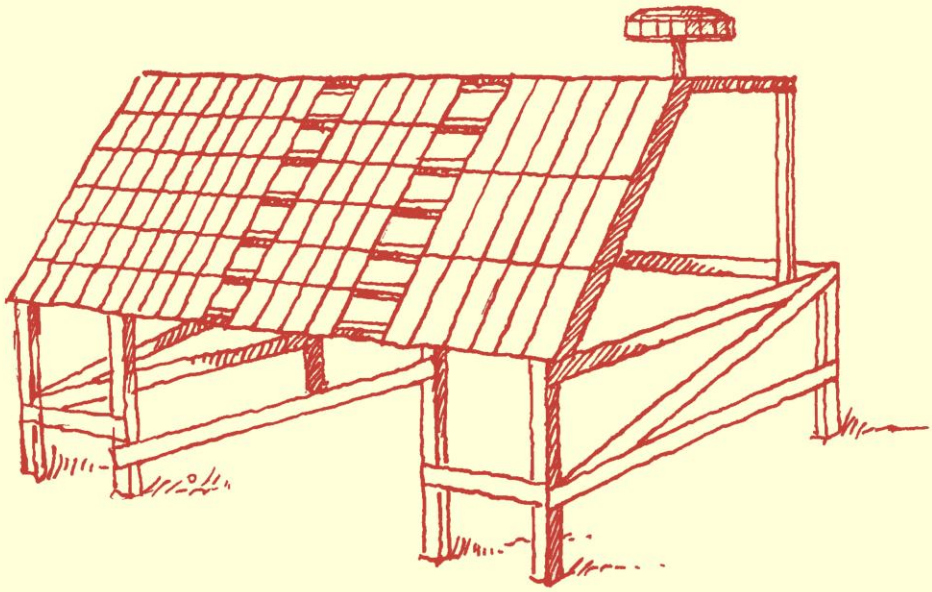
CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

UN/ECE INTERNATIONAL CO-OPERATIVE PROGRAMME ON EFFECTS ON MATERIALS, INCLUDING HISTORIC AND CULTURAL MONUMENTS



Report No 75:

Environmental data report. October 2011 to December 2012

April 2014

PREPARED BY THE SUB-CENTRE

NILU

Norwegian Institute for Air Research
Kjeller / Norway

International Co-operative Programme on Materials, including Historic and Cultural Monuments

Trend exposure programme 2011 – 2012

Environmental data report October 2011 to December 2012

Terje Grøntoft[1] and Martin Ferm[2]

1) Norwegian Institute for Air Research
2) IVL Swedish Environmental Research Institute Ltd.

Contents

Summary

This report presents the environmental measurements for the UN/ECE ICP Materials trend exposure programme, 2011-2012. All the data collected from the participating test sites are reported here. Interpretation of the data related to effects on the corrosion of materials including cultural heritage, is presented in other ICP reports. The UN/ECE international co-operative programme on effects on materials is an international project that measure and assess the corrosivity of the atmosphere. The corrosion of exposed sample materials and the air pollutants and climate are measured at stations mainly in Europe. Exposures have been ongoing in the programme since 1987, in different phases with long time continuous exposures (1987-1995), exposures connected to EU framework projects (2002-2003) and since 2005 with trend exposures and measurement of the environment every three years, also with longer duration exposure of some materials.

The most recent material exposures and environmental sampling at all except seven stations started in October 2011. At the stations in Stockholm, Katowice and Vienna the exposure started in November 2011. At the four Italian stations the exposures started in December 2011. The exposures of carbon steel, weathering steel, zinc, copper, aluminium, limestone and modern glass, and the environmental sampling was going on for one year. For other samples of carbon steel, weathering steel, zinc, aluminium and limestone the exposures will continue for 4 and 7 (only weathering steel) years. The yearly average values for the environmental parameters have been calculated from the month when the exposures were started. For the Katowice station where the exposures were started late in the month, 20th October, the yearly average values were calculated from November 2011. However for the Riga station where the exposures were also started on 20th October, the yearly average values were calculated from October 2011, as environmental data for October 2012 were not reported from the station.

