



Size distributed traffic emission factors

Evaluation of simplified method by comparison with
inverse modelling

Sara Janhäll¹, Mattias Hallquist¹,
Ruwim Berkowicz² and Matthias Ketzel²

1. Göteborgs Universitet
2. Danmarks Miljøundersøgelser



Background and Objectives

- A novel simplified method to calculate E.R. has been developed
- Objectives
 - Validate this method with inverse modelling method
 - Apply this method on larger data sets (In this presentation Copenhagen data)
 - Use the method to initialise parameterisation of E.R.



Simplified approach

$$E.R. = \frac{UFP_{emitted}}{NOx_{emitted}}$$

$$Conc_{emitted} = Conc_{traffic} - Conc_{background}$$



Simplified approach

$$E.R. = \frac{UFP_{\text{traffic}} - UFP_{\text{background}}}{NOX_{\text{traffic}} - NOX_{\text{background}}}$$



Traffic selection

(According to Janhäll and Hallquist, ES&T 2005)

- High traffic
 - 20% of data with highest $[\text{NO}]/[\text{NO}_2]$
- Low traffic
 - 20% of data with lowest $[\text{NO}_x]$



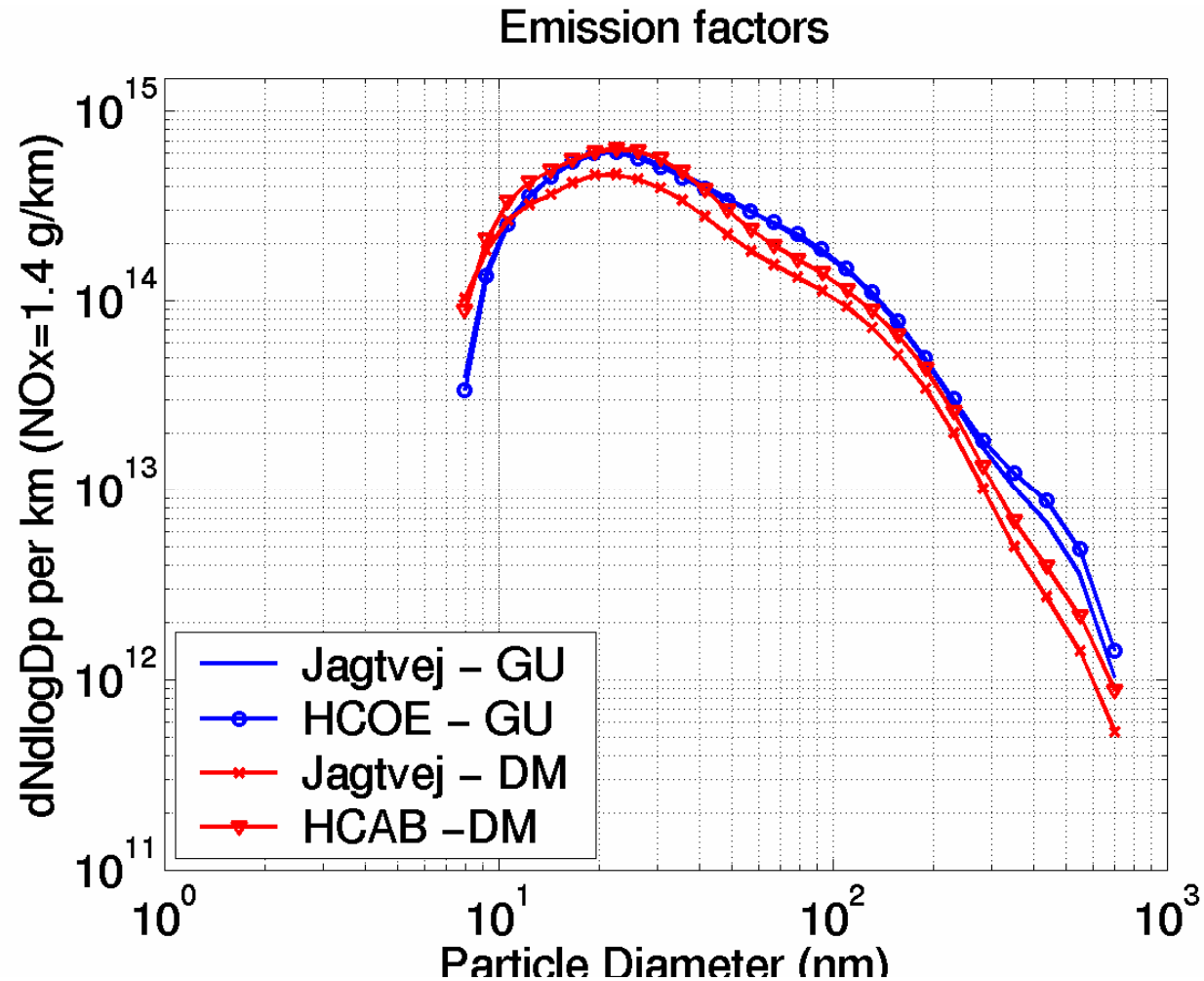
Copenhagen data

(see e.g. Ketzel et al 2003)

- Data from May 2001-Jan 2002
 - (1908 data points)
- Time resolution: 30 min
- SMPS – 6-700 nm diameter
- NO, NO₂
- Meteorology
 - Wind speed
 - Temperature
 - Humidity
 - Solar radiation

Comparison

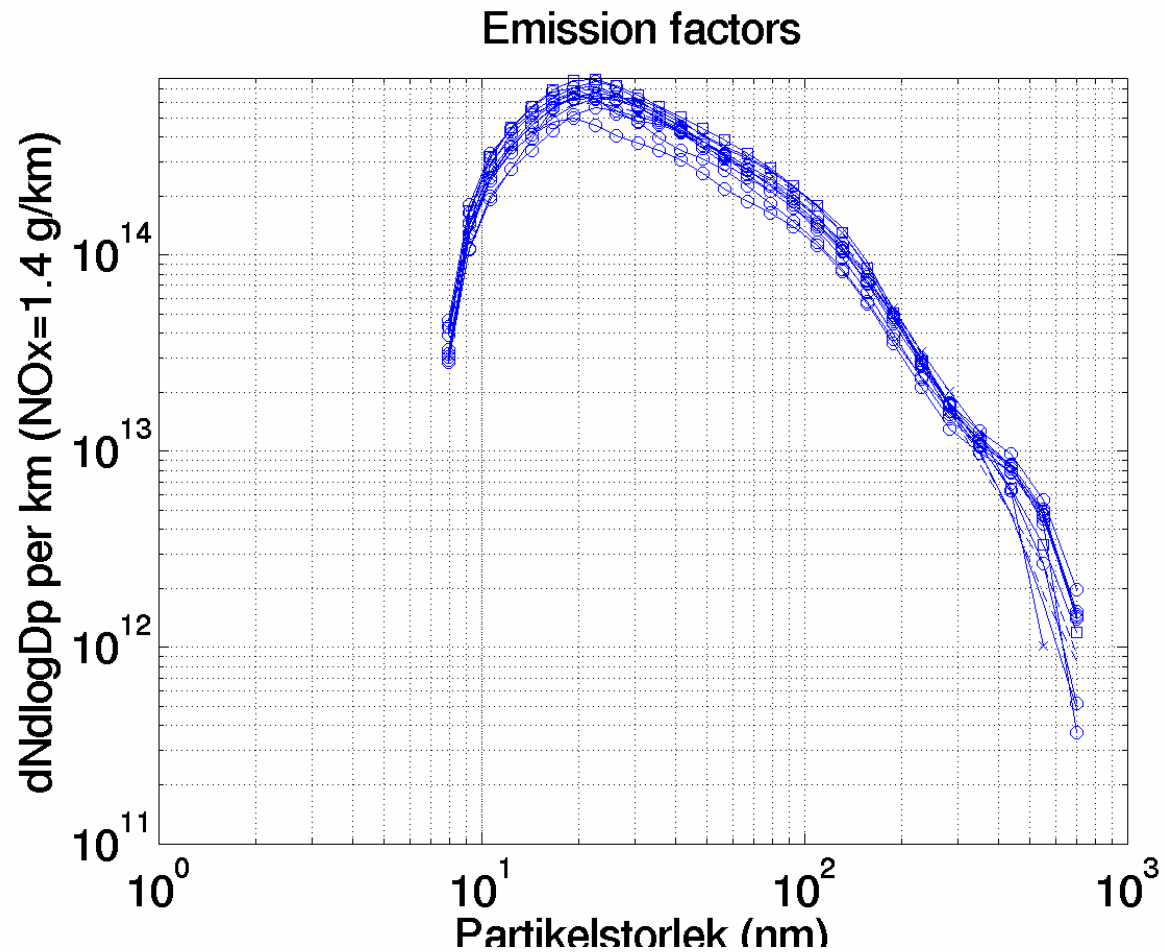
Simplified (GU) vs inverse modelling (DM)



