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Supplement of

Long-term observations of tropospheric particle number size distributions and equivalent black carbon mass concentrations in the German Ultrafine Aerosol Network (GUAN)

Wolfram Birmili et al.

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Supplementary Material

S1: View of the landing platform for data access, "Continuous data from the German Ultrafine Aerosol Network (GUAN)", available at https://doi.org/10.5072/guan, as of July 11, 2016.

Continuous data from the German Ultrafine Aerosol Network (GUAN)

Contents [show]

Introduction

The German Ultrafine Aerosol Network (GUAN) is a cooperative atmospheric observation network that adresses climate-related effects, and human particle exposure.

GUAN data are stored at EBAS, a data repository hosted by the Global Atmosphere Watch World Data Centre of Aerosols. EBAS is operated by the Norwegian Institute for Air Research (NILU).

Data format

The download links on this page refer to Level-2 data (quality controlled, hourly time resolution, normalised to 0°C and 1013 hPa). Level-0 data (instrumental raw data) and Level-1 data (processed data at original time resolution and operational conditions) can be obtained on request from EBAS. All data are stored in EBAS NASA-Ames format.

Download instructions

We ask you to carefully read the text found in the data disclaimer data disclaimer and in EBAS' "info" pages associated to the filter criteria. Having agreed to the EBAS data sharing policy, you will be able to navigate directly to the data sets through clickable links in the Tables below.

ONLINE - data set complete	ONLINE - data set not yet complete	Under verification at EBAS	Stored at the data originator (transfer to EBAS intended)

Particle number size distributions

In GUAN, particle number size distributions are measured in a "dry state", i.e. at low relative humidity. Technical measures ensure that the relative humidity inside the instrument's sheath air will not exceed 50% (Wiedensohler et al., 2012). Dry measurements ensure that particle number concentrations from different sites and from different seasons remain comparable. The actual values of relative humidity and temperature in every instrument are stored at EBAS and can be accessed through the data base interface there.

Click here to view the data capture statistics.

No.	Site name	EBAS code	Type	All	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	...	former data
1	Annaberg-Buchholz	DE0061B	urban background	All				2013	2012												
2	Augsburg	DE0062B	urban background	All																	
3	Bösel (Südoldenburg)	DE0056R	rural	All			2014	2013	2012	2011	2010										
4	Dresden-Nord	DE0063K	roadside	All				2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002		
5	Dresden-Winckelmannstrasse	DE0064B	urban background	All					2012	2011	2010										
6	Hohenpeissenberg	DE0043G	rural (mountain)	All		2015	2014	2013	2012	2011	2010	2009									1998-2000[1]
7	Langen	DE0065B	urban background	All																	
8	Leipzig-Eisenbahnstrasse	DE0066K	roadside	All		2015	2014	2013	2012	2011											
9	Leipzig-Mitte	DE0067K	roadside	All		2015	2014	2013	2012	2011	2010										
10	Leipzig-Tropos ("Leipzig")	DE0055B	urban background	All		2015	2014	2013	2012	2011	2010										
11	Leipzig-West	DE0068B	urban background	All		2015	2014	2013	2012	2011	2010										
12	Melpitz	DE0044R	rural	All		2015	2014	2013	2012	2011	2010	2009	2008[1]	2007[1]	2006[1]	2005[1]	2004[1]	2003[1]			1996-1997[1]
13	Mülheim-Styrum	DE0069B	urban background	All																	
14	Neuglobsow	DE0007R	rural	All			2014	2013	2012	2011											
15	Schauinsland	DE0003R	rural (mountain)	All		2015	2014	2013	2012	2011	2010	2009	2008[1]	2007[1]	2006[1]	2005[1]					
16	Waldhof	DE0002R	rural	All		2015	2014	2013	2012	2011	2010	2009									
17	Zugspitze (Schneefernerhaus)	DE0054R	Alpine mountain	All			2014	2013	2012	2011	2010	2009	2008[1]	2007[1]	2006[1]	2005[1]	2004[1]				

[1]These data sets were processed under former data processing standards. These data lack, particularly, the corrections for the losses in the internal tubing of the mobility particle size spectrometers, which are mostly relevant for particle diameters below 30 nm. With time, these data sets will be updated.

