UFIPOLNET
ultrafine particle size distributions in air pollution monitoring networks

Ultrafine particles in Stockholm

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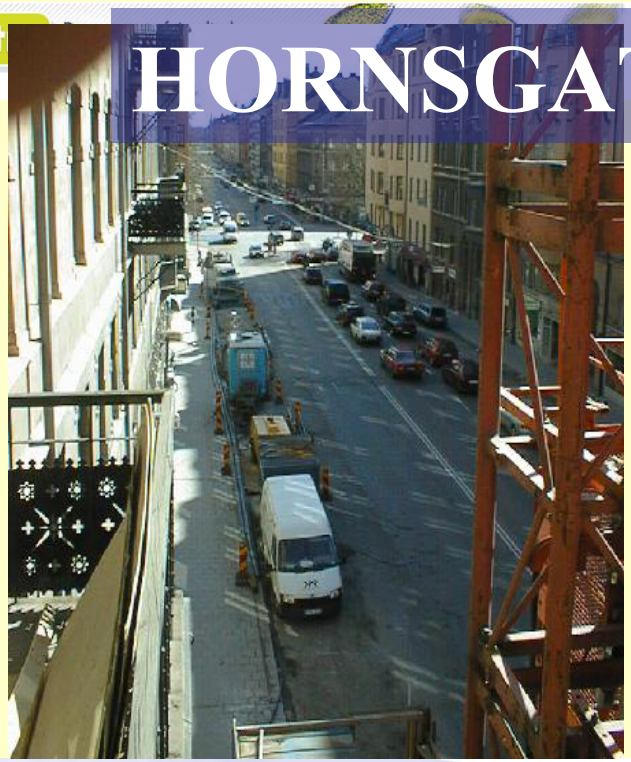
Outline

- Motivation for particle size measurements
- Trends & temporal variations
- Relation between UFP & NOx, PM10, BC
- Modelling of ultrafine particles

