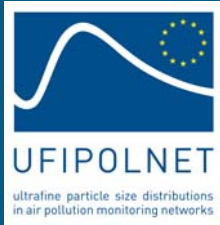


# UFIPOLNET: Concentration of Particle Number Distributions at 4 Stations in Europe



H. Gerwig<sup>1\*</sup>, G. Löschau<sup>1</sup>, L. Hillemann<sup>2</sup>, B. Wehner<sup>3</sup>, A. Wiedensohler<sup>3</sup>, A. Zschoppe<sup>4</sup>, C. Peters<sup>4</sup>, A. Rudolph<sup>4</sup>, C. Johansson<sup>5</sup>, J. Cyrus<sup>6</sup>, M. Pitz<sup>6</sup>, R. Rückerl<sup>6</sup>, J. Novák<sup>7</sup>, H. Horn<sup>8</sup>, R. Caldow<sup>9</sup>, G. Sem<sup>9</sup>



## WHY ULTRAFINE PARTICLES?

- **Epidemiological studies show** relationships between high concentrations of **PM<sub>10</sub>** and **adverse health effects**, like heart attacks and premature deaths. It is suggested, that Ultrafine particles (UFP) are of importance in this contents. The EU needs therefore more information about UFP concentrations within CAFE process and the Thematic Strategy on Air Pollution.
- Several studies show a **decline** of particle mass concentrations in Central Europe of TSP and **PM<sub>10</sub>** during 1990-99. But **particle number concentrations** of ultrafine particles (< 100 nm = UFP) partly **raised during winter periods** 1991 – 1999 in Erfurt/Germany (Cyrus et al. 2002).
- **Ultrafine particles are measured in only a few routine measuring stations** in Europe.

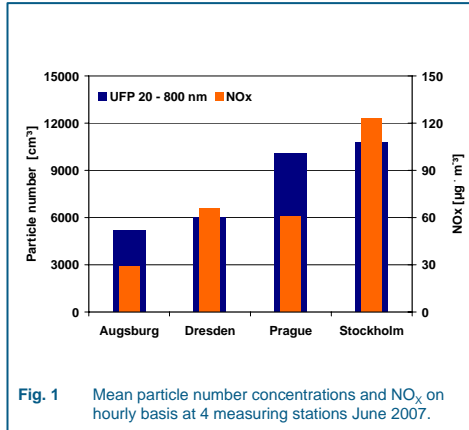


Fig. 1 Mean particle number concentrations and NO<sub>x</sub> on hourly basis at 4 measuring stations June 2007.

## OBJECTIVES

- **Measuring instrument** for ultrafine particle size distributions (UFP 330 by TOPAS GmbH)
  - **Affordable and easy to use** under routine measuring network conditions
  - **No butanol or radioactive wastes**
  - **6 different size classes** (UFP1 - UFP6) >20 | >30 | >50 | >70 | >100 | >200nm (-800nm) therefore **reduced data amount**
- **Harmonisation of sampling conditions**
- **Measuring activities over 5 years**
- **Contact with interested groups**, like CAFE-Working group and VDI
- **Long term stability** will be tested in Jan 08



Fig. 2 Dresden: UFP 330, TOPAS (middle) and reference Twin-DMPS, IFT (right)

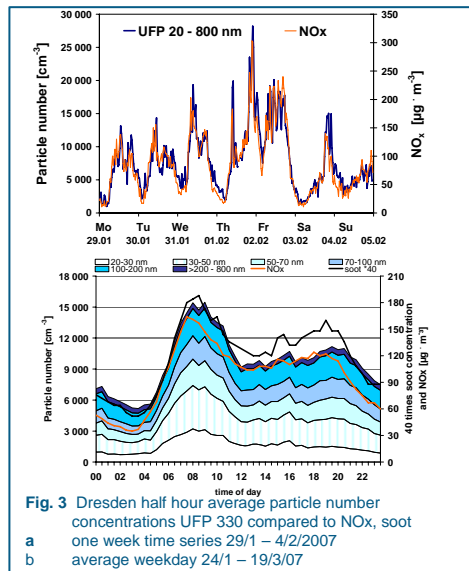


Fig. 3 Dresden half hour average particle number concentrations UFP 330 compared to NO<sub>x</sub>, soot one week time series 29/1 – 4/2/2007  
a one week time series 29/1 – 4/2/2007  
b average weekday 24/1 – 19/3/07



