

Press release

## ***High concentration of fine dust particles in cold air from Eastern Europe***

*The influx of cold air from Eastern Europe, especially in winter time leads to violations of the PM<sub>10</sub> legal limit value*

**Leipzig. Long-range air mass transport from Eastern Europe can contribute to exceedances of the daily legal limit values of particulate matter in Germany. This is the result of a multi-year study of the Leibniz Institute for Tropospheric Research (IfT). The researchers compared measurements of particulate matter at the rural research station Melpitz near Torgau to the origin of air masses. The particulate matter PM<sub>10</sub> concentration - this includes particles up to a diameter of 10 micrometers - was about twice as high under easterly wind directions in winter (35 micrograms per cubic meter) compared to westerly influx. On individual days, this lead to daily mean values above 50 micrograms per cubic meter, which should happen on no more than 35 days per year in accordance with EU regulation. In the case of more than 35 exceedances per year local authorities must take preventive measures, such as setting-up low-emission zones. Since the decline of the regional emissions after 1990, atmospheric long-range transports and stagnant weather conditions, especially in winter, are the cause of days with elevated particulate matter concentrations in rural areas of East Germany, as the researchers write in the journal *Atmospheric Environment*.**

Dry continental air masses arriving in Germany with easterly winds favor the long-range transport of trace gases and particles by low turbulent mixing. Self-cleaning of the atmosphere by precipitation is strongly reduced under such meteorological conditions.. The air masses come from Russia, Belarus and Ukraine and pass on their way to the coal mining and industrial areas of Slovakia, Poland and the Czech Republic. PM<sub>10</sub> particle mass concentrations are aligned with a higher content of sulfate and carbon compared to other wind directions, and indicate anthropogenic PM sources. In conjunction with low exchange stable high-pressure weather conditions, this may lead to situations in which already in rural areas the limit of 50 micrograms per cubic meter in the daily average was exceeded. Typically, such extreme situations take place only during winter. In the years 2005 to 2010, for instance, 69 days with daily legal limit exceedances were observed in Melpitz. Only 7 of those events took place in the summer season (May to October) but 61 in the winter.

"We measured the so-called background levels in Melpitz (50 km northeast of Leipzig) since the early 1990s. The station is far away from traditional sources such as industry or traffic," Dr. Gerald Spindler from IfT describes the location of the research station.

His IfT colleague Dr. Wolfram Birmili, who investigates particulate matter at city level added: "One should realize, however, that these 69 dramatic, because virtually area-wide PM<sub>10</sub> exceeding's in 6 years, which means 11-12 per year, range far below the EU-approved margin of 35 days per year. A far greater number of exceedings are known to occur in our city (on average 49-52 a year for Leipzig-Mitte and Leipzig-Lützner-Strasse, based on the period 2005-2010) with a significant involvement of local sources of particulate matter such as traffic. Therefore it remains a task to prevent the release of particulate matter within our cities as well. One possible instrument to reduce local PM<sub>10</sub> concentrations is the low emission zone. Because of the exhaust gas filtering enforced by

the low emission zones, a concentration decrease is expected especially for diesel soot and nitrogen dioxide. "Although so-called east wind weather situations will occur approximately only 15% of the time of the year in Saxony. Nevertheless, it appears imperative to further reduce human-induced emissions in Eastern Europe.. The researchers point to EU-driven actions in the new member countries. Further technical improvements, e.g., in the reduction of power plant and domestic heating emissions could diminish the large-scale transportation of particulate matter in Europe significantly. Moreover, that would also lead to significant improvements in air quality in the Eastern European problem areas themselves".

At Melpitz, also PM<sub>2.5</sub> and PM<sub>1</sub> mass concentrations (particles with a diameter of up to 2.5 or 1 µm) have been measured continuously. The mass concentrations of PM<sub>2.5</sub> were 15-19 micrograms per cubic meter averaged over the year 2004-2008; this is below the EU target value for PM<sub>2.5</sub> valid since 2010: 25 µg/m<sup>3</sup> annual mean. From 2015, this will be a compulsory annual maximum level, which will be further tightened to 20 µg/m<sup>3</sup> from 2020. In general, the smaller particles in the particulate matter mix are the more dangerous for health. It is, however, more difficult and expensive to measure smaller particles. For PM<sub>10</sub> extensive monitoring networks in Europe exist. The measurement of PM<sub>2.5</sub> was started in the German federal states as well as by the Federal Environment Agency. In 2015 all the EU member countries have to measure PM<sub>2.5</sub>. For PM<sub>1</sub> so far, there is no obligation to measure and there do not nationwide monitoring networks exist. PM<sub>1</sub> is now quantified only by a few research stations.