Monthly (and tri-/four-monthly) values and annual average values for the period are reported in two Appendixes, A and B, respectively. Appendix A gives the monthly data reported directly from the ICP Materials test sites and the tri-/four-monthly values for the same pollutant gases and for particle deposition measured with IVL passive samplers and analysed at IVL in Gothenburg, Sweden. Appendix B gives the annual average values for the data reported directly from the ICP Materials test sites, and for the same pollutant gases and for particle deposition measured with IVL passive samplers. Annex B also reports the start and end dates for the material exposures and the months included in the calculation of the annual averages for the environmental parameters. Appendix C and D give the original data from the IVL sampling. Appendix C gives the tri-/four-monthly mean values for particle deposition on IVL samplers in a position sheltered from rain and for passive gas sampling of pollutant gases. Appendix D gives the annual average values for the particle deposition and pollutant gases measured in a position sheltered from rain for the exposure period. Appendix E gives the data availability in % for the sampling performed.

A good database for dose-response evaluation, should have data with a wide range of values for the most important parameters. The 2011-2012 environmental data have a good spread in values for all important gases as well as for the most important meteorological parameters.

Trend exposure programme 2011 – 2012
Environmental data report
October 2011 to December 2012

1 Introduction

Airborne acidifying pollutants are known to be one major cause for corrosion of different materials including the extensive damage that has been observed on historic and cultural monuments. In order to fill some important gaps of knowledge in this field the Executive Body for the Convention on Long-range Transboundary Air Pollution decided to launch an International Co-operative Programme on Effects of Air Pollution on Materials, including Historic and Cultural Monuments, ICP Materials. The programme was launched in 1985. Measurements have been running since September 1987 and has involved exposure of materials at more than 30 test sites in Europe and North America.

Exposures were running for eight years at 39 test sites in 14 countries from 1987 to 1995 (Henriksen et al., 1997). A second phase of the project started in 1997 with an adjusted number of test sites, 30, and participating countries, 19 (Henriksen and Arnesen, 2003, Henriksen and Arnesen, 2000). During the interim period 1995 to 1997 trend analysis for metal corrosion and exposure of the glass and polymeric materials continued. In 2002-2003 the ICP Materials programme was combined with exposures in the EU project MULTI-ASSESS (EVK4-CT-2001-00044) (Henriksen et al. 2004). In 2005-2006 and 2008-2009 annual trend exposures with analysis of corrosion of carbon steel, zinc and Portland limestone, and analysis of soiling of glass samples were carried out. In 2011-2012 new exposures started with carbon steel, weathering steel, zinc, copper, aluminium, limestone and modern glass, some of them to be exposed up to seven years. For every period of the trend exposures the environmental parameters are measured and reported. In 2005-2006, 22 stations in 13 European countries plus Canada participated. In 2008-2009, 24 stations in 14 European countries participated. In 2011-2012, 22 stations in 13 European countries participated. The Norwegian Institute for Air Research-NILU has been the sub-centre responsible for the environmental data collection, storing, evaluation and reporting during the whole programme. This report includes the environmental data reported from the 2011-2012 trend exposures**.**

The aim of the trend exposures, from 2005, is to follow the development of corrosion trends over time in Europe in the present situation with a changing pollution and climate situation. The aim of the programme has changed focus during the time past. In 1987 the focus was on the impact of SO_2 and climate. Later the programme was enlarged to perform a quantitative evaluation of the effect of NO_x and other pollutants like ozone and sulphur in combination with climatic parameters, on the atmospheric corrosion of important materials. New parameters like HNO_3 and particulate matter were introduced in the EU-project MULTI-ASSESS, and the study was expanded from corrosion to include soiling.

In the new trend exposure programme from 2005, main indicator materials are exposed every third year and environmental parameters are collected.

The environmental data for the ICP Materials programme has been collected since September 1987. The environmental data from the trend exposures in 2005-2006 and 2008-2009 are reported in Grøntoft et al. (2011, 2007).

