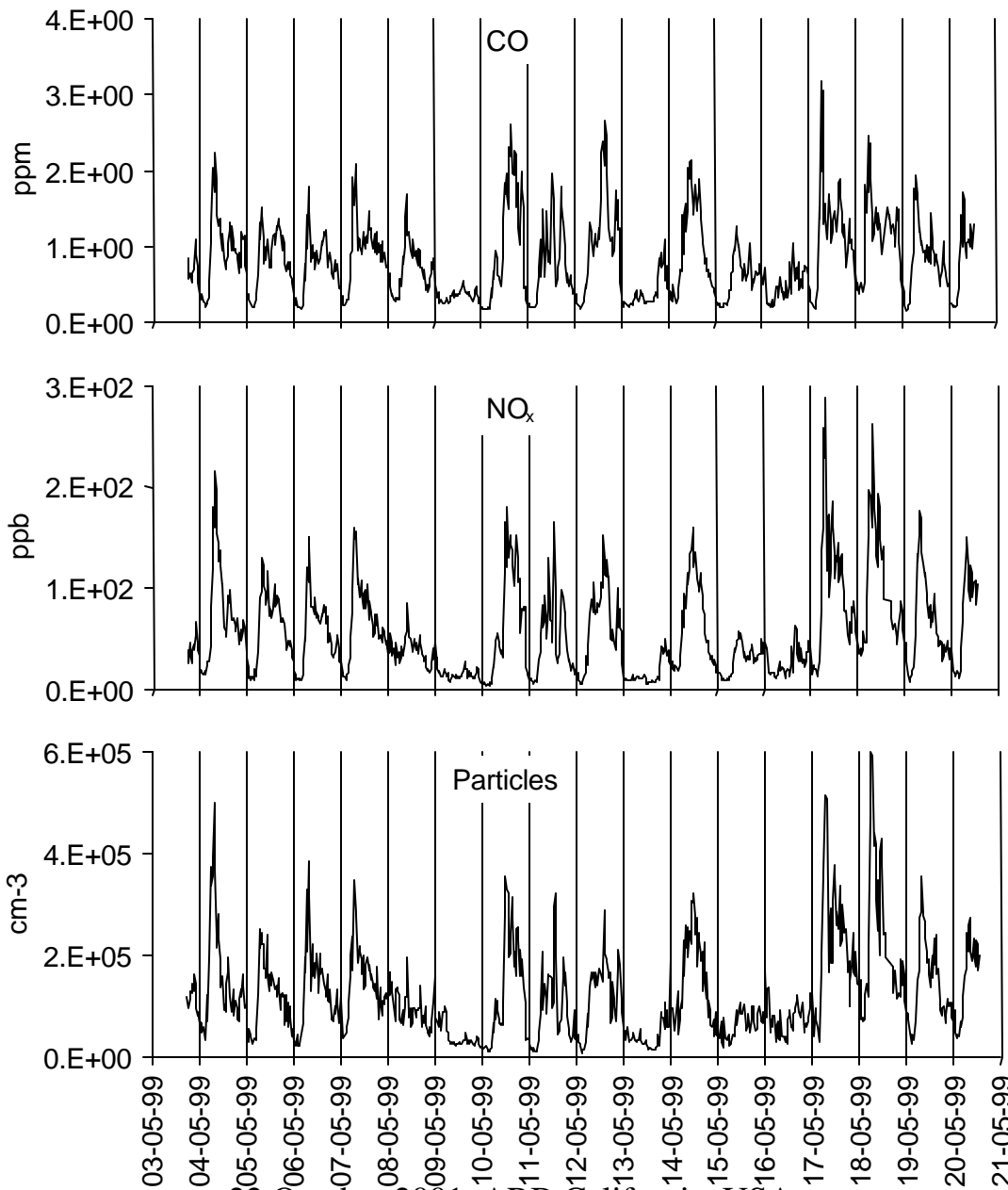
Approach

- Field measurements of particles in connection with other pollution measurements (routine monitoring)
- Measurements in streets, urban background and indoor
- Long time series and high time resolution
- Application of receptor modelling and source-receptor modelling
- Supplemented with emission measurements

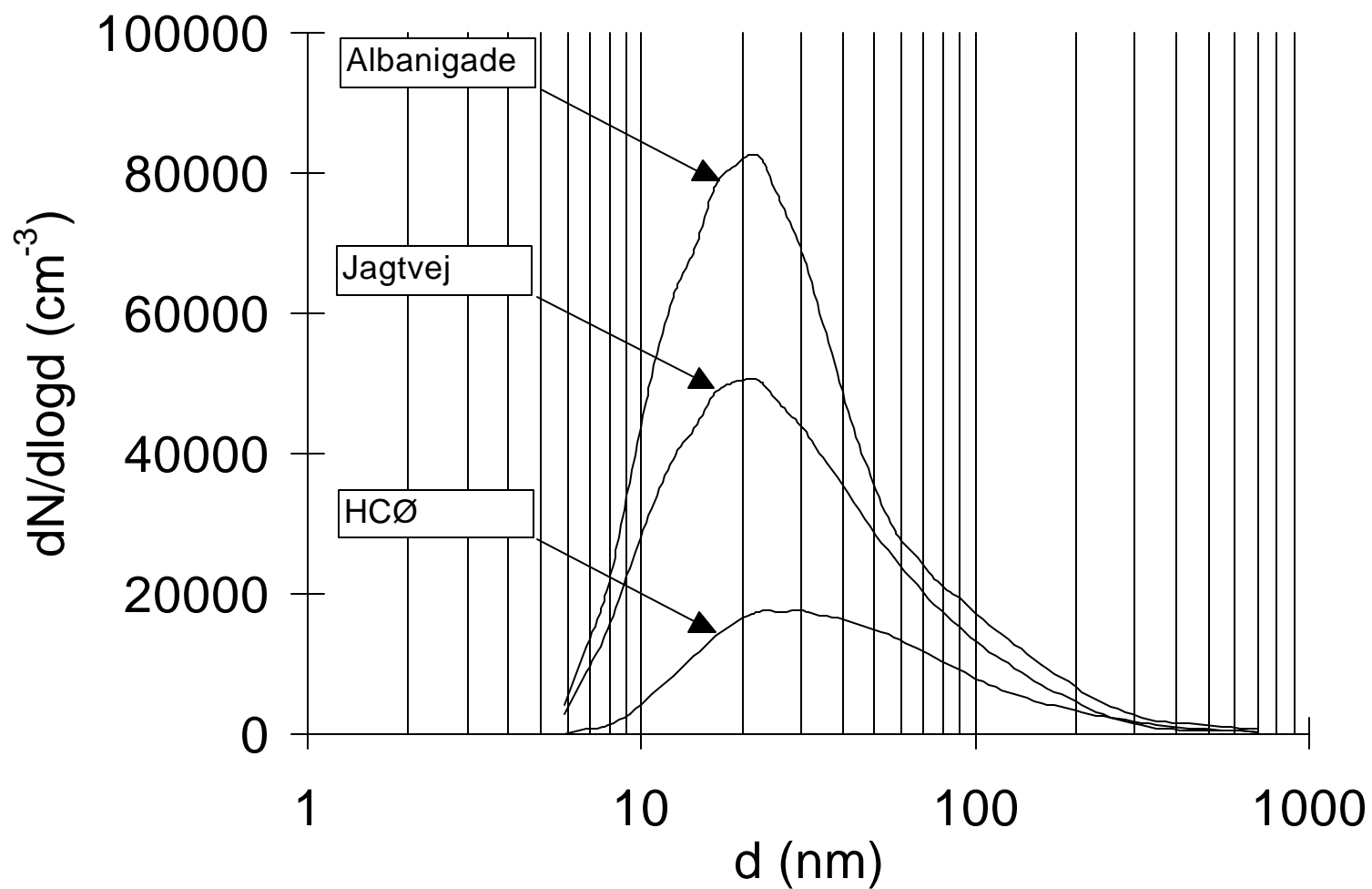
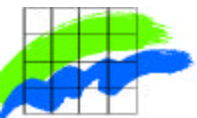