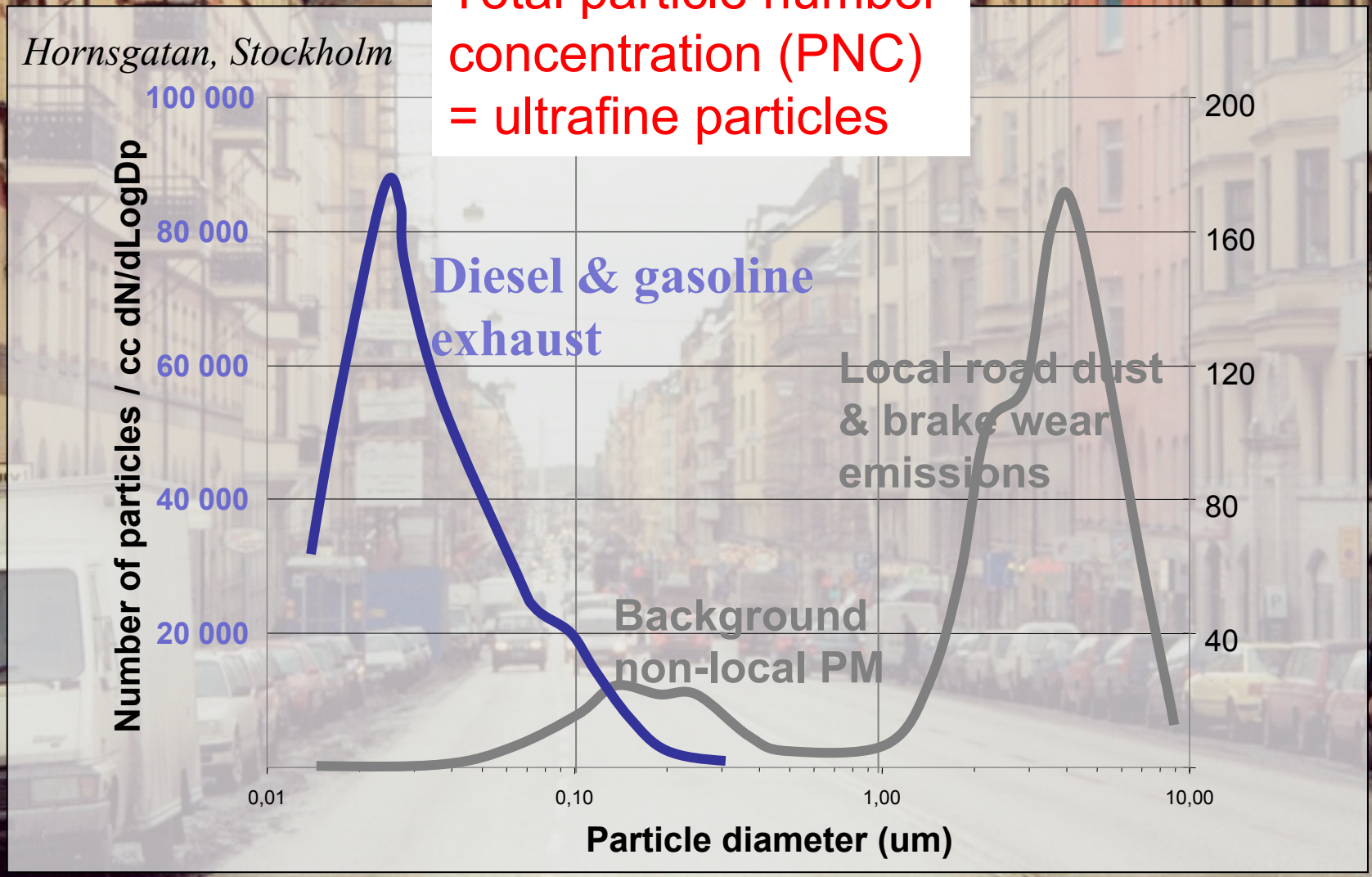
HORNSGATAN, STOCKHOLM



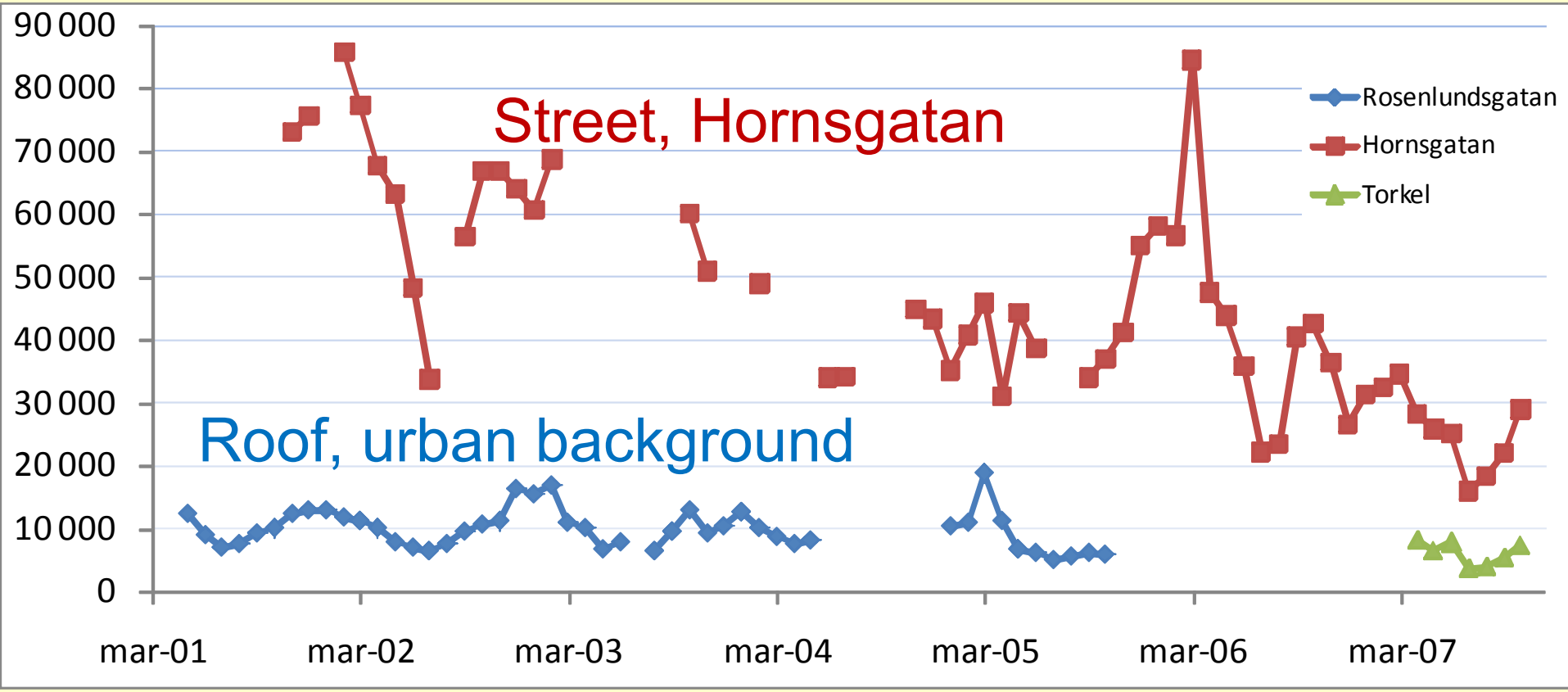

Hornsgatan
Traffic: 35 500 veh/day
PM10, PM2.5, PNC, PSD, NOx, CO, VOC's

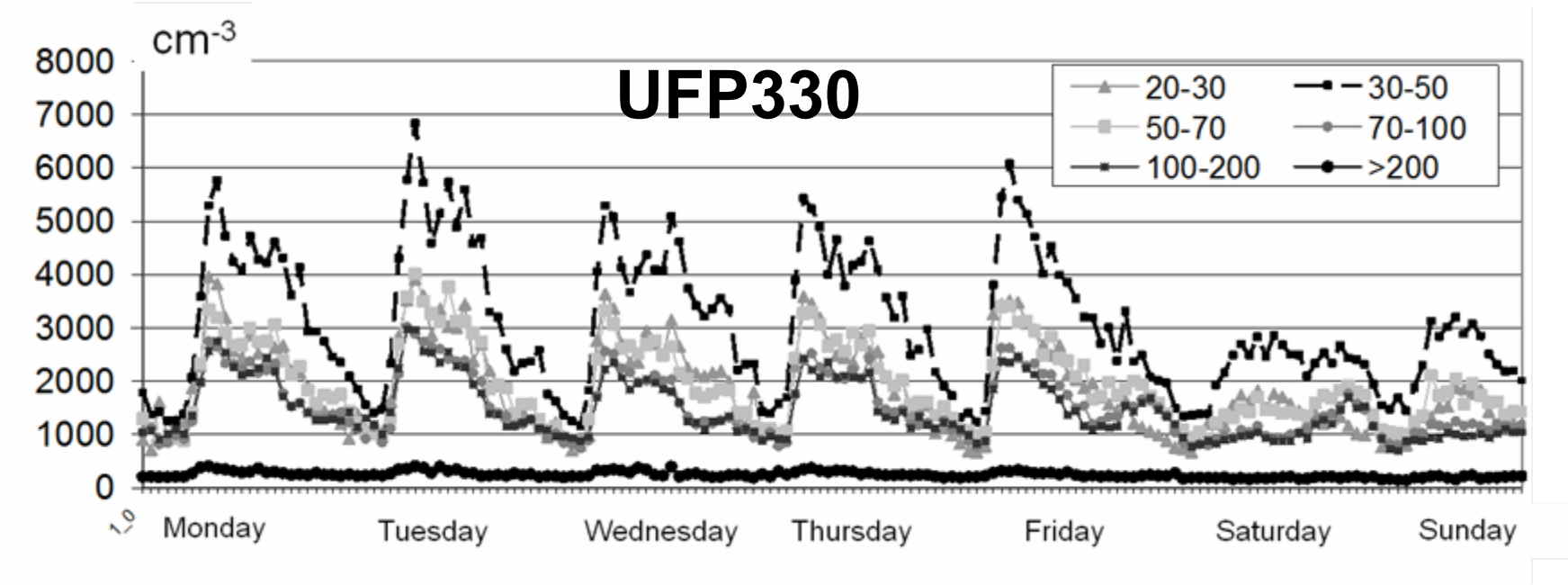
Number & mass size distributions