NORPAC Norrköping October 2005

Diurnal Behaviour – Day time

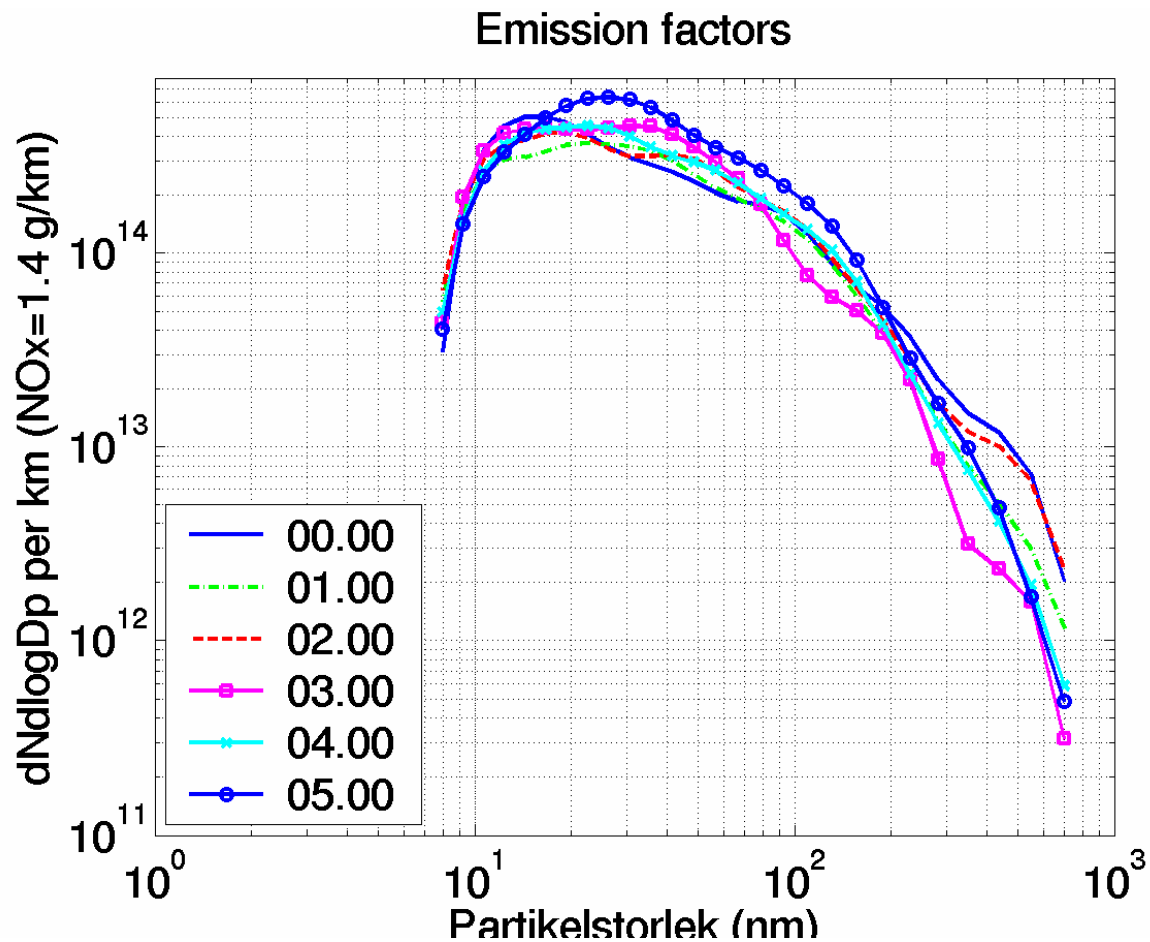
(06.00-19.00)