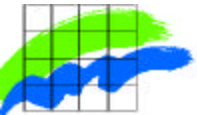
Finn Palmgren

22 October 2001, ARB California, USA

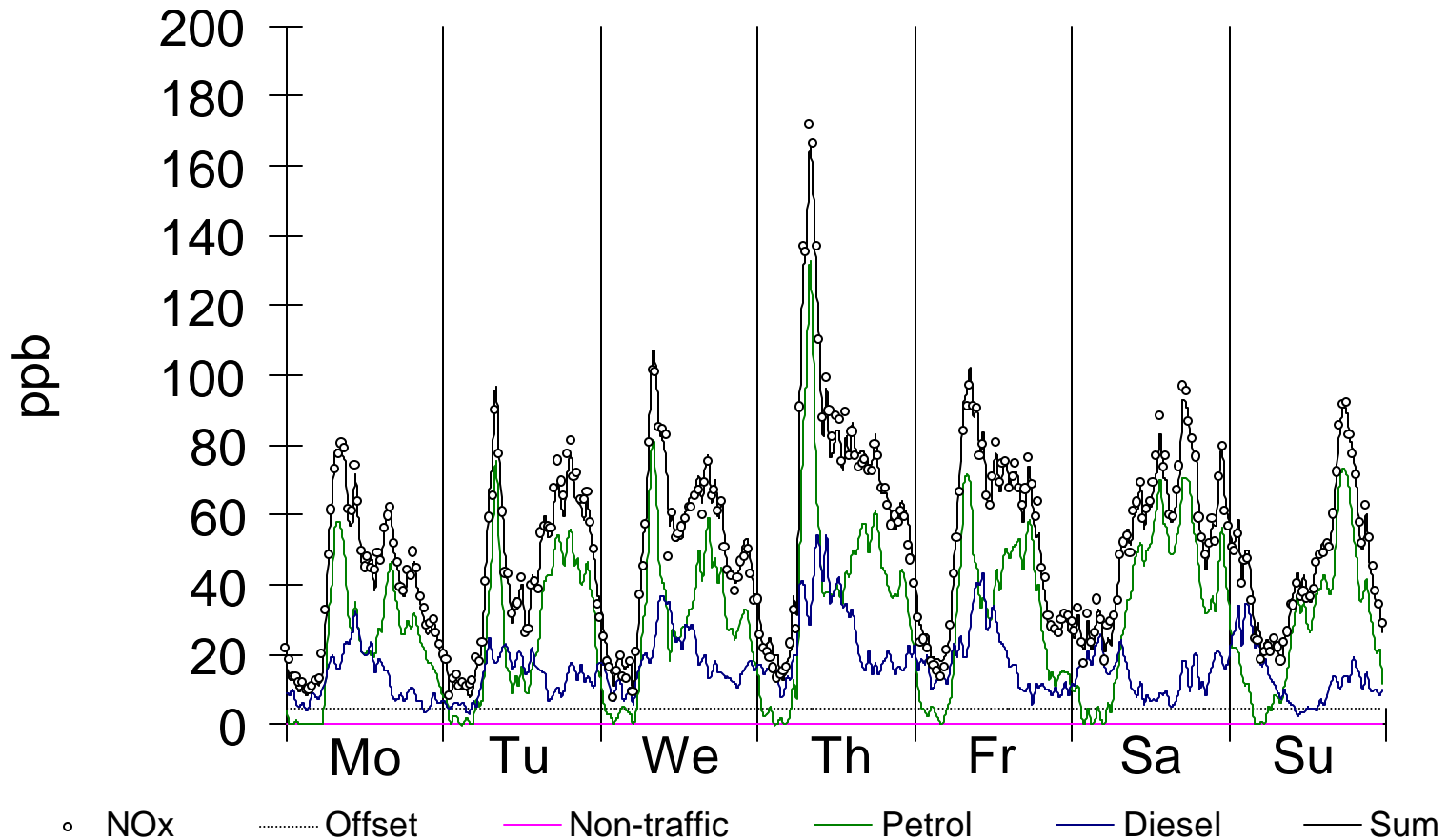


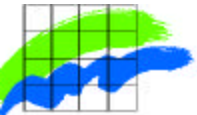
22 October 2001, ARB California, USA



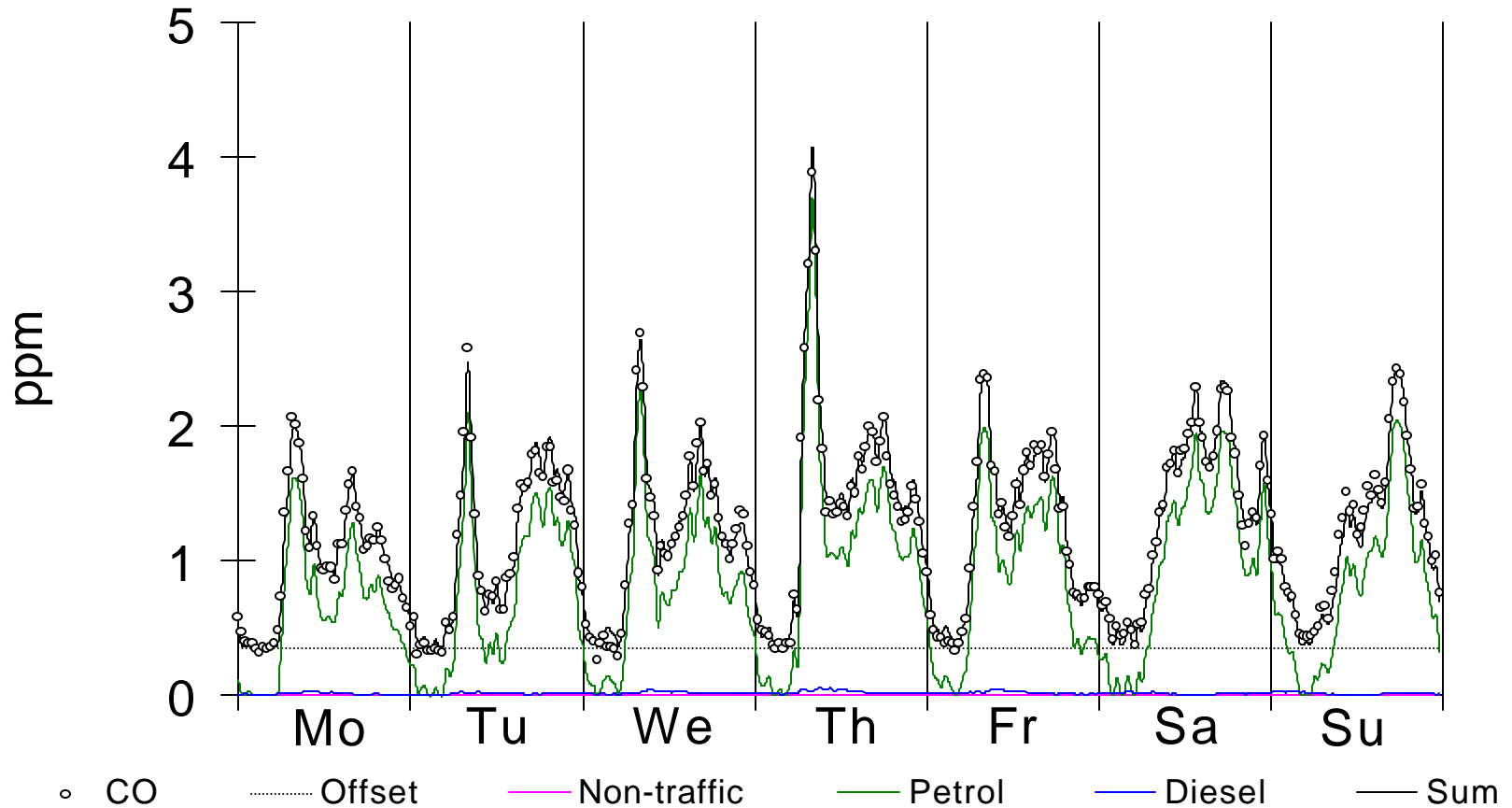


