

Extended Summary

UltraSchwarz – Ultrafine Particles and Health in the Ore Mountains:
Annaberg-Buchholz (Germany) and Ústí nad Labem (Czech Republic)

by:

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The knowledge about the influence of ultrafine particles on human health is still limited. Studies dealing with the interaction of ultrafine particles and health are based only on time periods shorter than one year. Currently, there exists no limit value for effective surface area, number or mass concentrations of ultrafine particles in the guideline 2008/50/EG. The guideline has the goal to protect human health and the environment.

Our project called “UltraSchwarz” focuses on the health effects of ultrafine particles in a highly industrialized region and started 7/2011. It is funded by the European Regional Development Fund (ERDF).

A widely used instrument to measure the number size distribution of ultrafine particles is a SMPS. However, there exists no commercial instrument so far, which shows a long-term stability with an uncertainty of 10% against a reference instrument. This long-term stability is important to yield comparable measurements, which is a pre-condition for a revision of the 2008/50/EG.

Number size distributions of ultrafine and fine particles were measured in a size range from 10-800 nm with a non-commercial SMPS manufactured by the Leibniz Institute for Tropospheric Research in Leipzig, whereas soot mass concentrations are determined by a MAAP (Thermo Fisher Scientific Inc., Waltham, USA). Figure 1 shows the particle number concentration for seven size classes and the soot mass concentration from March 6, 2012 for the site in Annaberg-Buchholz. The figure represents typical rush hour times in the morning and the afternoon. Furthermore, the figure illustrates that the soot mass concentration is mostly influenced by particles smaller than 70 nm, which are mostly emitted by traffic.

At the two stations, every 6th filter of the regularly HVS PM_{2.5} aerosol sampling is analyzed for chemical composition. The chemical analysis includes the determination of PAHs, heavy metals, major ions, and carbon (OC/EC). Additionally, regularly gaseous air pollutants, meteorological as well as traffic counting data, are used to evaluate and interpret the aerosol measurements.

Aerosol measurements in Annaberg-Buchholz started in January 2012, whereas the particle measurements in Ústí started in May 2012. However, no results exist yet for the interaction of air pollution with epidemiological data to investigate the influence on human health under consideration of socio-demographic parameters. Epidemiological data will include mortality as well as cardiovascular and respiratory diseases. The collection and consolidation of epidemiological with environmental data is the task of the lead partner TU Dresden (for Annaberg-Buchholz) and the Public Health Institute (for Ústí nad Labem).

Based on the findings at the end of the project, one important goal of this project is to recommend a limit value for ultrafine particles and thus to protect the human health.

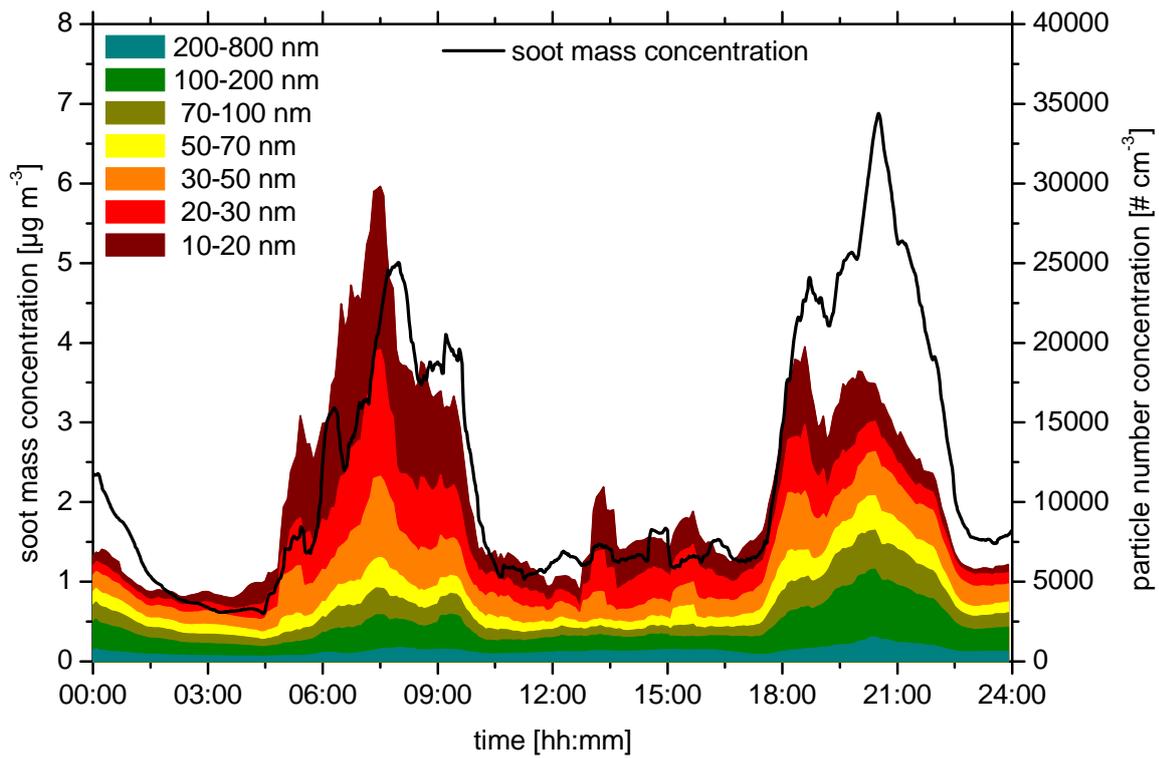


Figure 1: Particle number and soot mass concentration from March 6 for the site in Annaberg-Buchholz with traffic peaks in the morning and the afternoon.