NORPAC Norrköping October 2005

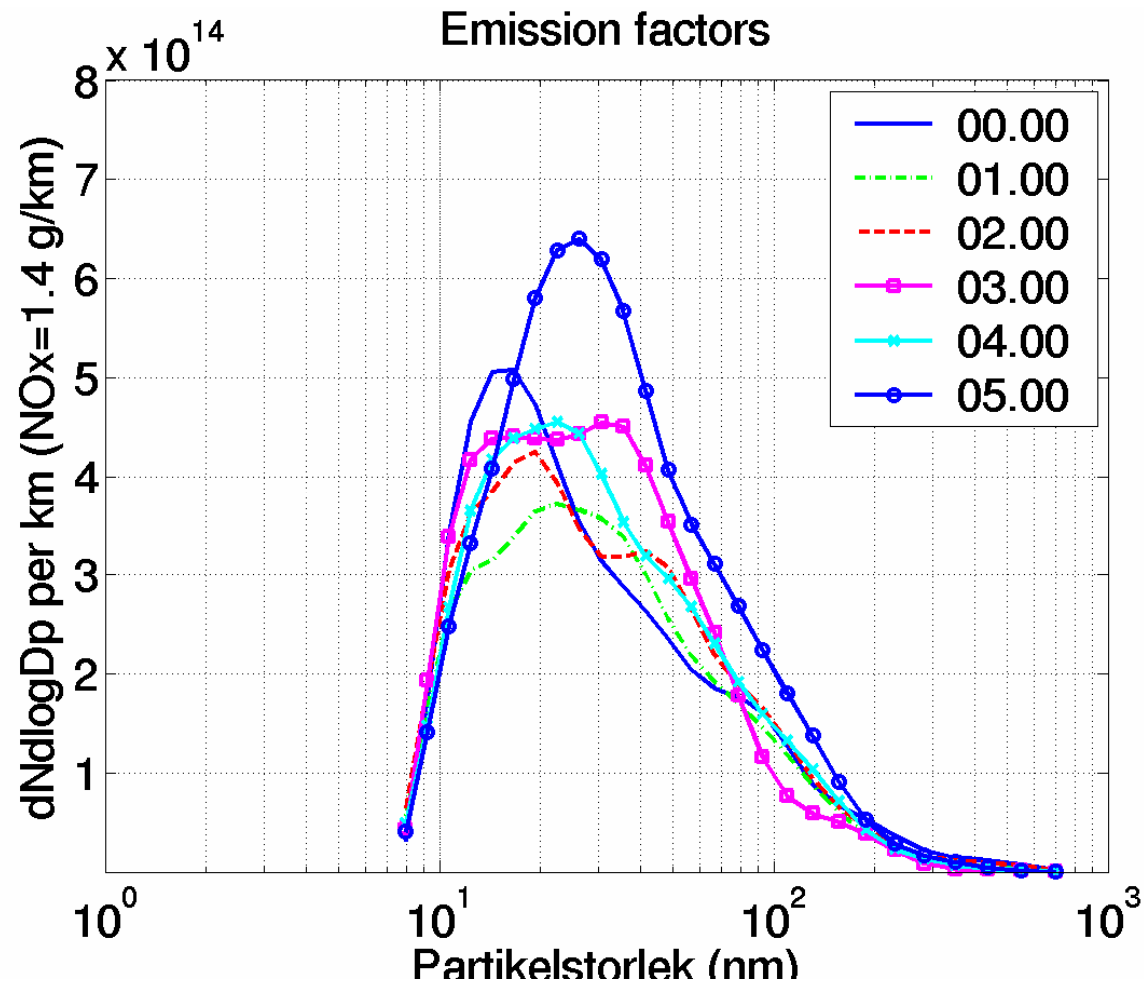
Diurnal Behaviour – Night time

(00.00-05.00)