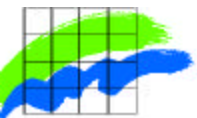
NO_x, Jagtvej, CPH



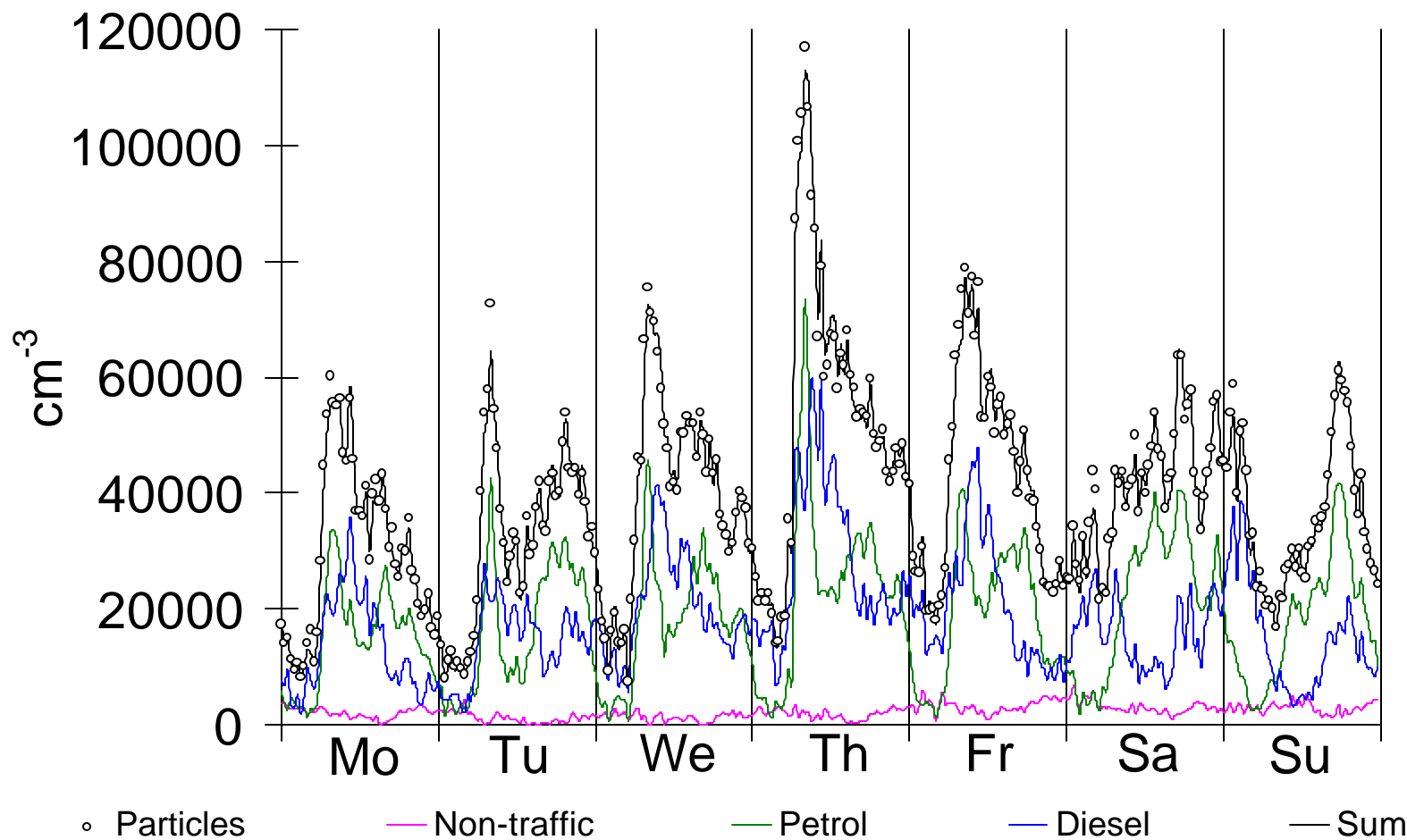


CO Jagtvej, CPH





Particles, Jagtvej, CPH



○ Particles
Finn Palmgren

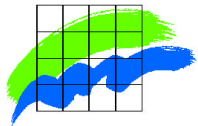
— Non-traffic

— Petrol

— Diesel

— Sum

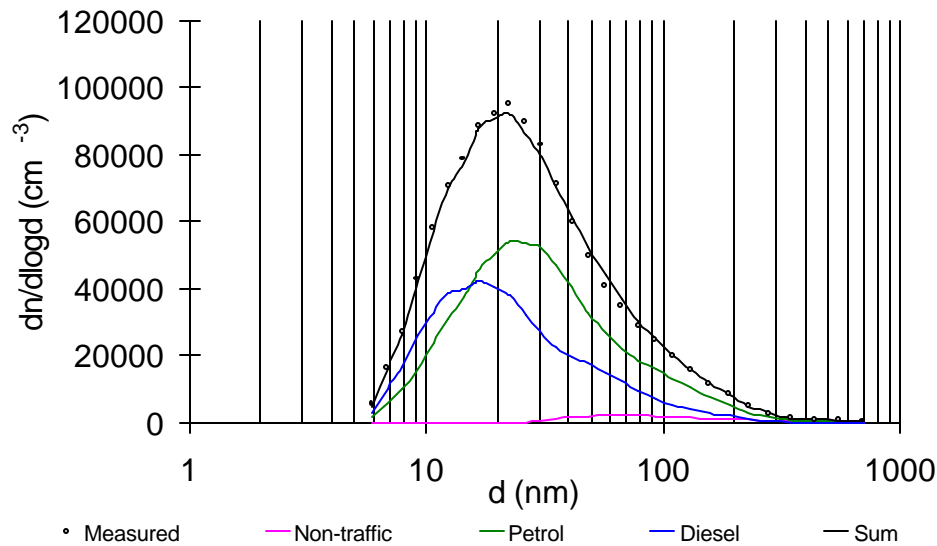