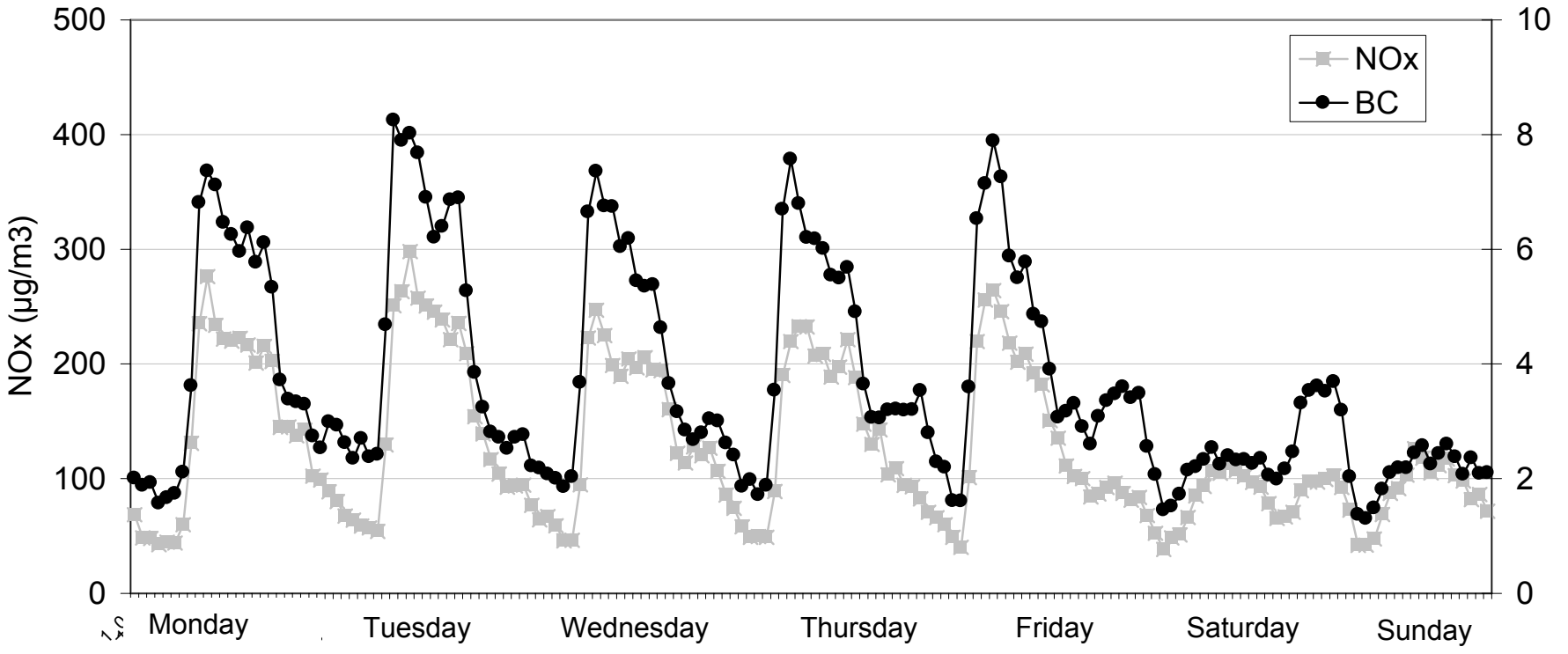
Total particle number concentration (PNC) = ultrafine particles



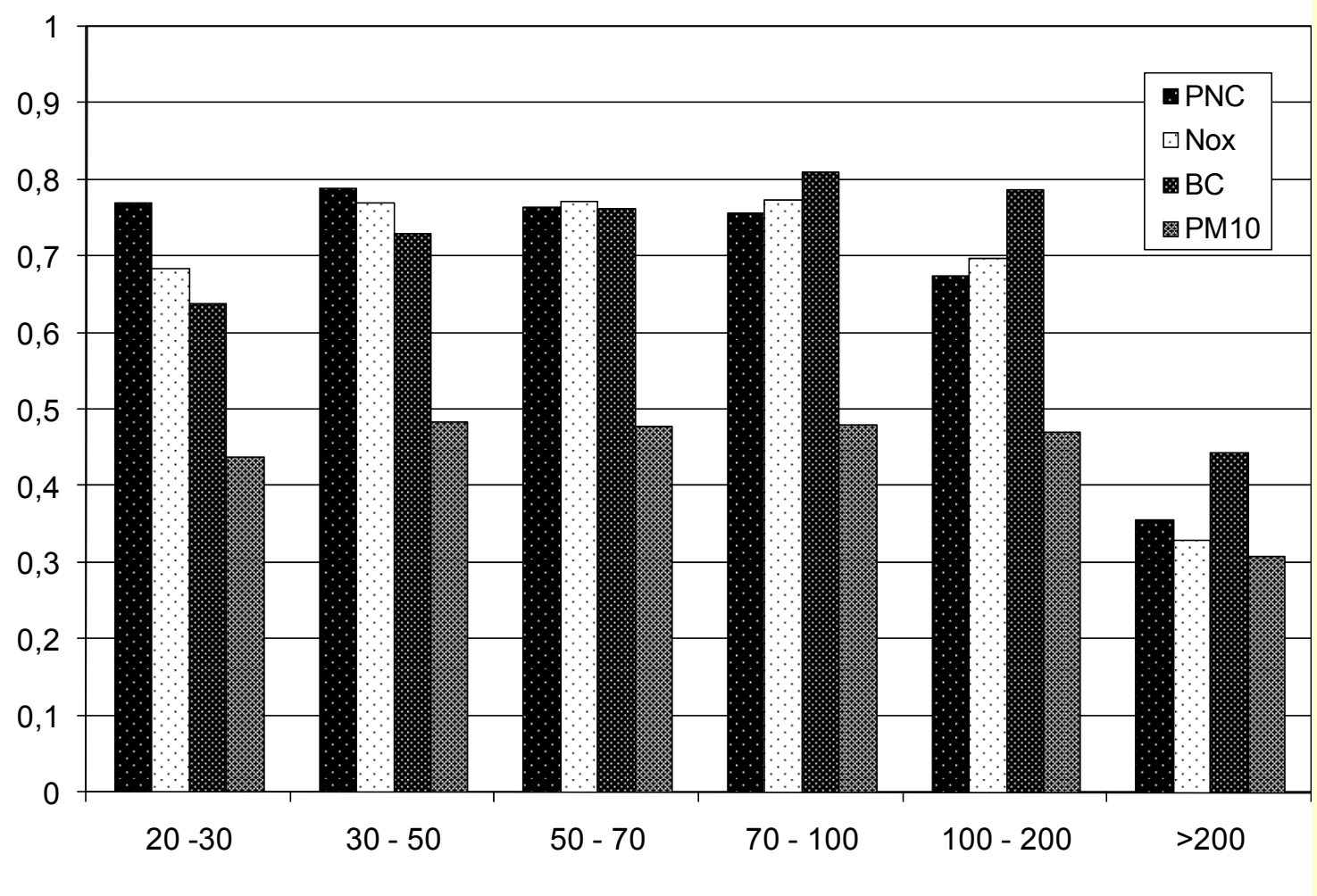
Decreasing levels of particle number >7nm; 2001 – 2007 (monthly mean values)