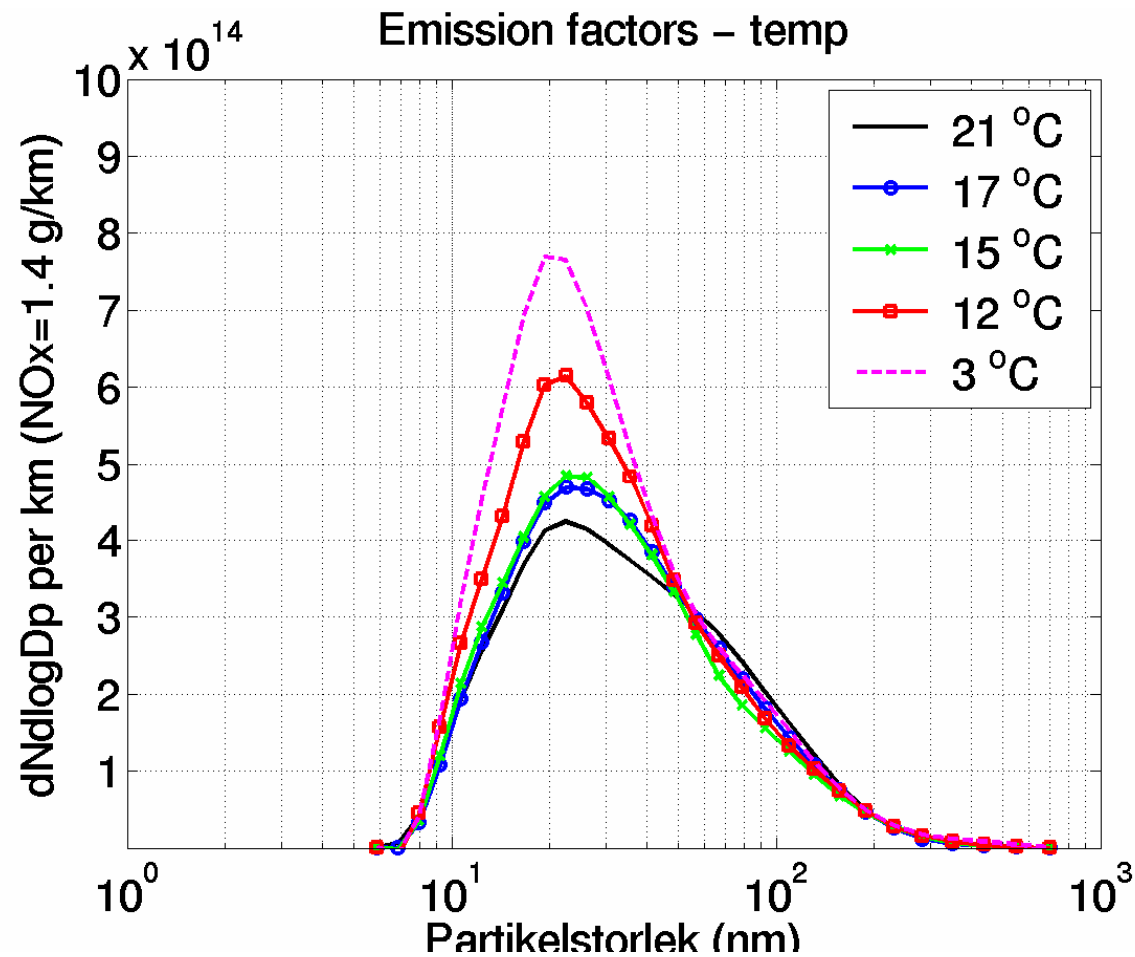
Diurnal Behaviour – Night time

(00.00-05.00)