Non-volatile particle number size distributions (T = 300°C)

Non-volatile particle number size distributions are measured downstream of a thermodenuder, operated at 300°C, which strips off non-volatile particulate compounds (Birmili et al., 2010; Poulain et al., 2014)

No.	Site name	EBAS code	Type	All	2016	2015	2014	2013	2012	2011	2010	2009
2	Augsburg	DE0062B	urban background	All								
3	Bösel (Südoldenburg)	DE0056R	rural	All				2013	2012	2011	2010	
6	Hohenpeissenberg	DE0043G	rural (mountain)	All		2015	2014	2013	2012	2011	2010	
8	Leipzig-Eisenbahnstrasse	DE0066K	roadside	All								
10	Leipzig-Tropos ("Leipzig")	DE0055B	urban background	All		2015	2014	2013	2012	2011	2010	
12	Melpitz	DE0044R	rural	All						2011	2010	2009
15	Schauinsland	DE0003R	rural (mountain)	All		2015	2014	2013	2012	2011	2010	2009
17	Zugspitze (Schneefernerhaus)	DE0054R	Alpine mountain	All				2013	2012	2011		

S1: View of the landing platform for data access (continued)

Aerosol absorption coefficient (Equivalent Black Carbon)

The aerosol absorption coefficient is usually indicated in Mm^{-1}. To obtain equivalent black carbon (eBC) mass concentrations in $\mu g/m^3$, these numbers are divided by a mass absorption cross section of 6.6 m^2/g.

Click here to view the data capture statistics.

No.	Site name	EBAS code	Type	Matrix[1]	All	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
1	Annaberg-Buchholz	DE0061B	urban background	PM_1	All				2013	2012								
2	Augsburg	DE0062B	urban background	$PM_{2.5}$	All													
3	Bösel (Südoldenburg)	DE0056R	rural	PM_{10}	All			2014	2013	2012	2011	2010	2009					
4	Dresden-Nord	DE0063K	roadside	PM_1	All													
5	Dresden-Winckelmannstrasse	DE0064B	urban background	PM_1	All													
6	Hohenpeissenberg	DE0043G	rural (mountain)	PM_{10}	All						2011	2010	2009	2008				
8	Leipzig-Eisenbahnstrasse	DE0066K	roadside	PM_1	All		2015	2014	2013	2012	2011	2010	2009					
9	Leipzig-Mitte	DE0067K	roadside	PM_{10}	All		2015	2014			2011							
10	Leipzig-Tropos ("Leipzig")	DE0055B	urban background	PM_{10}	All		2015	2014	2013	2012	2011	2010	2009					
11	Leipzig-West	DE0068B	urban background	PM_{10}	All		2015	2014	2013	2012	2011	2010						
12	Melpitz	DE0044R	rural	PM_{10}	All		2015	2014	2013	2012	2011	2010	2009	2008	2007			
14	Neuglobsow	DE0007R	rural	PM_{10}	All		2015											
15	Schauinsland	DE0003R	rural (mountain)	PM_{10}	All			2014	2013		2011	2010	2009					
16	Waldhof	DE0002R	rural	PM_{10}	All		2015	2014	2013		2011							
17	Zugspitze (Schneefernerhaus)	DE0054R	Alpine mountain	TSP	All		2015	2014	2013	2012	2011	2010	2009					

[1]Matrix indicates the regime (cut-off diameter) of the inlet used for the eBC measurement at a particular site.

Aerosol absorption coefficient (eBC) correction

Unfortunately, not all aerosol absorption measurements in GUAN use the same inlet configuration. Inlets for PM_{10}, $PM_{2.5}$ and PM_1 are used throughout the network (see Table above). In order to harmonise the absorption (and also eBC) values, the data recorded downstream of the PM1 cyclone inlets may be adjusted to the corresponding level of a PM_{10} inlet by a multiplication factor of 1.10 for rural sites, 1.08 for urban background sites, and 1.05 for roadside sites. For details, see Birmili et al. (2015) below.