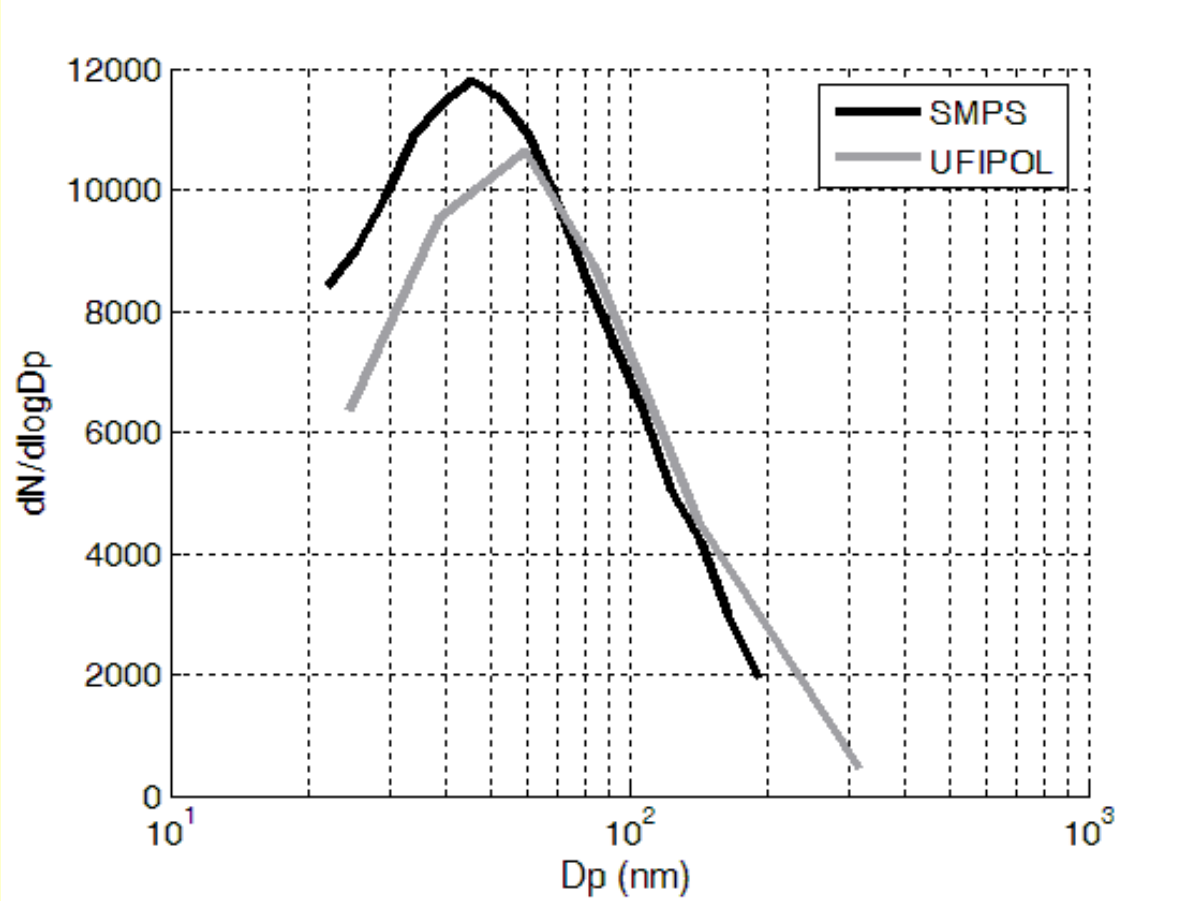

cm-3
UFP330
20-30
30-50
50-70
70-100
100-200
>200
8000
7000
6000
5000
4000
3000
2000
1000
0
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday


NOx
BC
NOx (µg/m3)
BC (µg/m3)
500
400
300
200
100
0
10
8
6
4
2
0
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