The programme has been and is organised with Sweden as lead country and the Swedish Corrosion Institute (SCI), - from 2005 named "the Corrosion and Metals Research Institute" (KIMAB), is serving as the Main Research Centre. Sub-centres in different countries have been appointed, each responsible for the provision and analysis of one or more materials. The present materials Sub-centres are:

Structural metals:
- Steel and zinc (Sub-centre responsible for evaluation: SVUOM Praha a.s., Prague, Czech Republic)
- Weathering steel (CENIM, Madrid, Spain)
- Zinc (EMPA Corrosion/Surface Protection, Dübendorf, Switzerland)
- Copper and aluminium (KIMAB, Stockholm, Sweden)

Stone materials. Portland limestone (Building Research Establishment Ltd., Department of Environment, Waterford, United Kingdom).

Glass materials – **soiling.** The Univeristy Paris XII (LISA)

The Norwegian Institute for Air Research is, and has been through the whole programme, the sub-centre for the environmental database.

Other sub-centres through the history of the exposure programs, non-active in 2011-2012, are:

Paint coatings. Steel with silicon alkyd paint (Norwegian Institute for Air Research, Kjeller, Norway).

Glass materials. Two types of glass M1 and M3 (Institute of Chemistry, Academy of Fine Arts, Vienna, Austria)

Sub-centres for concrete and more stone materials, some of which are operational within the present trend exposure programme (see above), were active in the MULTI-ASSESS project 2002:

Stone and concrete materials:
- Standard Portland concrete, Latvian limestone (Riga Technical University, Riga, Latvia).
- Portland limestone, Carrara marble, Calcareous Baumberger sandstone (Building Research Establishment Ltd., Department of Environment, Waterford, United Kingdom).
- Gotland sandstone (Swedish Corrosion Institute, Stockholm, Sweden).

Soiling materials:

- Synthetic polymeric materials (Middelsex University, GB)
- Modern Glass (LISA – Universite Paris XII, Paris, France)

The range of materials that has been and can be exposed and related scientific partners/contacts is large.

Corrosion of carbon steel, zinc and Portland limestone and soiling of modern glass were measured in the trend exposures of 2005/6, 2008/9. In addition corrosion of weathering steel, copper and aluminium was measured in in 2011/12. Simultaneously a range of environmental parameters was measured (Table 1 and Appendix A – B).

Extended environmental analyses. Passive HNO_3 and particle deposition measurement were introduced in the MULTI-ASSESS project (IVL Swedish Environmental Research, Gothenburg, Sweden), and are measured in the later trend exposure programme (2005/6, 2008/9 and 2011/12). In addition for the 2011-2012 period SO_2, HCOOH, CH_3COOH, HCl and HF gas (non-optional) NH_3, NO_2 and O_3 (optional) were measured with IVL passive sampling methods.

A complete list of participants and national contact centres participating in the 2011–2012 trend exposure programme is given in Appendix F.

2 The measuring programme

The measuring programme for the trend exposures is given in Table 1

Table 1: The environmental measurement programme for the ICP Materials trend exposures 2011 - 2012. "Standard parameters".

Components to be measured		
Mandatory	Gas	SO_2, O_3, NO_2, HNO_3(IVL),
	Precipitation	mm, pH, SO_4-S, NO_3-N, Cl^-
	Particulates	Particle deposition (IVL)
	Climate	Temperature, relative humidity
Optional	Precipitation	Conductivity, NH_4-N, Na^+, Ca^{2+}, Mg^{2+}, K^+,
	Particulates	PM_{10}

The measurements were partly performed with local equipment partly with passive samplers from IVL-Sweden (Ferm, 1999).

The data are reported to the environmental sub-centre as monthly mean values, except for mm precipitation, which is reported as the monthly sum. Tri-monthly mean values are reported for SO_2, HNO_3 and particle deposition data collected on IVL passive samplers for all sites. In addition, to the standard parameters recurring in the trend exposures and listed in Table 1, for the 2011-12 period tri-monthly values from measurement with IVL passive samplers are reported for HCOOH, CH_3COOH, HCl and HF gas (non-optional) NH_3 (optional), NO_2 and O_3 (depending on availability of local measurements).

The data are presented as monthly and annual average values for the project period.