Overall reference

- Birmili, W., Weinhold, K., Merkel, M., Rasch, F., Sonntag, A., Wiedensohler, A., Bastian, S., Schladitz, A., Löschau, G., Cyrys, J., Pitz, M., Gu, J., Kusch, T., Flentje, H., Quass, U., Kaminski, H., Kuhlbusch, T. A. J., Meinhardt, F., Schwerin, A., Bath, O., Ries, L., Wirtz, K., and Fiebig, M.: Long-term observations of tropospheric particle number size distributions and equivalent black carbon mass concentrations in the German Ultrafine Aerosol Network (GUAN), *Earth Syst. Sci. Data Discuss.*, **8**, 935-993, 2015. This manuscript is currently under review. Access the discussion paper here.

Technical references

Parameter	Instrument	Main technical references
Particle number size distribution	Mobility particle size spectrometer	Wiedensohler et al. (2012); Pfeifer et al. (2014)
Non-volatile particle number size distribution	Mobility particle size spectrometer-Thermodenuder	Wehner et al. (2002); Birmili et al. (2010); Poulain et al. (2014)
Aerosol absorption coefficient	MAAP	Petzold and Schönlinner (2004)

- Petzold, A. and Schönlinner, M.: Multi-Angle Absorption Photometry - a new method for the measurement of aerosol light absorption and atmospheric black carbon. *J. Aerosol Sci.*, **35**, 421-441, 2002.
- Wehner, B., S. Philippin, and A. Wiedensohler, Design and calibration of an improved thermodenuder to study the volatility fraction of aerosol particles, *J. Aerosol Sci.*, **33**, 1087-1093, 2002.

Digital Object Identifier (DOI)

This landing page can be accessed by the digital object identifier https://doi.org/10.5072/guan.

Revision date

Last update: 2016-07-08.

Contact

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Navigation

Click here to return to the German Ultrafine Aerosol Network Main Page.

S1: View of the landing platform for data access (continued)

Particle number size distribution data capture statistics

Legend

ONLINE - data set complete	ONLINE - data set not yet complete	Under verification at EBAS	Stored at data origin (transfer to EBAS pending)

Particle number size distributions (fraction of valid data)

1.00 = 100 % successful data capture. Data capture has been computed for the period 2009-2014.

No.	Site name	EBAS code	Data link	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	...	former data
1	Annaberg-Buchholz	DE0061B	All				0.94	0.89												
2	Augsburg	DE0062B	All																	
3	Bösel (Südoldenburg)	DE0056R	All			0.84	1.00	0.77	0.87	1.00										
4	Dresden-Nord	DE0063K	All				0.90	0.56	0.96	0.86	0.59	NN	NN	NN	NN	NN	NN	NN		
5	Dresden-Winckelmannstrasse	DE0064B	All					0.72	0.94	0.67										
6	Hohenpeissenberg	DE0043G	All		NN	0.99	0.94	0.91	0.83	0.99	0.98									NN
7	Langen	DE0065B	All																	
8	Leipzig-Eisenbahnstrasse	DE0066K	All		NN	0.87	0.89	0.98	0.90											
9	Leipzig-Mitte	DE0067K	All		NN	0.95	0.95	0.92	0.92	0.41										
10	Leipzig-Tropos ("Leipzig")	DE0055B	All		NN	0.97	0.95	0.96	0.88	0.97										
11	Leipzig-West	DE0068B	All		NN	0.85	0.99	1.00	0.83	0.48										
12	Melpitz	DE0044R	All		NN	0.96	0.97	0.98	0.80	0.91	0.95	NN	NN	NN	NN	NN	NN			NN
13	Mülheim-Styrum	DE0069B	All																	
14	Neuglobsow	DE0007R	All			1.00	0.98	0.52	0.59											
15	Schauinsland	DE0003R	All		NN	0.90	0.87	0.69	0.75	0.99	0.93	NN	NN	NN	NN					
16	Waldhof	DE0002R	All		NN	0.98	0.99	0.92	0.94	0.93	0.98									
17	Zugspitze (Schneefernerhaus)	DE0054R	All			0.40	0.96	0.68	0.69	0.82	0.98	NN	NN	NN	NN	NN				