But researchers think one step further already: The IfT coordinates the German Ultra-fine Aerosol Network (GUAN) and implements in it special studies on the environmental zone in Leipzig. In this project a high emphasis was directed to properties that are relevant to the health effects of particles: These are the number concentration of ultrafine particles and their chemical composition, such as the black carbon content. This measurements are new and not legally binding but they are showing clearly the prevailing concentration levels in the region and the city, e.g., from traffic fumes.

Tilo Arnhold

### **More Information:**

Dr. Gerald Spindler/ Dr. Wolfram Birmili  
Leibniz-Institut für Troposphärenforschung (IfT)  
Tel. 0341-235-2865, -3437  
[http://www.tropos.de/ift\\_personal.html](http://www.tropos.de/ift_personal.html)

### **Publications:**

G. Spindler, E. Brüggemann, T. Gnauk, A. Gruner, K. Müller, H. Herrmann (2010): A four-year size-segregated characterization study of particles PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> depending on air mass origin at Melpitz. *Atmospheric Environment* 44, 164-173

<http://dx.doi.org/10.1016/j.atmosenv.2009.10.015>

*The research was supported by the Saxon State Office for the Environment, Agriculture and Geology / LfULG ("influence of small wood furnaces on the pollution situation").*

W. Birmili, K. Weinhold, S. Nordmann, A. Wiedensohler, G. Spindler, K. Müller, H. Herrmann, T. Gnauk, M. Pitz, J. Cyrys, H. Flentje, C. Nickel, T.A.J. Kuhlbusch, G. Lösschau, D. Haase, F. Meinhardt, A. Schwerin, L. Ries, K. Wirtz (2009): Atmospheric aerosol measurements in the German Ultrafine Aerosol Network (GUAN). *Gefahrstoffe – Reinhaltung der Luft* 69, 137-145.

<http://www.dguv.de/ifa/en/pub/grl/index.jsp>

*The research was supported by the Saxon State Office for the Environment, Agriculture*

and Geology / LfULG ("influence of small wood furnaces on the pollution situation").

**Links:**

Research Station of the IfT near Melpitz

[http://www.tropos.de/eng/chemistry/fieldexp/chemistry\\_fap\\_up3.html](http://www.tropos.de/eng/chemistry/fieldexp/chemistry_fap_up3.html)

<http://www.eusaar.net/upload/Melpitz.pdf>

<http://chemie.tropos.de/Poster/GS/pdf/melpitz2007.pdf>

EMEP (European Monitoring and Evaluation Programme):

<http://www.emep.int/>

Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:01:en:HTML>

[http://ec.europa.eu/environment/air/index\\_en.htm](http://ec.europa.eu/environment/air/index_en.htm)

*The Leibniz Institute for Tropospheric Research is a member of the Leibniz Association. They are currently 87 research institutes and service facilities for research and two associate members. The Leibniz-Institute ranges from the natural sciences, engineering and environmental sciences to economic, social and space sciences to the humanities. Leibniz Institutes work for society relevant strategic issues and themes. They use different types of research as basic, upper-and application-oriented research. They create the next great importance to scientific research services and knowledge transfer in the direction of politics, science, business and the public. They maintain close cooperation with universities, industry and other partners at home and abroad. The external review process of the Leibniz Association sets standards. Each Leibniz Institute has a mission of national importance. Federal and state governments encourage the institutes of the Leibniz Association joined forces. The Leibniz Institute employs about 16 100 employees, of which about 7,100 scientists, including another 2,800 young scientists. The total budget of the Institute is more than 1.3 billion euros, the third-party funds amount to about € 280 million per year.*

<http://www.leibniz-gemeinschaft.de>