The quality control of the reported data is the responsibility of the countries and partners that report the data. The environmental sub-centre will control the data reported for outliers and create the joint database. It will perform an evaluation of the data files and look for trends in the data set.

3 Data from the monitoring test sites

The data are sent to the environmental sub-centre as Excel data files by e-mail.

All data presented by the environmental sub-centre are given with the same accuracy as in the reporting forms agreed upon. For data series which include values "below the detection limit", these are, by convention, replaced with one half of the reported detection limits when calculating the mean values.

4 Monthly mean concentrations

The average monthly data reported for the test sites for the trend exposure, October 2011 to December 2012, are given in Appendix A. The calculated average annual data are given in Appendix B. The tri-/four-monthly values for

particles and gases measured with IVL samplers are given with the monthly values in Appendix A. The calculated average annual values for particles and pollutant gases are given in Appendix B. The complete IVL data are given in Appendix C and D. The participating countries are reporting data on a monthly basis. The particle deposition, HNO_3, and additional sampling of the gases SO_2, HCOOH, CH_3COOH, HCl, HF and of NH_3, NO_2 and O_3 is analysed and reported from IVL, Sweden.

5 Calculation of monthly values

For their own test sites the participants shall calculate the mean values in accordance with the following equations.

- Mean temperature (T_M)

$$T_M = \frac{\sum_1^i T_i}{i} \qquad (1)$$

T_i = measured values

$i = number\ of\ records$

- Mean relative humidity (RH_M)

$$RH_M = \frac{\sum_1^i RH_i}{i} \qquad (2)$$

- Mean gas concentrations G_M

$$G_M = \frac{\sum_1^i G_i}{i} \qquad (3)$$

For some sites where complete information of the sampling period exists, another equation is used

$$G_M = \sum_1^i \frac{(n_i \cdot G_i)}{\sum_1^i n_i} \qquad (4)$$

$n_i = sampling\ period$

- Precipitation

$$mm = \sum_1^i mm_i \qquad (5)$$

- Weighted mean pH (pH_M)

$$pH_M = \div \log \frac{\sum_1^i \left[mm_i \cdot \left(10^{-pH_i}\right)\right]}{\sum_1^i mm_i} \qquad (6)$$

- Weighted mean values for cations, anions and conductivity (C_M)

$$C_M = \frac{\sum_{1}^{i} (mm_i \cdot C_i)}{\sum_{1}^{i} mm_i} \quad (7)$$

6 Results

For the trend exposures taking place from 2011 a selection of exposure sites was made. The list of test sites over time for the UN/ECE ICP Materials project is given in Table 2 (extended from SCI, 2005). The sites with a not yet finalised measuring period onwards from 1987 (no end year) were participating in the 2011/12 trend exposures.

Table 2: List of test sites of UN/ECE ICP Materials exposure programme.

Test site no.	Test site name	Country	Location	Measuring period
1	Prague	The Czech Republic	Urban	1987→
3	Kopisty	"	Industry	1987→
5	Ähtäri	Finland	Rural	1987→ 2003
7	Waldhof-Langenbrügge	Federal Republic of Germany	Rural	1987→ 2003
9	Langenfeld-Reusrath	"	Rural	1987→ 2003
10	Bottrop	"	Industry	1987→
13	Rome	Italy	Urban	1987→
14	Casaccia	"	Rural	1987→
15	Milan	"	Urban	1987→
16	Venice	"	Urban	1987→
21	Oslo	Norway	Urban	1987→
23	Birkenes	"	Rural	1987→
24	Stockholm South	Sweden	Urban	1987→
26	Aspvreten	"	Rural	1987→
27	Lincoln Cathedral	United Kingdom	Urban	1987→ 2003, 2008→ 2009
31	Madrid	Spain	Urban	1987→
33	Toledo	"	Rural	1987→
34	Moscow	Russia	Urban	1987→ 2003
35	Lahemaa	Estonia	Rural	1987→ 2012
36	Lisbon-Jeronimo Monastery	Portugal	Urban	1987→ 2003
37	Dorset	Canada	Rural	1987→ 2006
40	Paris	France	Urban	1997→
41	Berlin	Germany	Urban	1997→
43	Tel Aviv	Israel	Urban	1997→ 2001
44	Svanvik	Norway	Rural, industry	1997→
45	Chaumont	Switzerland	Rural	1997→
46	London	United Kingdom	Urban	1997→ 2003
47	Los Angeles	USA (CA)	Urban	1997→ 2003
49	Antwerp	Belgium	Urban	1997→ 2003
50	Katowice	Poland	Urban, industry	1999→
51	Athens	Greece	Urban,	2005→
52	Riga	Latvia	Urban,	2005→
53	Vienna¨	Austria	Urban,	2008→
54	Sofia	Bulgaria	Urban,	2008→
55	St. Petersburg	Russia	Urban	2011→