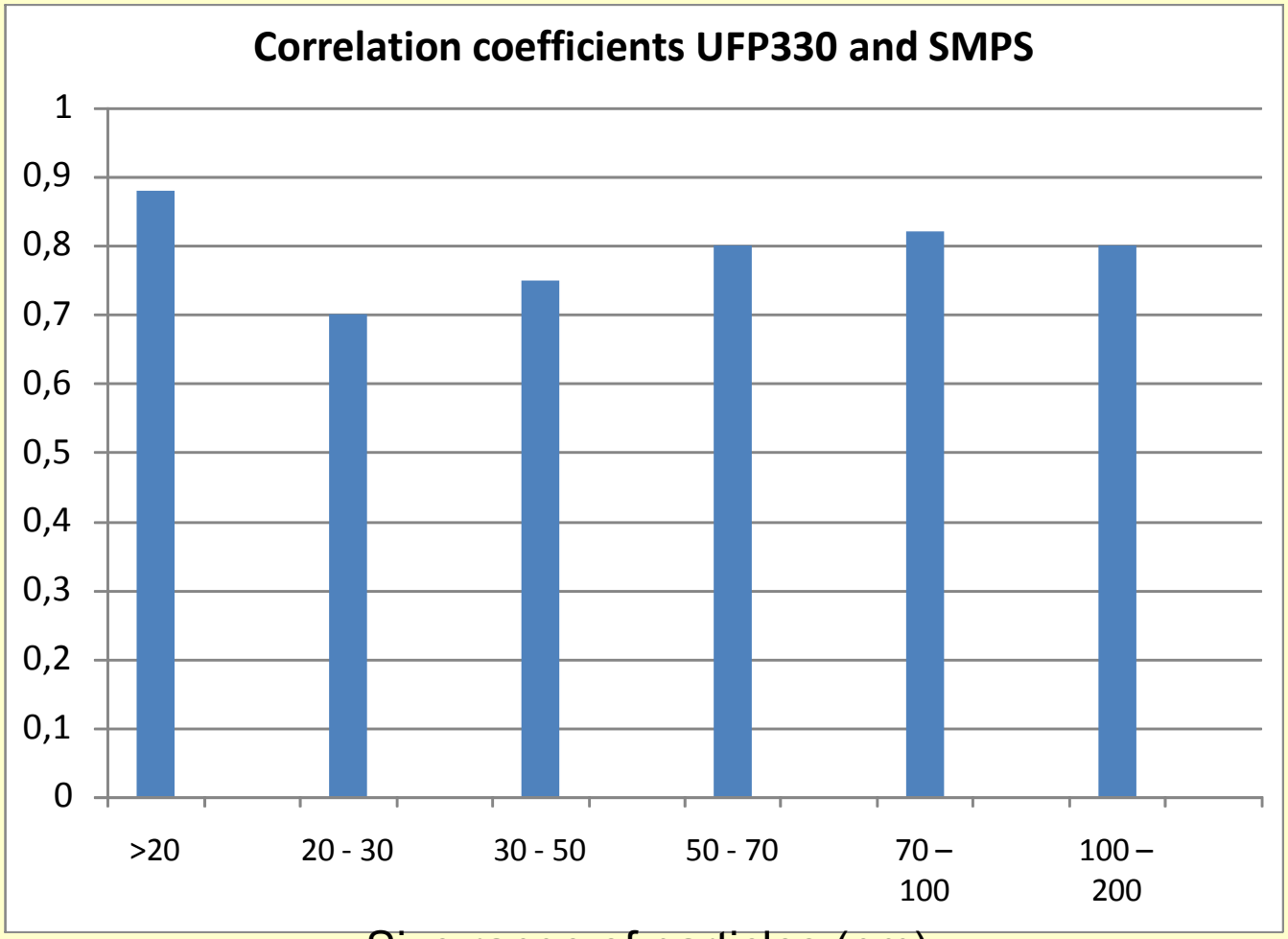
Correlations with PNC, Nox, BC, PM10



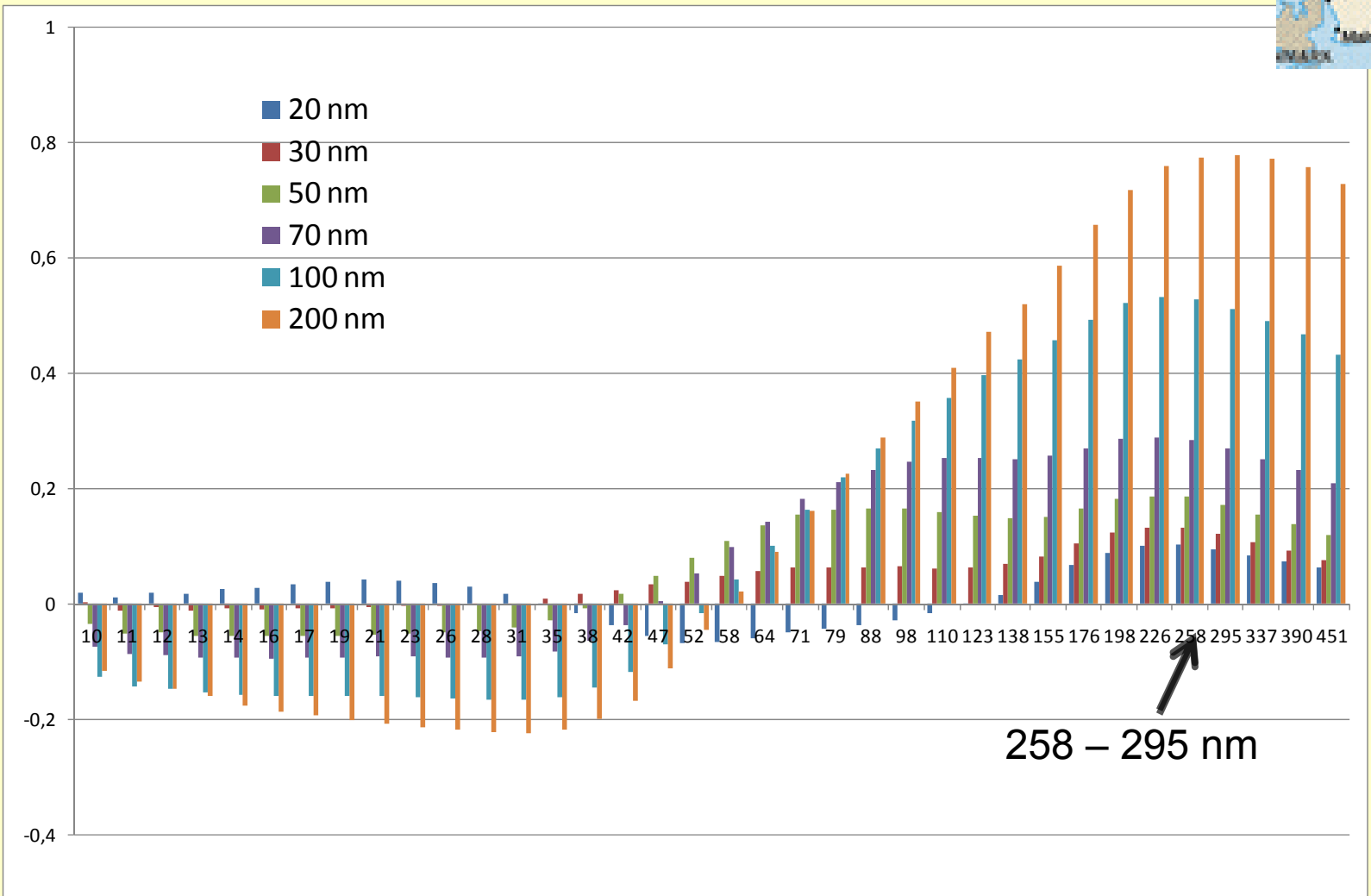
Comparison between SMPS(TSI) and UFP330



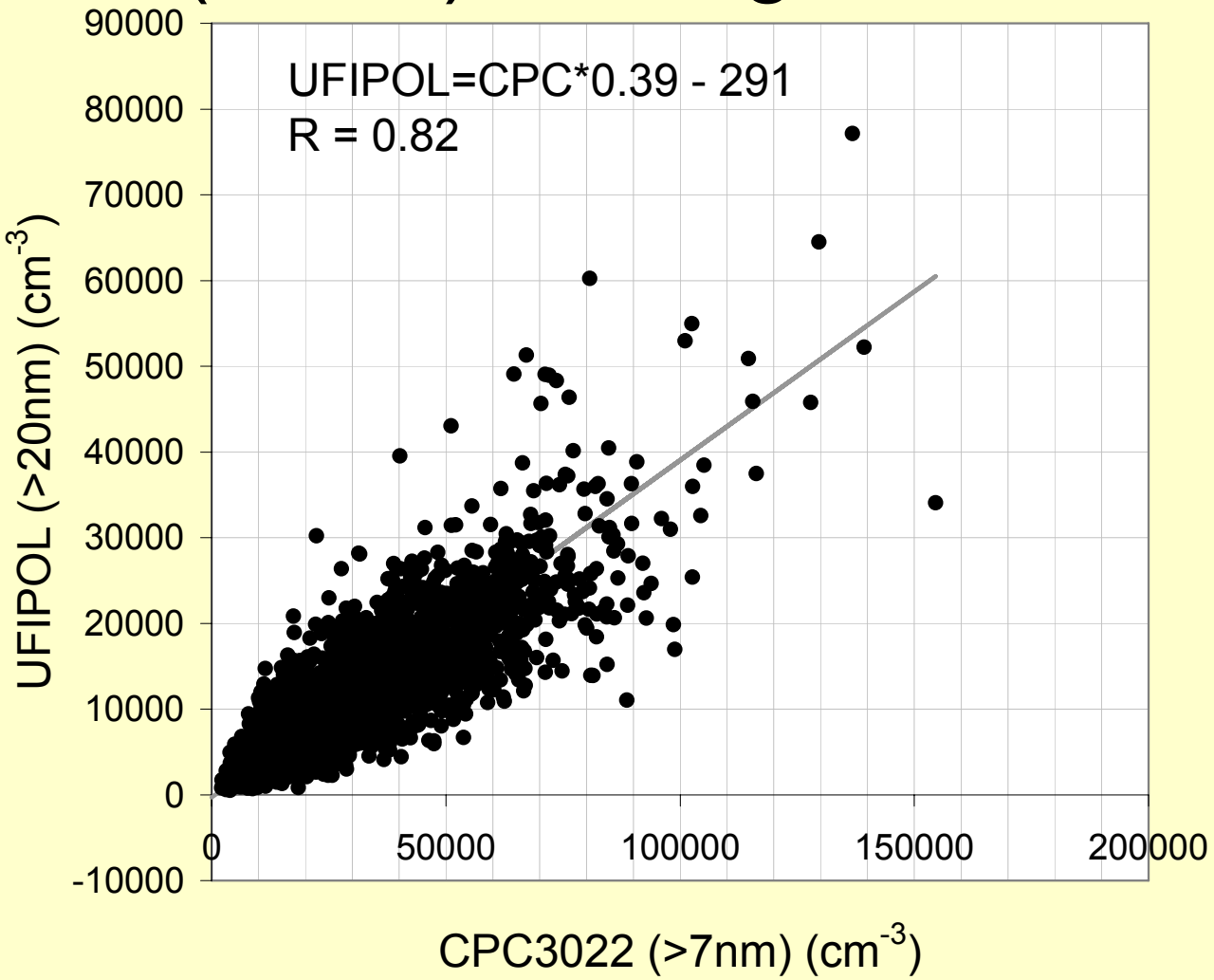
Lower correlation for 20-30nm and 30-50nm