Black carbon data capture statistics

Legend

ONLINE - data set complete	ONLINE - data set not yet complete	Under verification at EBAS	Stored at data origin (transfer to EBAS pending)

Black carbon concentrations (fraction of valid data)

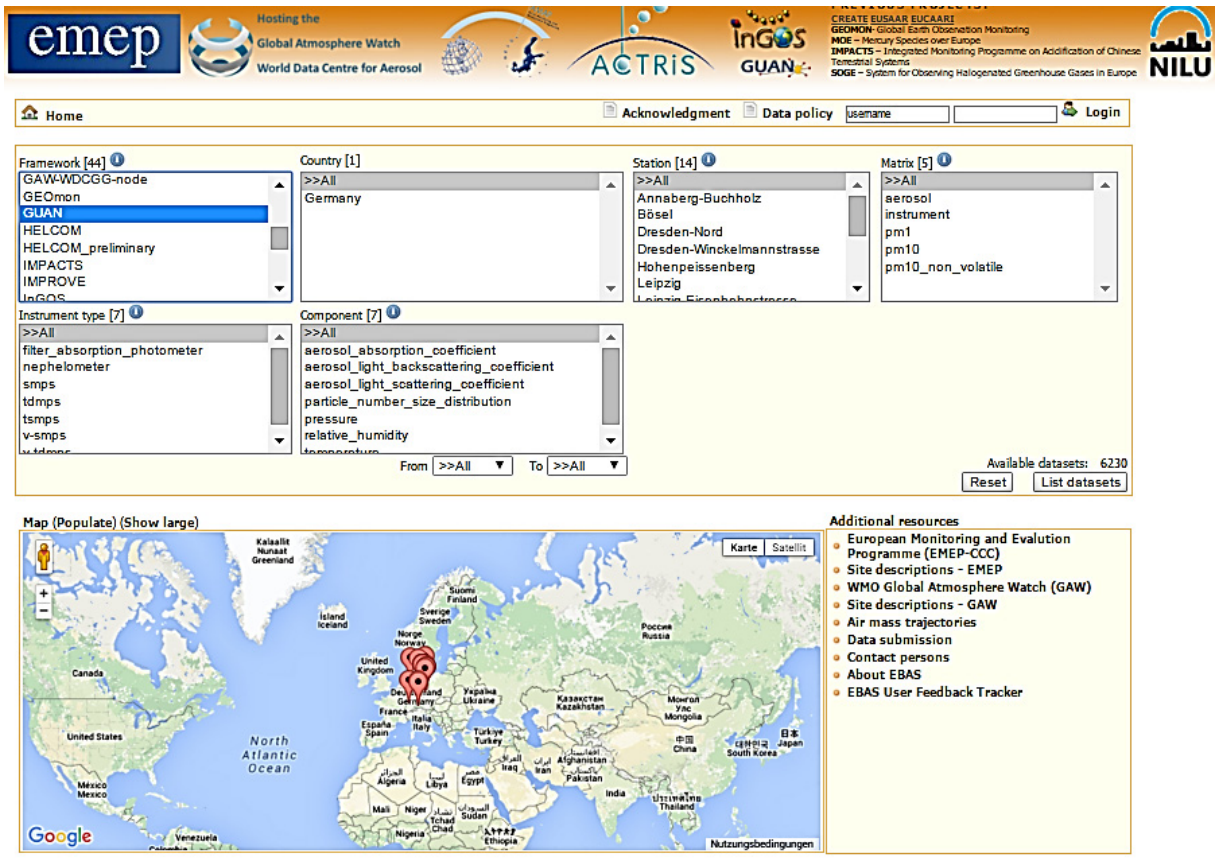
The aerosol absorption coefficient is usually indicated in Mm^{-1}. To obtain equivalent black carbon (eBC) mass concentrations in $\mu g/m^3$, these numbers are divided b

1.00 = 100 % successful data capture. Data capture has been computed for the period 2009-2014.