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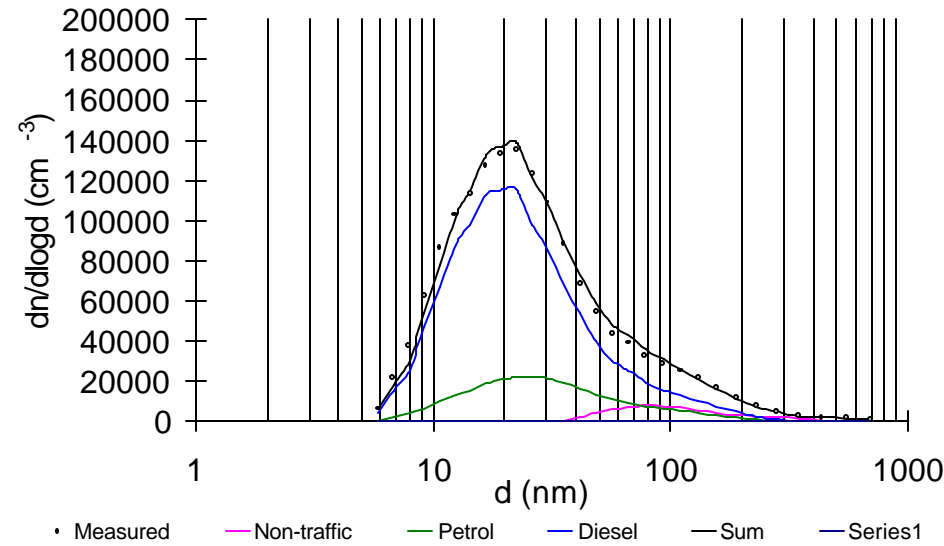
Jagtvej

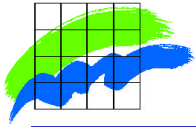
Albanigade

Workday 8:30 - 9:00

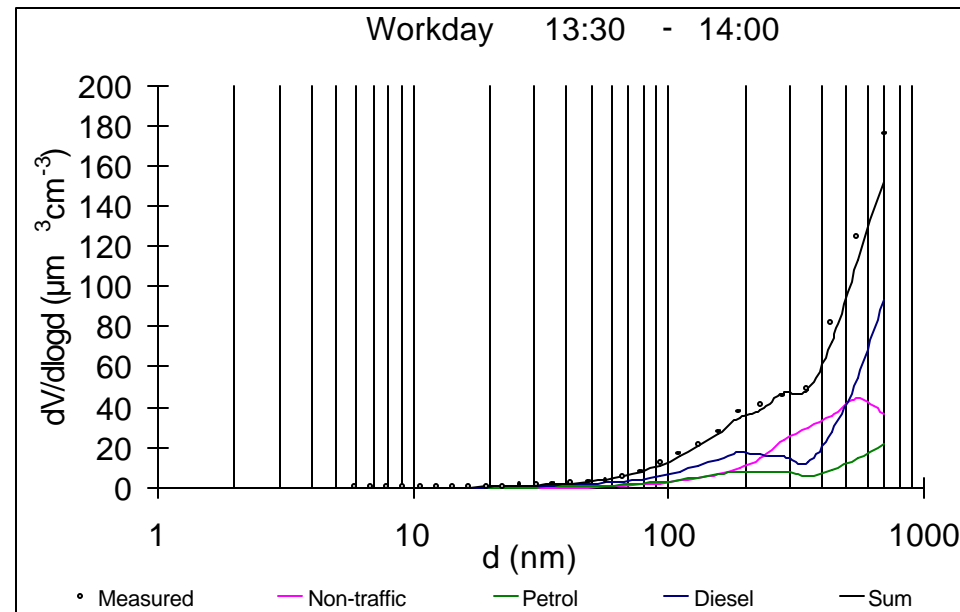
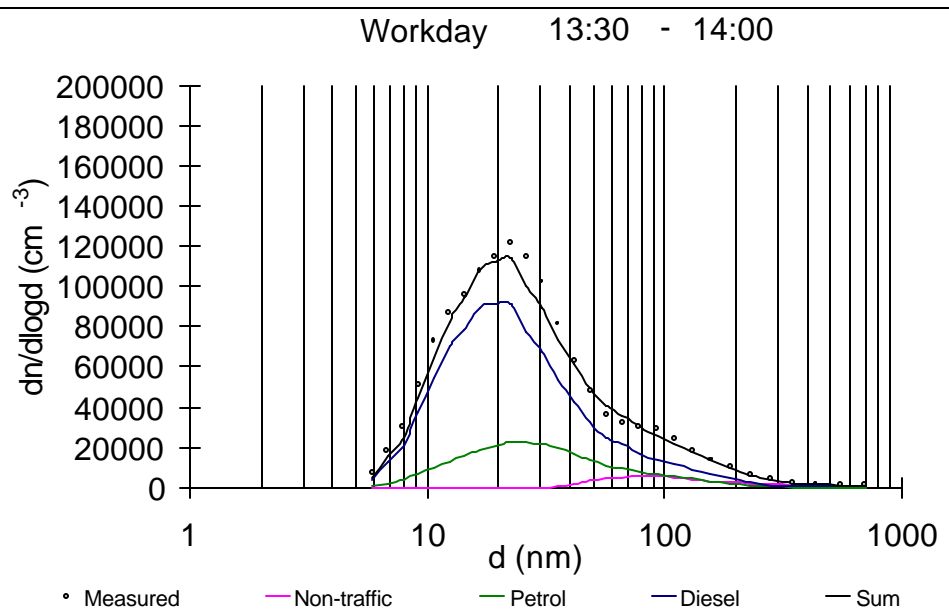