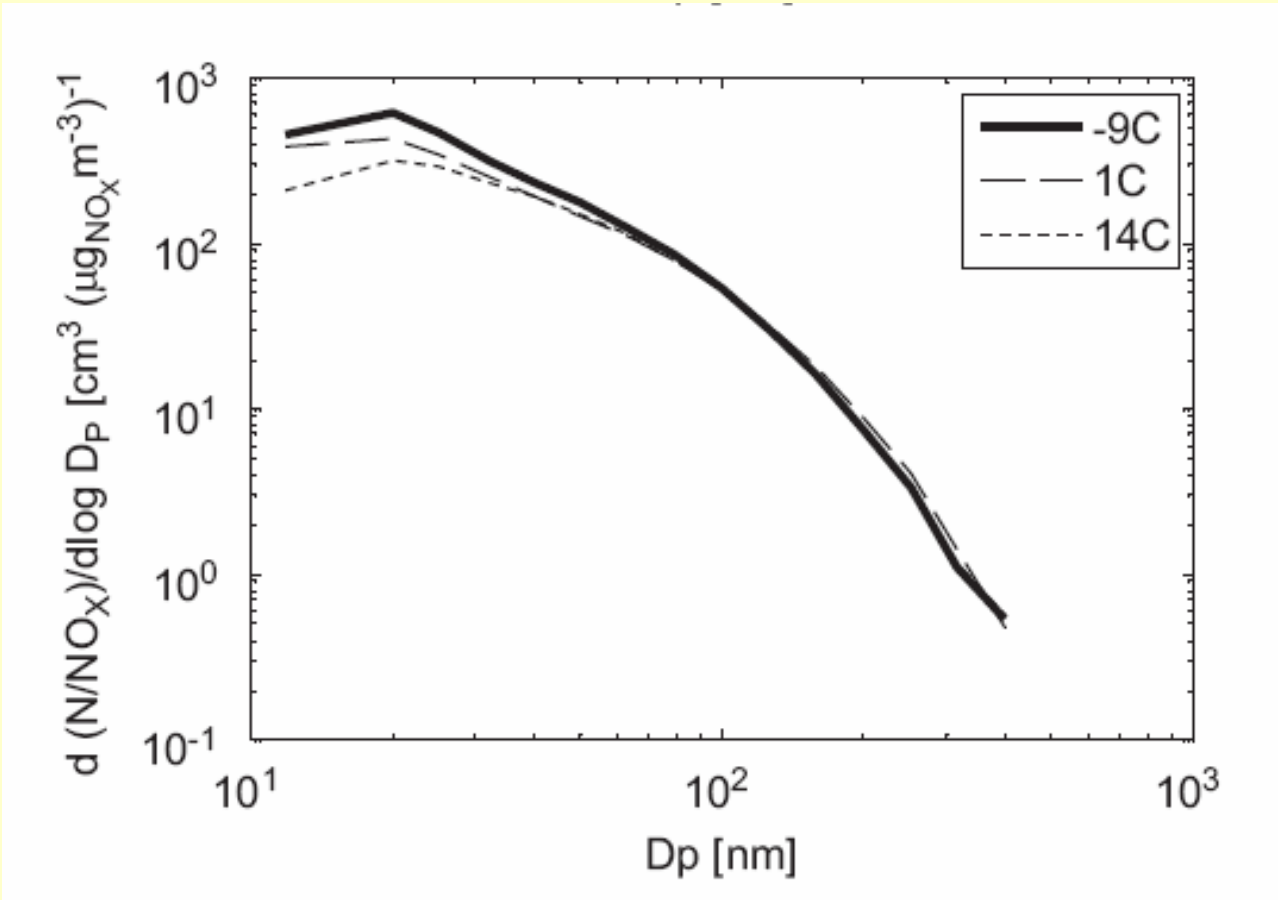
Particles >150 nm mainly due to non-local sources