Fig. 4 The 4 Measuring sites

## RESULT: UFP 330

- UFP 330 (Fig. 2) consists of a **corona-jet-charger**, a **DMA**, an **electrometer** (Hillemann et al., 2007).
- **Same sampling system at all sites** (0.5 µm cyclone and membrane dryer), different data collecting systems and different communication protocols (Zschoppe et al., 2007).

## RESULT: 4 STATIONS COMPARED

- UFP particle number concentrations + NO<sub>x</sub> (1 hour average) at 4 measuring stations in June 2007. (Fig. 1)
- **Urban Background site Augsburg shows less, street canyon Stockholm shows twice** as many particles as Dresden. NO<sub>x</sub> in Prague and Dresden show almost the same concentration, in Stockholm it was twice as much.

## EVALUATION RESULTS

- Ongoing measurements since 12-2006 in Dresden, at the other 3 places since 02-2007.
- **Comparing UFP 330 and TDMPS**: In general, the correlation for the size classes UFP2 – UFP5 is higher than for the largest (> 200 nm) and smallest (20 – 30 nm) one (Jan/2007). (Wehner et al., 2007).
- **Correlation between total number concentration UFP 330 (20 – 800 nm) and TDMPS (20 – 400 nm) in Dresden (24/1 – 15/2/07) was good: R<sup>2</sup> = 0.85.**
- Particle number concentration of UFP 330 to NO<sub>x</sub> in Dresden shows good correlation **R<sup>2</sup> = 0.83** (29/1 – 4/2/07) and therefore similar curves in a time series (Fig. 3a). A correlation with NO<sub>x</sub> indicates traffic influence (Birmili, 2006).
- The change of **particle number concentration** during an average weekday (24/1–19/3/07) shows the **similar pattern like NO<sub>x</sub> and soot** (Fig. 3b).

## MEASURING SITES

- **Stockholm**: Hornsgatan (street canyon)
- **Dresden**: Schlesischer Platz (main crossing)
- **Prague**: Strahovský tunnel (above tunnel exit)
- **Augsburg**: Friedberger Straße (urban background) Three places are near busy roads, whereas the place in Augsburg is an urban background site (Fig. 4).

## REFERENCES

- Cyrus, J., Heinrich, J.; Peters, A.; Kreyling, W., Wichmann, H. E. (2002). Umweltmed Forsch Prax., 7, 67-77.
- Birmili, W. (2006). Editor: D. Bake; Forschungsbericht 203 43 257/05 UBA-FB 000942 ; UBA Texte 26 – 06, Umweltbundesamt, Berlin.

## PARTNER



## CONTACT

\* Saxon State Agency for Environment and Geology  
 Section 22, Air Quality  
 email: Holger.Gerwig@smul.sachsen.de  
 web: www.ufipolnet.eu  
 conference: Ultrafine Particles in Urban Air 23 - 24-Oct-2007  
 Dresden/Germany

With the contribution of the LIFE financial instrument of the European Community: LIFE04 ENV/D/000054. The authors wish to thank Heinz Ott, LIU Bavaria for providing NO<sub>x</sub>-data in Augsburg from the routine air measuring network.

## RELATED POSTER + LECTURES

- T13A202 B. Wehner et al., The new UFP 330: Comparison with a DMPS for ambient aerosols  
 T02A048, A. Zschoppe et al., A new conception for environmental measurement of ultrafine particles  
 T05A008 L. Hillemann et al., Aerosol mobility spectrometry based on diffusion charging