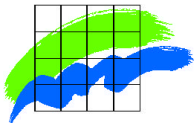
Workday 8:30 - 9:00





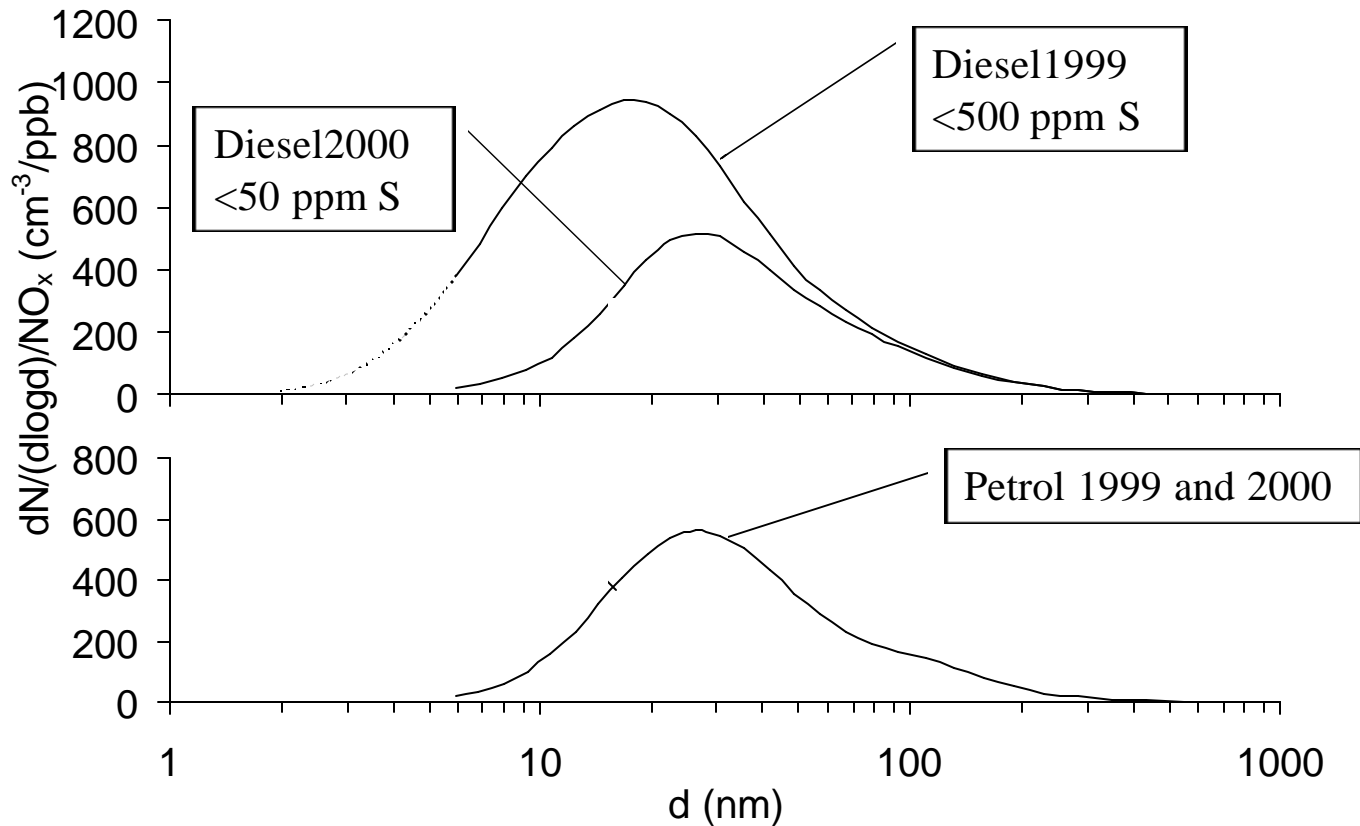
Number/Volume

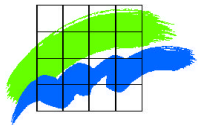




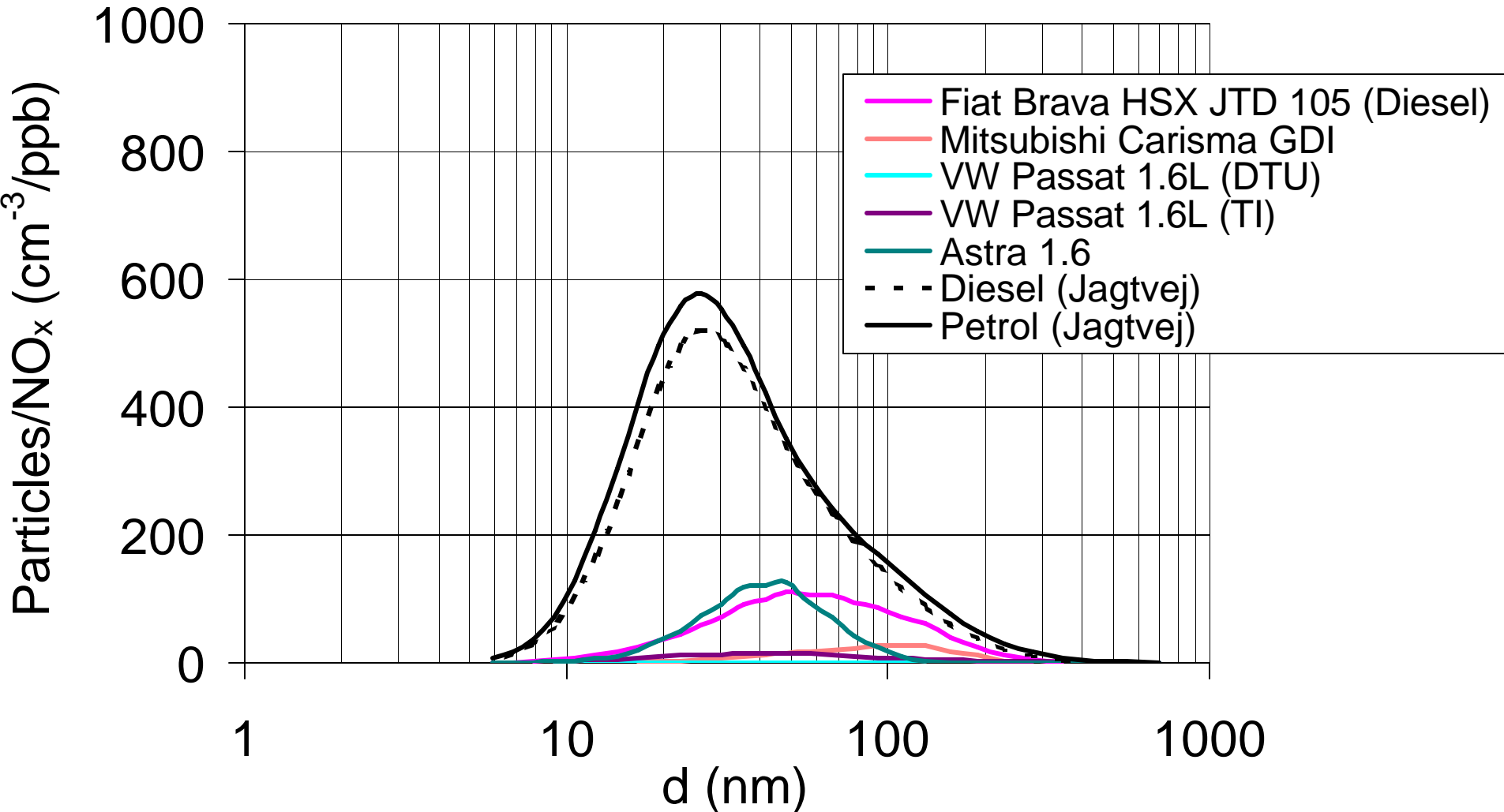
Reduced sulphur in diesel fuel

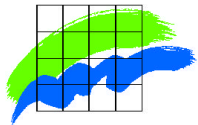
(Peter Wählin et al.)