7 Regularity and quality of the reported data

The test sites represent areas from background level of pollutants to urban and industry levels. The background sites have historically had the best regularity for the data reported. Many of these sites belong to the EMEP monitoring programme and have long and good data records.

In urban and industrial areas it is generally more difficult to maintain sites. In programmes like ICP Materials with long exposure periods, it is sometime necessary to move a test site due to local problems like new use of the property. In some countries the funding of the environmental measurements was limited in periods. This is reflected in the selection of measurement stations for the trend exposures.

A brief review of the quality of the reported data for the different test sites are given in the following pages.

7.1 Review of reported data in the trend exposure programme, 2011 – 2012.

Optional data
The reporting of data for kations in precipitation and for particle concentration, PM_{10}, were optional in the programme. Full sets of monthly data for kations in precipitation are reported for sites 10, 21, 23, 31, 33, 40, 41, 44 and 45. Full sets of monthly PM_{10} data are reported for sites 1, 3, 10, 23, 24 and 26 (based on annual averages), 31, 33, 41, 45, 50, 51, 53 and 55. The optional data for NH_3 gas is only reported from three sites (24, 26 and 45). The optional data for NO_2, O_3 are reported from a number of sites, mainly those that don't have local measurements results for these parameters from the stations.

Non optional data
The non-optional IVL data (HNO_3, SO_2, HCOOH, CH_3COOH, HCl and HF gas and deposition of particulate matter deposition) are reported from all sites, except from sites 15 and 54 (which only reports IVL data for Temperature, HNO_3, and particulate matter deposition).

The IVL tri-monthly and annual average data for HNO_3 and particulate matter deposition, and for SO_2, NO_2, O_3, where these were measured, are reported with the other station-data in Appendix A and B.

A review of the reporting of the mandatory data from the single countries and stations is given below.

Sites 1 and 3 Czech Republic
Sites 1 and 3 have almost complete sets of data. Only O_3 data is missing for October 2011 for station no. 1

Sites 10 and 41 Germany
Site 10 Bottrop has a complete data set for the period. Site 41 report all data except for H+ which are missing for the whole period.

Sites 13, 14, 15 and 16 Italy
The Italian stations report nearly all data except the ions in precipitation which are missing for all the stations for the whole period. For station 14, Casaccia, the amount of precipitation is missing for March 2012. For station 13 the SO_2 data are IVL data. For station 15, Milan, the IVL-HNO_3 data are missing.

Sites 21, 23 and 44 Norway
The Norwegian stations 21 and 23 report all the data, except NO_2 for April and May 2012 for station 21. For station 21 the SO_2 and O_3 data are IVL data. Station 44, Svanvik, report all the data except temperature and RH for April, August and September 2012, and NO_2 for August 2012.

Sites 24 and 26 Sweden
The Swedish stations report all the annual data. The annual reported values for NO_2, SO_2 and O_3 from local measurements are based original annual mean values for 2011 and 2012. IVL data for SO_2, NO_2 and O_3 are also reported for station 24 and IVL data for NO_2 and O_3 for station 26.

Sites 31 and 33 Spain
The Spanish stations report all data except temperature and RH for station 31, Madrid, for December 2011.

Site 40 France
All the data are available for Site 40, Paris. The SO_2, NO_2 and O_3 data are IVL data

Site 45 Switzerland
All the data are available for Site 45, Chaumont. IVL particle deposition data are missing for 2011.