UFP330 gives only 40% of total PNC(>7nm), but high correlation

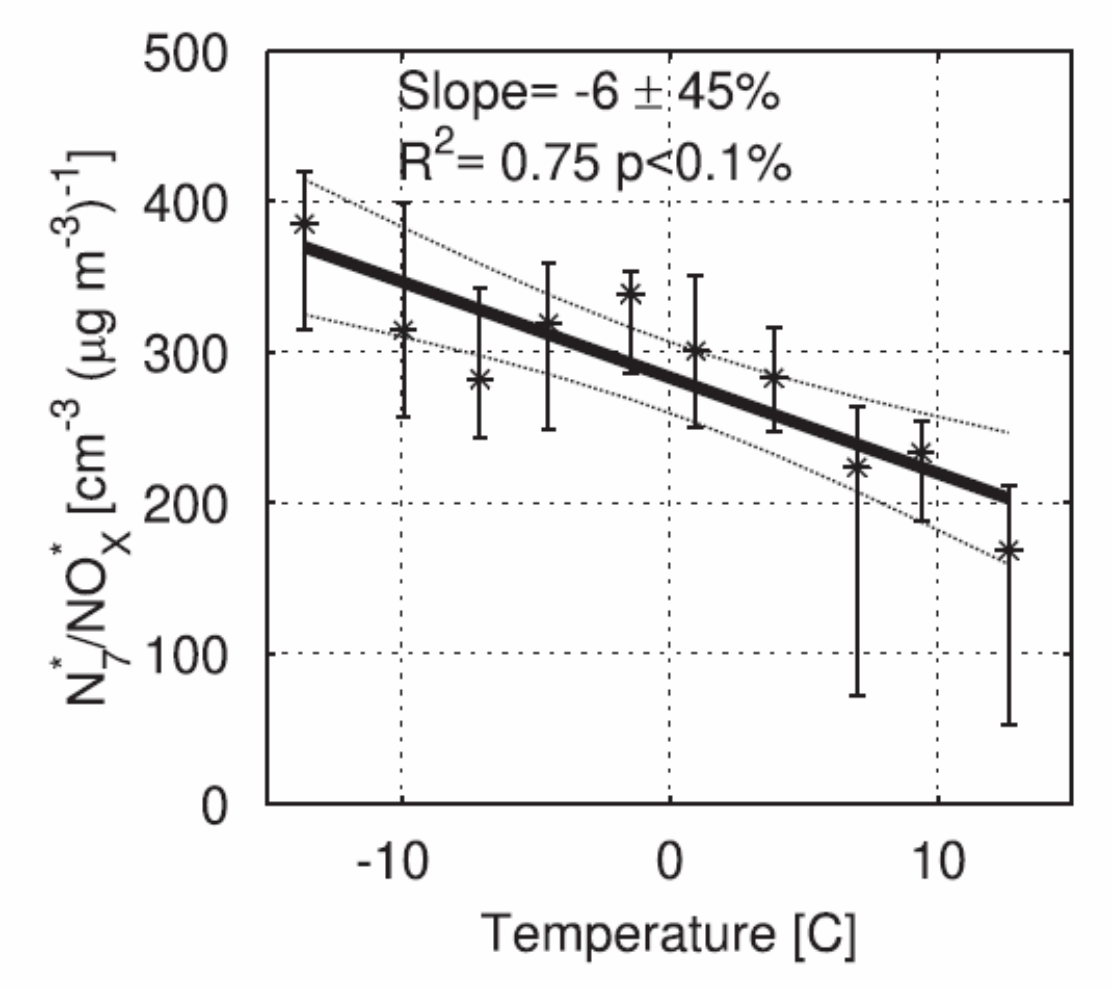


PNC/Nox increase as temp decrease for <50 nm PN



Olivares et al. (2007)