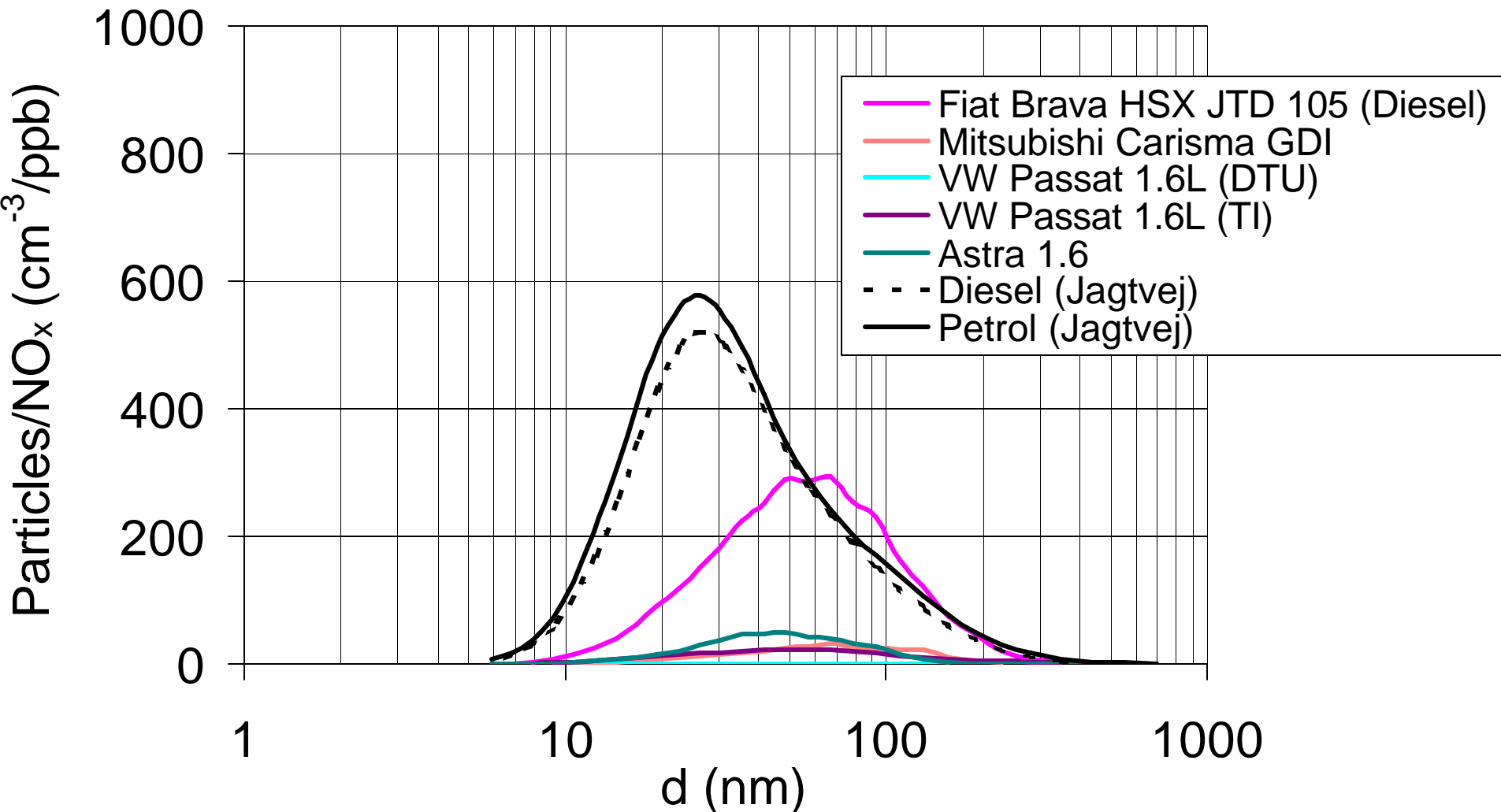


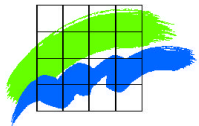
50 km/h 4.gear



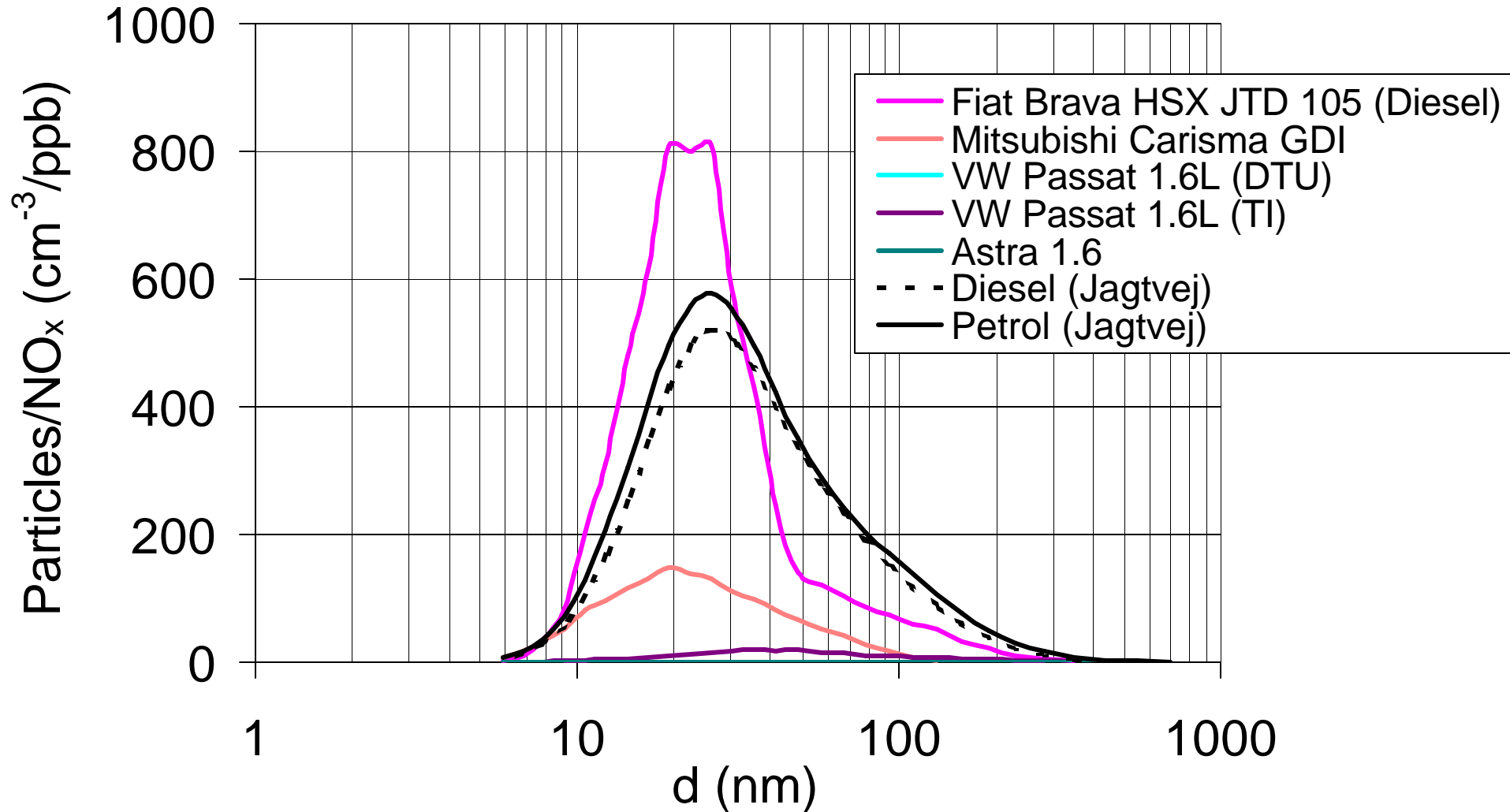


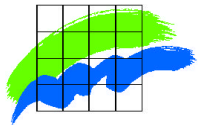
40 km/h 3.gear



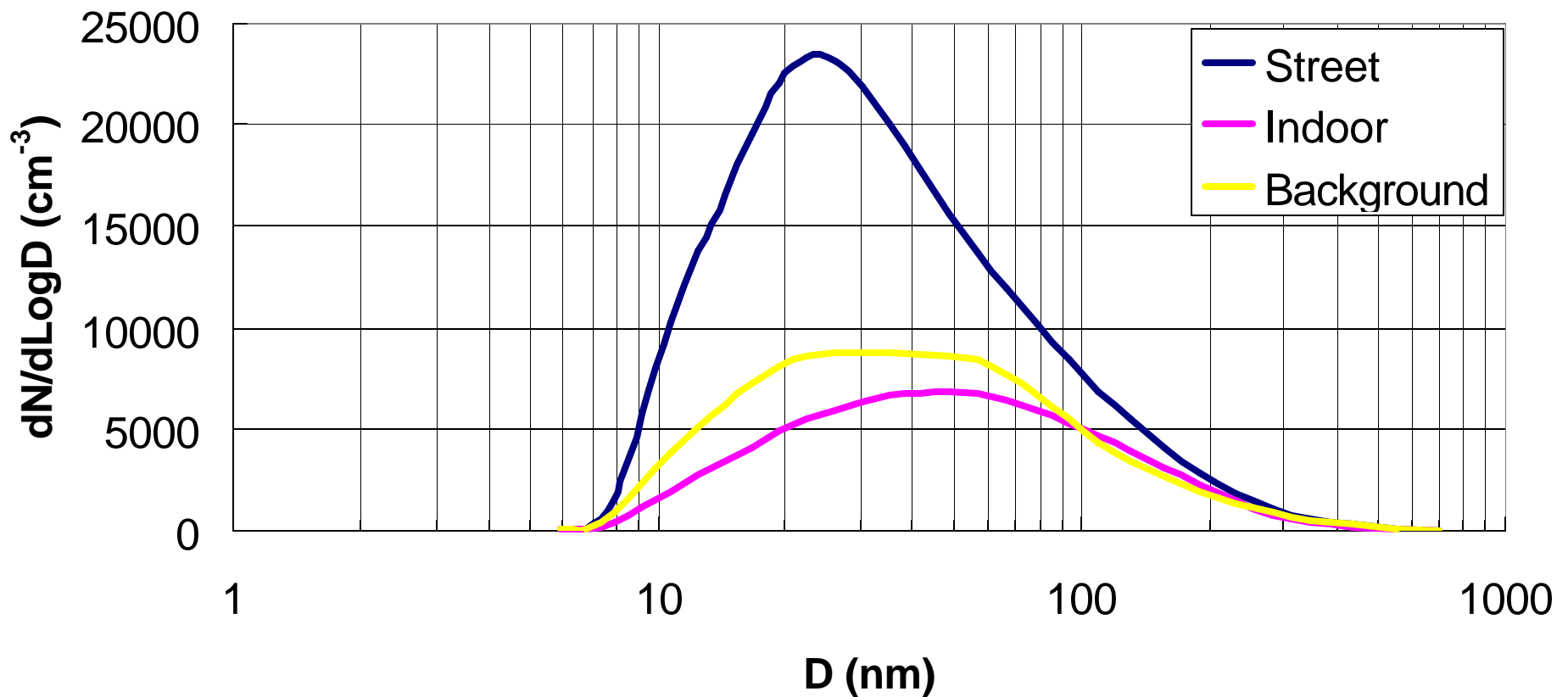


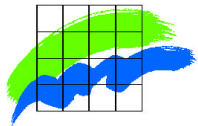
Idling



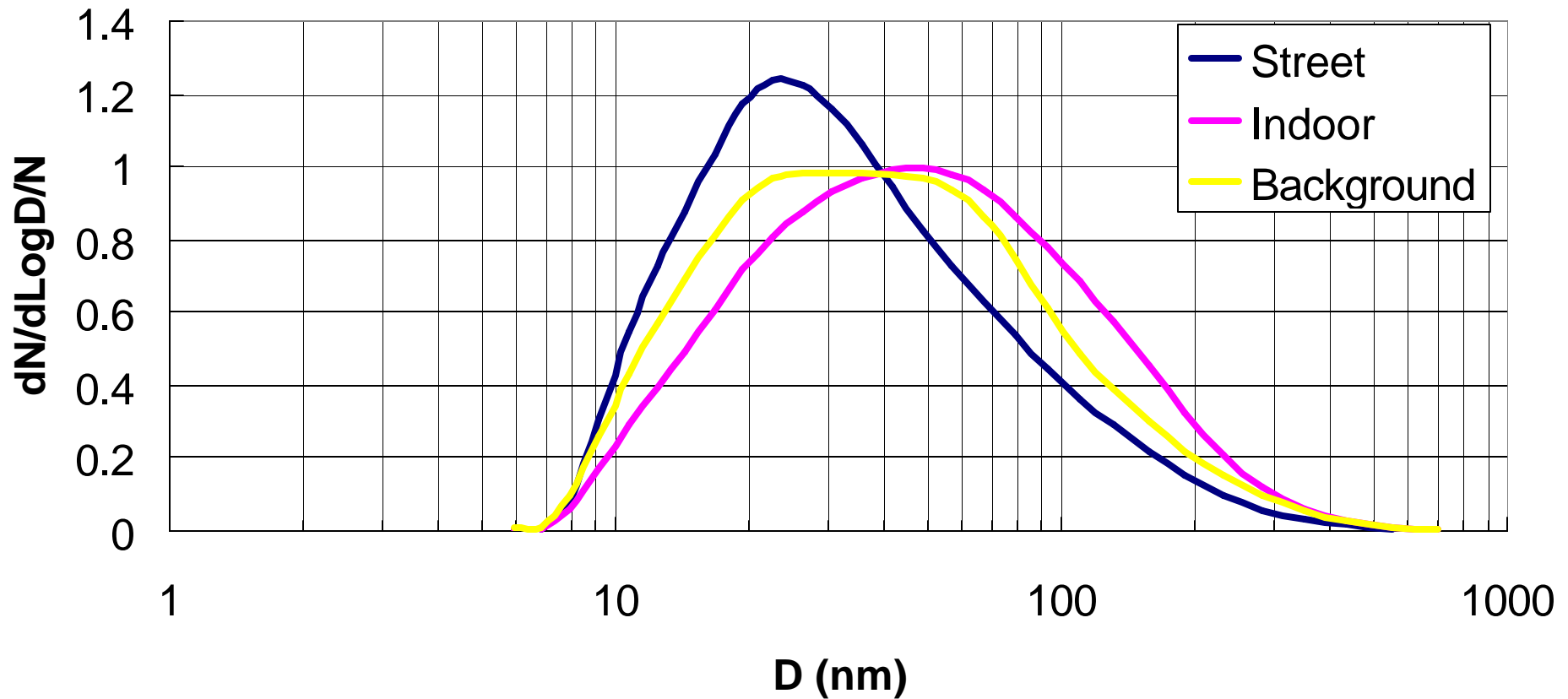


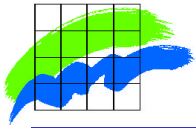
Particle distribution, CPH



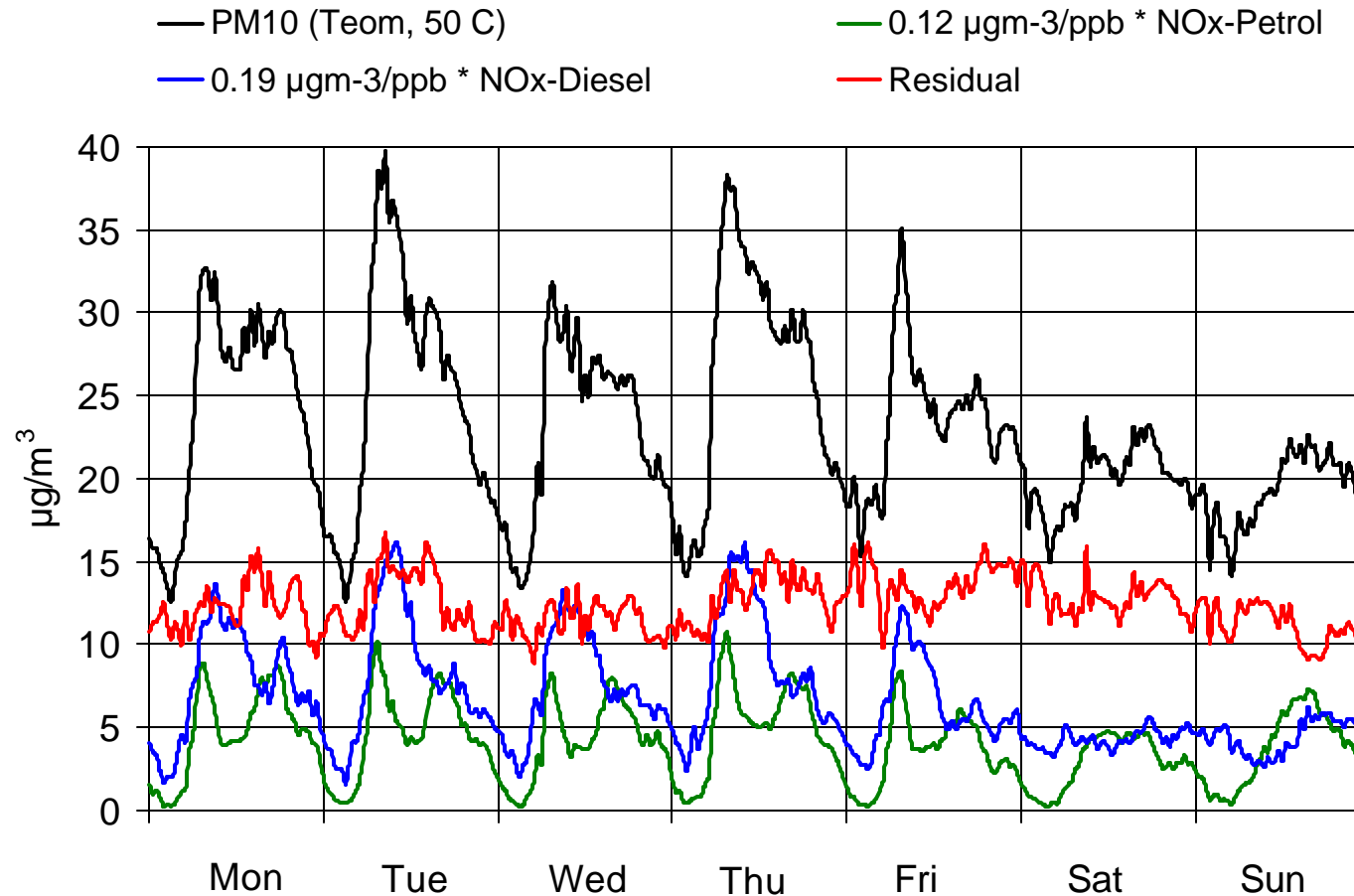


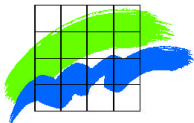
Particle distribution, CPH





TEOM measurements