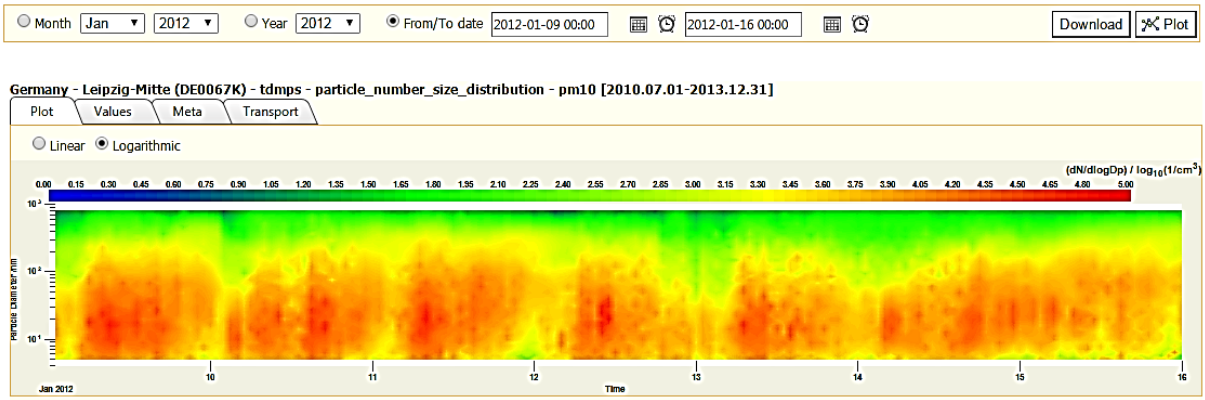
No.	Site name	EBAS code	Matrix[1]	Data link	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
1	Annaberg-Buchholz	DE0061B	PM_1	All				1.00	0.88								
2	Augsburg	DE0062B	$PM_{2.5}$	All													
3	Bösel (Südoldenburg)	DE0056R	PM_{10}	All			0.82	0.80	0.72	0.87	0.98	0.92					
4	Dresden-Nord	DE0063K	PM_1	All													
5	Dresden-Winckelmannstrasse	DE0064B	PM_1	All													
6	Hohenpeissenberg	DE0043G	PM_{10}	All						1.00	1.00	1.00	NN				
8	Leipzig-Eisenbahnstrasse	DE0066K	PM_1	All		NN	0.83	0.81	1.00	0.99	0.95	0.96					
9	Leipzig-Mitte	DE0067K	PM_{10}	All		NN	0.92			0.95							
10	Leipzig-Tropos ("Leipzig")	DE0055B	PM_{10}	All		NN	0.99	1.00	0.94	0.96	0.98	1.00					
11	Leipzig-West	DE0068B	PM_{10}	All		NN	0.83	0.93	0.97	0.97	0.48						
12	Melpitz	DE0044R	PM_{10}	All		NN	0.92	1.00	1.00	1.00	1.00	1.00	NN	NN			
14	Neuglobsow	DE0007R	PM_{10}	All		NN											
15	Schauinsland	DE0003R	PM_{10}	All			1.00	0.88		0.79	0.84	0.96					
16	Waldhof	DE0002R	PM_{10}	All		NN	0.31	0.99		0.70							
17	Zugspitze (Schneefernerhaus)	DE0054R	TSP	All		NN	0.92	0.95	0.85	0.70	1.00	1.00					

[1]Matrix indicates the regime (cut-off diameter) of the inlet used for the eBC measurement at a particular site.

S2: View of the user interface at EBAS (World Data Center for Aerosols), http://ebas.nilu.no. Note that the German Ultrafine Aerosol Network (GUAN) appears in the upper left selection box as one of the 44 "framework" projects associated with EBAS.



S3: Data preview tools supplied in EBAS include this viewer of particle number size distributions.