For more information of the project see: <http://www.umwelt.sachsen.de/umwelt/luft/25819.htm>
<http://ultraschwarz-ziel3.de/>

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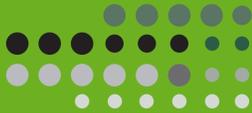
LANDESAMT FÜR UMWELT,
LANDWIRTSCHAFT
UND GEOLOGIE



UltraSchwarz

Ultrafeinstaub
Gesundheit

Ultrajemné částice
Zdraví



Why UltraSchwarz?

- limited knowledge about influence of ultrafine particles on human health
- limit value for ultrafine particles to protect the human health is recommended
- cross-border cooperation of public authorities and scientific institutions from Saxony and the Czech Republic in a highly industrialized region (former “Schwarzes Dreieck”)

Where is the project area?

- Fig. 1 shows a map of Saxony and northern Bohemia
- arrows show urban background sites for air quality measurements in Annaberg-Buchholz (D) and Ústí n.L. (CZ)
- both cities have large hospitals and surgeries for collection of health data



Fig. 1: Map of Saxony and Bohemia downloaded from <http://karten21.com>.

Who is involved in UltraSchwarz?

- TU Dresden (analyse the health effects in D)
- LfULG Dresden (responsible for ultrafine particle measurements in D)
- IfT Leipzig (responsible for the quality assurance of particle measurements)
- CHMI Ústí n.L. (responsible for ultrafine particle measurements in CZ)
- Regional authority Ústí n.L. (responsible for financial issues)
- Public health institute Ústí n.L. (analyse the health effects in CZ)

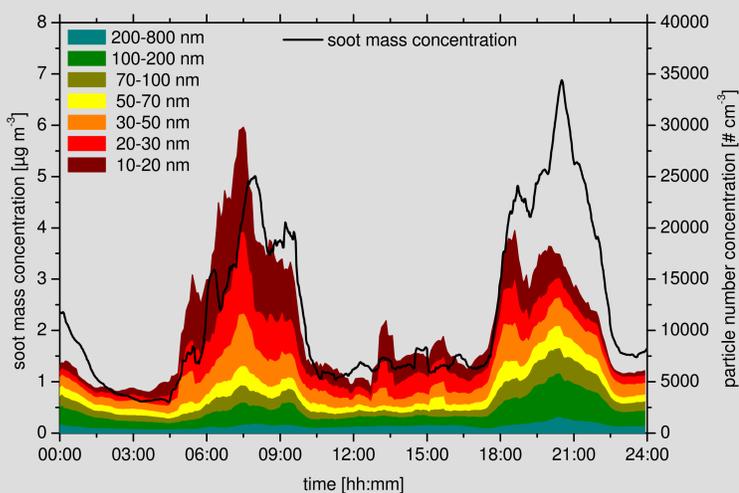


Fig. 2: Particle number and soot mass concentration from 6 March for the site in Annaberg-Buchholz with traffic peaks in the morning and the afternoon.

What is new in this project?

- measurement of particle number size distributions with a non-commercial SMPS (manufactured by IfT, Germany) to calculate particle number concentrations in different size classes (see Fig. 2)
- determination of soot (black carbon) mass concentration with a Multi Angle Absorption Photometer downstream a PM₁-inlet
- automatic quality control unit: checks integrated particle number concentration with a total particle counter every 2nd day
- simultaneous collection of health data in hospitals and surgeries as well as social demographic parameters from the official statistic

Which additional parameters should be linked with health data?

Parameter	Measurement system / Method	Size range	Temporal resolution
Particle mass concentration	EN 14907	PM _{2.5}	24h
Chemical composition of particles	VDI 2465 1 st sheet (EC/OC)	PM _{2.5}	24h (only every 6 th day)
	VDI 3497 3 rd sheet (Ions)		
	EN 15549 (PAHs)		
	EN 14902 (Heavy metals)		
Gaseous air pollutants	EN 14211 (NO, NO ₂)	n.a.	1h
	EN 14212 (SO ₂)		
	EN 14625 (O ₃)		
Meteorological data	Wind direction, wind speed, relative humidity, temperature, global radiation	n.a.	1h
Traffic data	Automatic counting	Heavy goods vehicles, passenger cars	1h

The project is funded by the European Regional Development Fund (ERDF)



Europäische Union. Europäischer Fonds für regionale Entwicklung: Investition in Ihre Zukunft / Evropská unie. Evropský fond pro regionální rozvoj: Investice do vaší budoucnosti

Ziel 3 | Cíl 3
Ahoj sousede. Hallo Nachbar.
2007-2013. www.ziel3-cil3.eu