Strong temperature dependence of PNC emission >7nm



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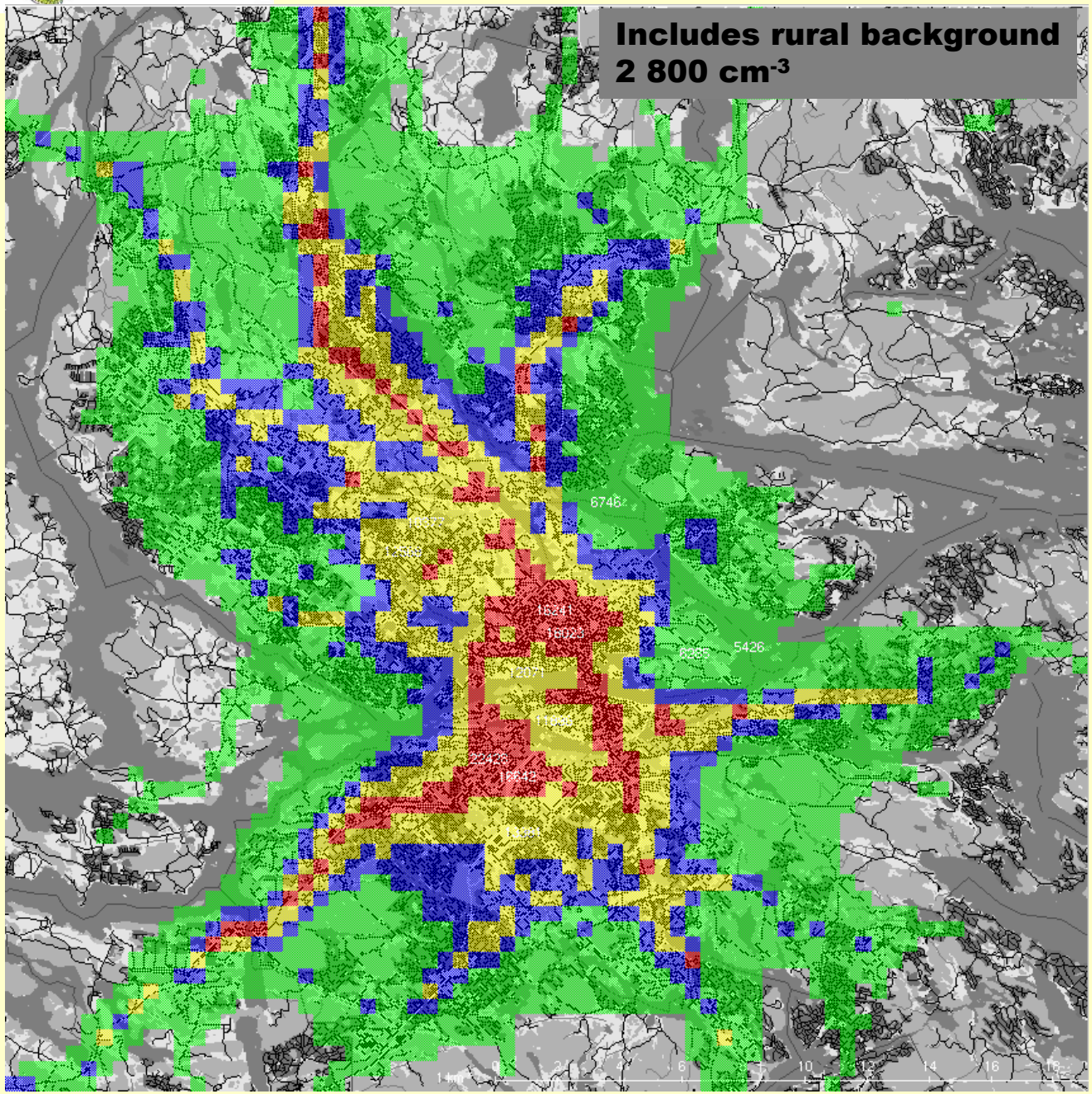
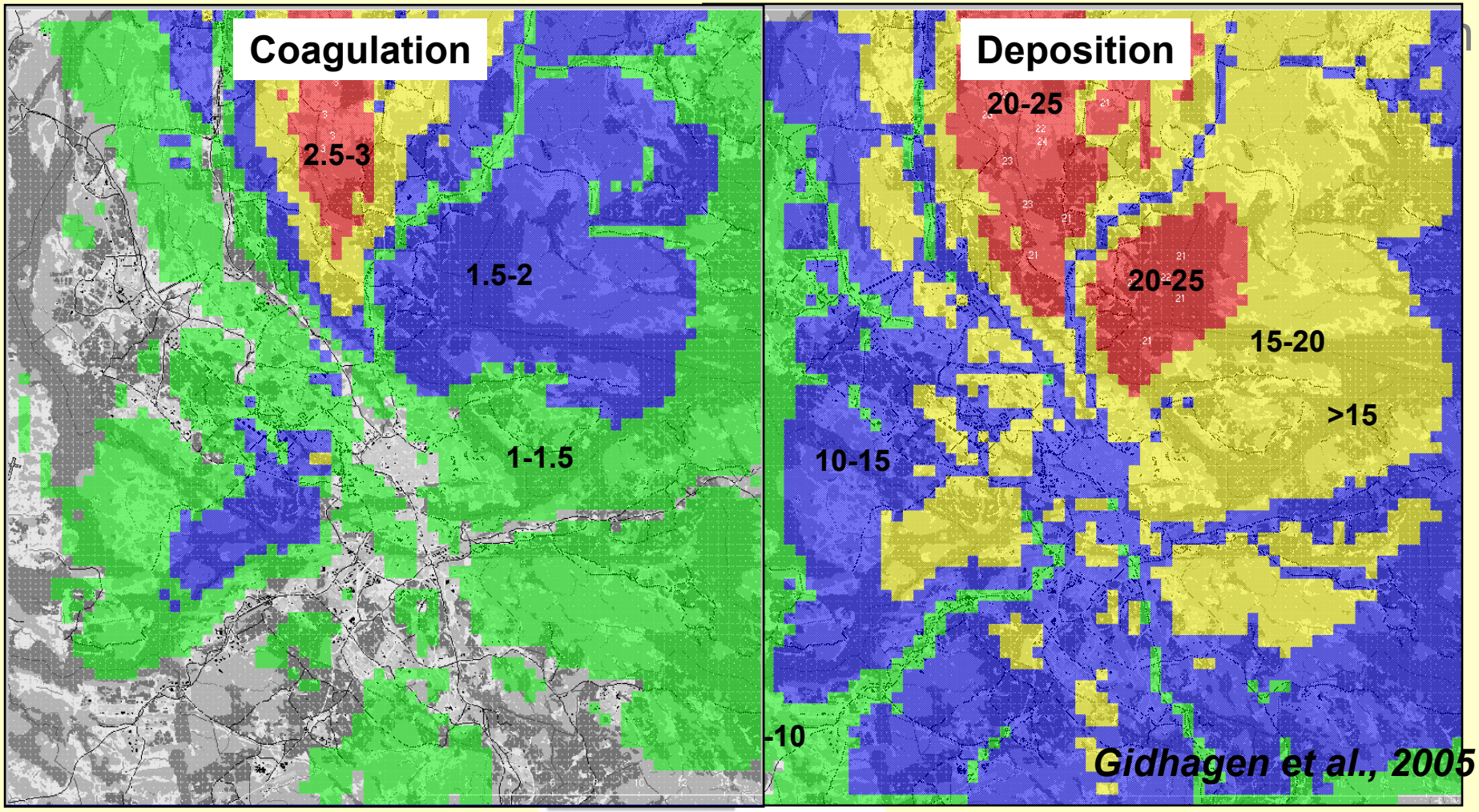
Model calculated PNC in Stockholm

Mean 2002



Importance of coagulation and deposition for PNC



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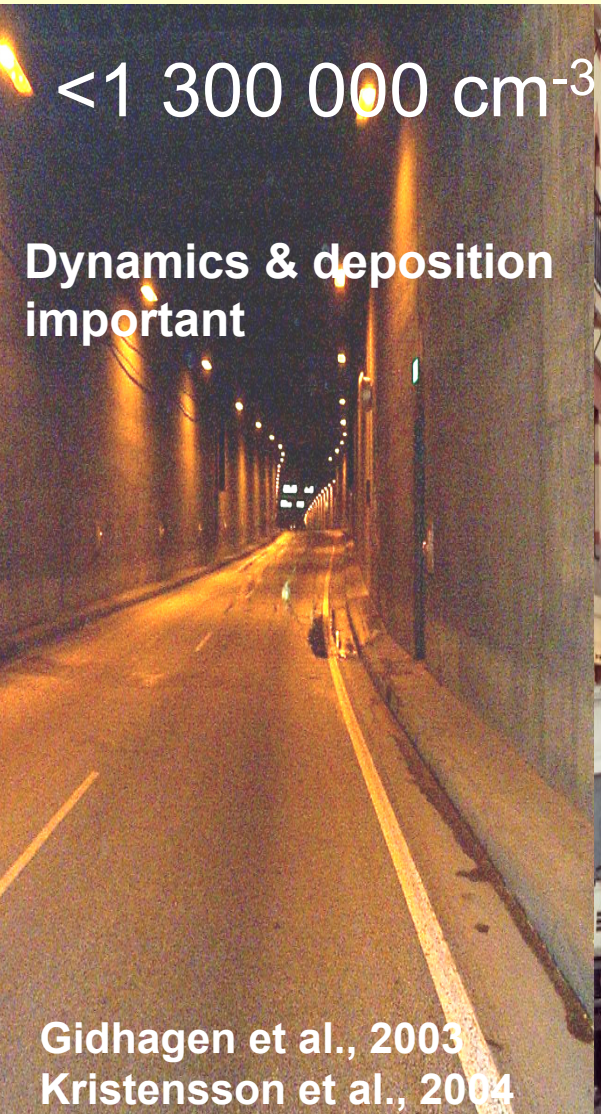
Measurements & modeling in different microenvironments



Summary

- Decreasing UFP levels (2001 – 2007)
- Size resolved particle measurements
  - Possible to keep track of main sources
  - Especially if combined with BC, NOx and PM10
- Considerations for modelling of UFP
  - Factor of 10 higher EF for diesel HDV comp LDV
  - Strong temperature dependence of emissions
  - UFP essentially inert on urban scale
    - dry deposition 20-25% reductions; Coagulation <5% reductions