S4: Sample extract of NASA-Ames 1001 format (ASCII text with blanks as a separator)

```
207 1001
Birmili, Wolfram; Wiedensohler, Alfred
DE08L, Leibniz Institute for Tropospheric Research, , , "Permoserstrasse
15, 04318 Leipzig, Germany", , , ,
Sonntag, Andre
GUAN
1 1
2012 01 01 2014 08 22
0.041667
days from file reference point
140
1 1 1 1 […]
99.999999 999999.999 999999.999 999999.999 999999.999 […]
end_time of measurement, days from the file reference point
particle_number_size_distribution, 1/cm3, D=5.1 nm, Statistics=arithmetic
mean
particle_number_size_distribution, 1/cm3, D=5.7 nm, Statistics=arithmetic
mean
particle_number_size_distribution, 1/cm3, D=6.4 nm, Statistics=arithmetic
mean
[…]
numflag, no unit
0
53
Data definition:                EBAS_1.1
Set type code:                  TU
Timezone:                       UTC
Timeref:                        00_00
File name:
DE0067K.20120109000000.20140822082535.tdmps.particle_number_size_distributi
on.pm10.1w.1h.DE08L_TDMPS_TROPOS_LE-Mitte.DE08L_TROPOS_CL_TDMPS.lev2.nas
File creation:                  20151023103922
Startdate:                      20120109000000
Revision date:                  20140822082535
Version:                        1
Version description:            initial revision, TDMPS_control_lev2 v.0.0_1
Data level:                     2
Period code:                    1w
Resolution code:                1h
Sample duration:                1h
Orig. time res.:                10mn
Station code:                   DE0067K
Platform code:                  DE0067S
Station name:                   Leipzig-Mitte
Station latitude:               51.344167
Station longitude:              12.377222
Station altitude:               111.0m
Measurement latitude:           51.34
Measurement longitude:          12.38
Measurement altitude:           111.0m
Measurement height:             4.0m
Regime:                         IMG
Component:                      particle_number_size_distribution
Unit:                           1/cm3
Matrix:                         pm10
Instrument type:                tdmps
Laboratory code:                DE08L
Instrument name:                TDMPS_TROPOS_LE-Mitte
Method ref:                     DE08L_TROPOS_CL_TDMPS
```

This is the header of the file establishing the data originators, and basic information on the masurement site, and parameters reported.

This is the meta data section of the file, providing more detailed parameters on the geographic location of the site, and and basic issues like time

```
Standard method:                SOP=Wiedensohler2012
Calibration standard ID:        (None,)
Inlet type:                     Impactor--direct
Inlet description:              PM10 at ambient humidity inlet, flow 16.67
l/min
Humidity/temperature control: Diffusion dryer
Humidity/temperature control description: sample dried to below 40% RH with
regenerative dryer
Volume std. temperature:        273.15
Volume std. pressure:           1013.25
Detection limit:                0.0 1/cm3
Detection limit expl.:          Determined only by instrument counting
statistics, no detection limit flag used
Measurement uncertainty:        10.0 %
Measurement uncertainty expl.: uncertainty range between instruments in
intercomparison by Wiedensohler et al. 2012. (AMT)
Zero/negative values code:      Zero possible
Zero/negative values:           Zero values may appear due to statistical
variations at very low concentrations
Originator:                     Birmili, Wolfram, , , , , , , , ,
Originator:                     Wiedensohler, Alfred, , , , , , , , ,
Submitter:                      Sonntag, Andre, , , , , , , , ,
Acknowledgement:                Request acknowledgement details from data
originator
Comment:                        None
starttime endtime particle_number_size_distribution
particle_number_size_distribution particle_number_size_distribution […]

 8.000000  8.041667   1520.586   2739.482   4331.160   4505.355   4809.187
5635.917   7372.570   7589.336   7402.448   8008.578   7032.986   7109.883
7645.798   5492.820   4401.676   3952.917   3545.183   3119.898   2806.955
2718.868   2753.224   2416.867   1967.370   1427.387    997.781    953.522
956.441    805.032    674.680    593.465    559.216    554.684    526.762
477.470   405.239    293.466    197.536    119.218     67.009     45.413
34.374   27.781    18.656    13.023  10.117    8.931    494.200    1616.024
[…]
```

This is the data section, where numbers, in this case the particle number size distribution, are organised in ASCII code columns of equal width.