Site 50 Poland
Site 50, Katowice, report all the data except the precipitation data. The IVL particle deposition data are missing for 2011 and from August to November 2012.

Site 51 Greece
Site 51, Athens, report all the data, except the ions in precipitation data.

Site 52 Latvia
Site 52, Riga, reports all the data except some IVL data. The SO_2, NO_2 and O_3 data are IVL data. IVL data for O_3 from August to November 2012, and for particle deposition from May to July 2012, are missing.

Site 53 Austria
Site 53, Vienna, report all the data, except IVL data for HNO_3 which are missing from November to January 2011/12 and from August until October 2012.

Site 54 Bulgaria
Site 54, Sofia, only reports IVL data for temperature, HNO_3 and particle deposition. For these parameters data are missing from August to October 2012 and also for particle deposition for February and March 2012.

8 Data for regression analyses

8.1 The data base

For regression analyses the database for material damage for one year has to be correlated with the environmental database for the same period (Appendix B).

8.2 The data distribution

It is important for the evaluation of the dose-response correlation for the environmental impact on the materials that there is as large spread as possible in the concentrations of the most important pollution parameters. In the following figures the ranked distributions of the yearly mean values for the climate and pollution parameters, for the exposure year 2011-2012, are given. The diamonds represent values for measurements with the local station equipment, whereas the squares represent values from measurements with IVL passive samplers.

In Figure 1 the spread in the SO_2 concentrations for the year (2011-2012) is shown. The numbering of the sites is in accordance with Table 2.

The values measured with IVL samplers range from 12.4 µg/m^3 in Kopisty down to 0.2 µg/m^3 for Birkenes. The distribution is uneven with most of the values, 18 stations, below 4.2 µg/m^3, and then four stations ranging from 4.3 µg/m^3 (locally measured value; 7.4) to 12.4 µg/m^3 (locally measured value; 19). The value for Katowice, no. 50, which was the highest for both in 2005-2006 (36.1 µg/m^3) and 2008-2009 (15.3 µg/m^3) is now 10.0 µg/m^3. The distribution of the values for 2011-2012 is slightly lower than for the period 2008–2009 indicating that the sulphur emission affecting many locations in Europe are still being reduced.

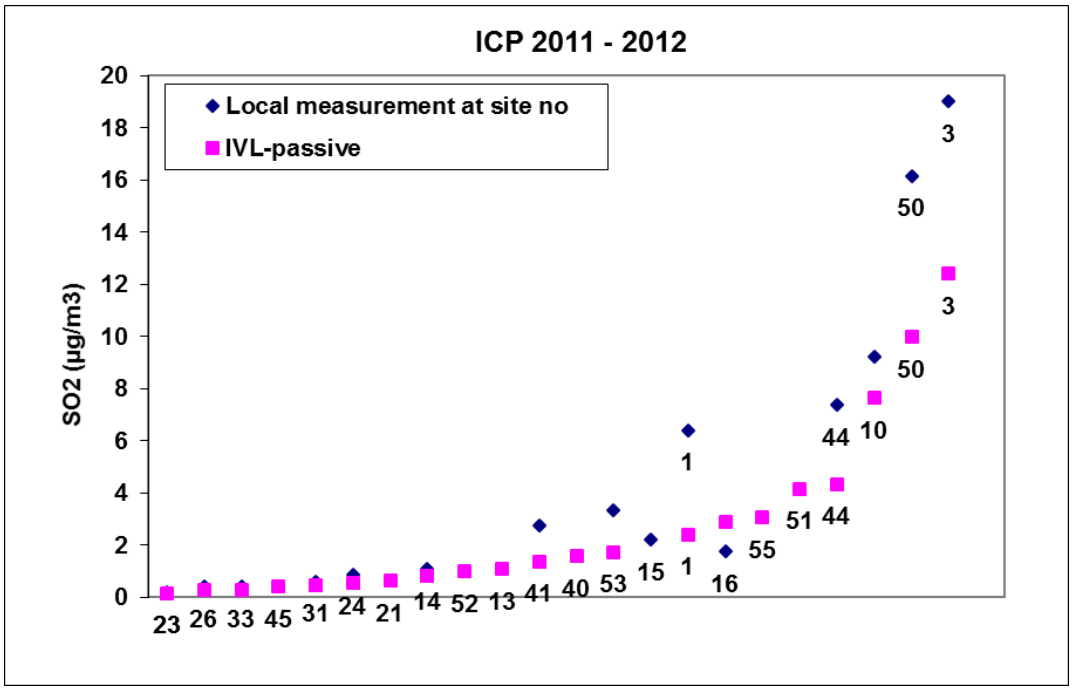


Figure 1: The spread in the yearly mean SO_2 concentrations at the test sites for the test period in ICP Materials.