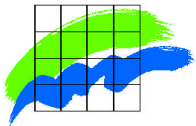




Plans for the coming years

- Measurements of ultrafine particles and $PM_{10}/PM_{2.5}$ at streets and urban background
- Emission measurements in the laboratory
- Chemical composition
 - BC, OC, PAH, metals, inorganic compounds etc.
- Physical properties
 - Solid/liquid/volatiles/condensates, Organic/inorganic?
 - Hygroscopic/hydrophobic?.
- Outdoor/indoor measurements
- Health impact assessment





References

- PALMGREN, F., HANSEN, A. B., BERKOWICZ, R. and SKOV, H. (2001)
Benzene emission from the actual car fleet in relation to petrol composition in Denmark. Atmospheric Environment. Vol 35/1001, pp S35-S42
- WÅHLIN, P., PALMGREN, F. and VAN DINGENEN, R. (2001a),
Experimental studies of ultrafine particles in streets and the relationship to traffic. Atmospheric Environment. Vol 35/1001, pp S63-S69
- WÅHLIN, P., PALMGREN, F., VAN DINGENEN, R. and RAES, F. (2001b).
Pronounced decrease of ambient particle number emissions from diesel traffic in Denmark after reduction of the sulphur content in diesel fuel. Atmospheric Environment. Vol 35/21, pp 3549-3552.