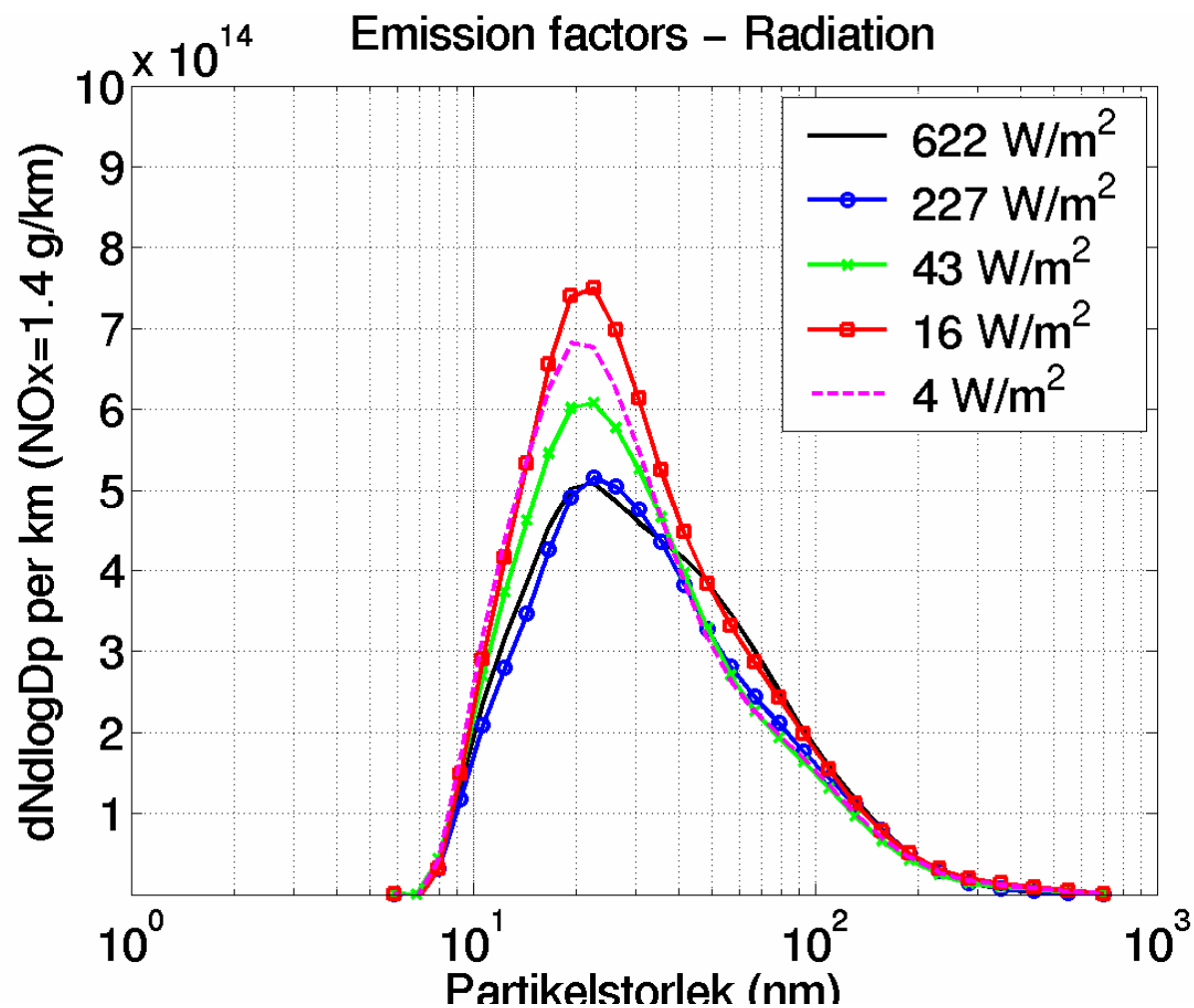


NORPAC Norrköping October 2005

Meteorological effects – Temperature

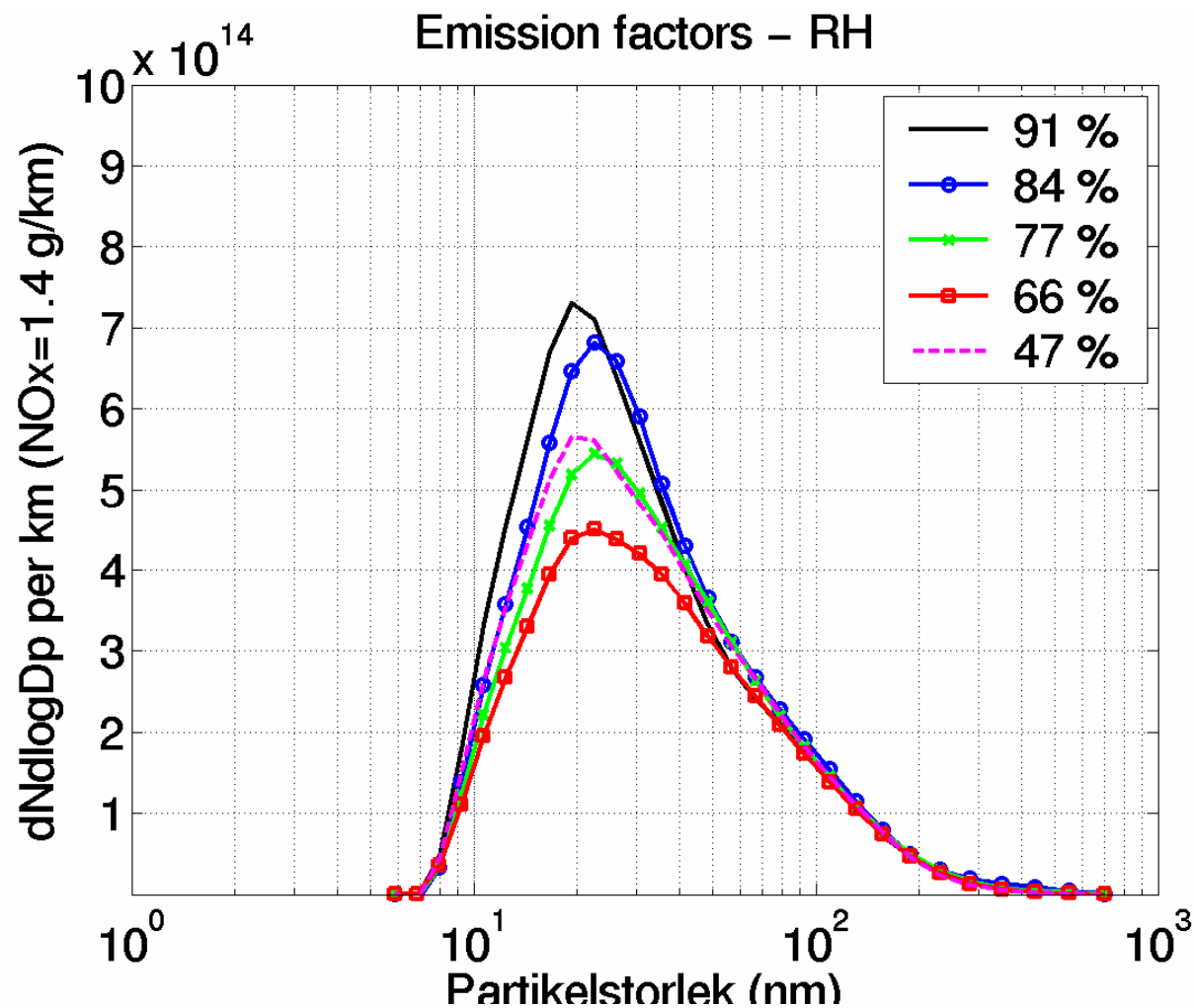


Meteorological effects – Radiation



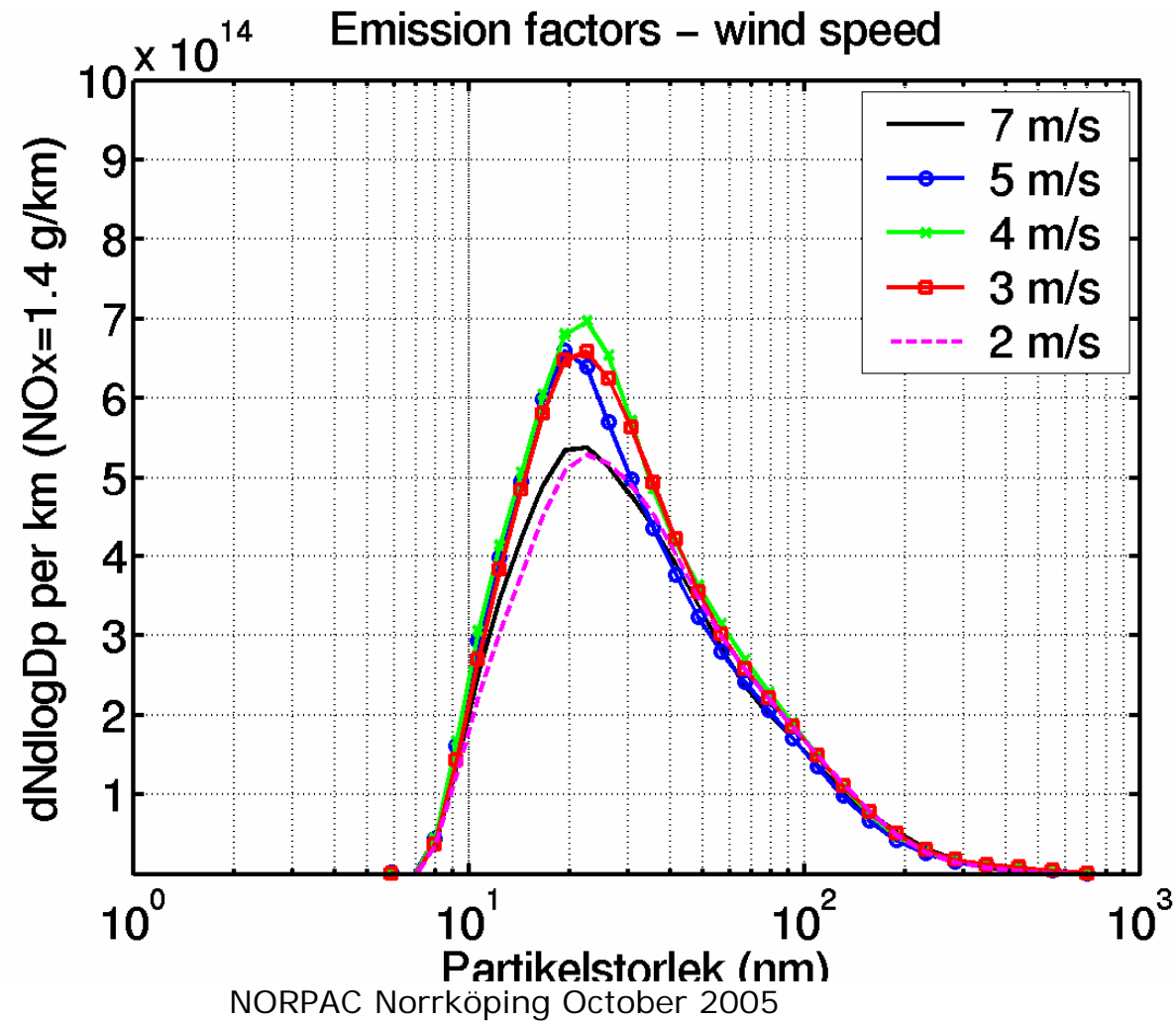
NORPAC Norrköping October 2005

Meteorological effects – Humidity



NORPAC Norrköping October 2005

Meteorological effects – Wind speed





Conclusion

- New method give similar results as two station-inverse modelling
- Simplified method enables ER calculation from road site stations
- Method can be used to evaluate the change in ER due to e.g.
 - Meteorology
 - Time of day
- Further evaluation of method
 - Use of other (larger) data sets
 - Parameterisation of ER by e.g. Temperature