The difference in the results for the local site and IVL measurements at stations 1, 3 and 50 may be due to the different measurement methods used. The local site measurements were performed by deposition on a flat plate sampler without a defined diffusion length. The IVL measurements were performed with a passive sampler with a defined constant diffusion length (Ferm, 1999).

In Figure 2 the spread in the NO_2 concentrations for the test period year is shown.

The values range from 63.3 µg/m^3 for Rome down to 1.3 µg/m^3 for Birkenes and Svanvik. The distribution is fairly good, but somewhat more uneven than in 2008-2009. There were no measurements for the location with the highest value in 2008-2009, Sofia. The values for Rome were 46.1 µg/m^3 in 2008-2009 and 28.7 µg/m^3 in 2005-2006, indicating an increasing trend. Several of the low values represent EMEP rural background sites.

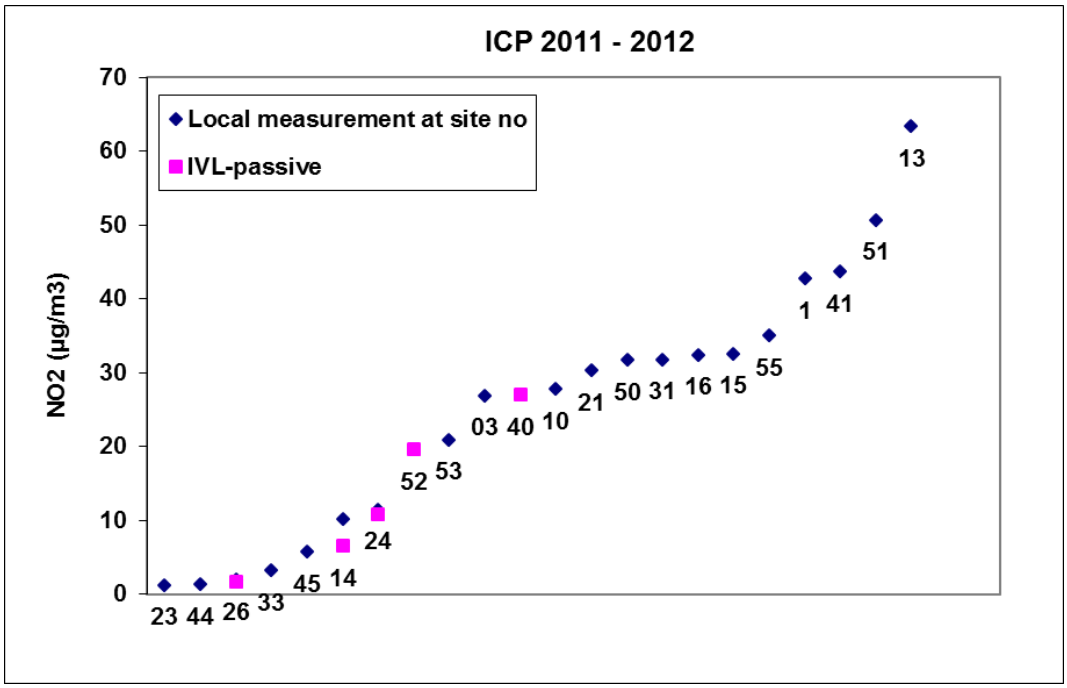


Figure 2: The spread in the yearly mean NO_2 concentrations at the test sites for the test period in ICP Materials.

In Figure 3 the spread in the O_3 concentrations for the test period is shown.

The values range from 84.8 µg/m^3 in Cassaccia to 24.7 µg/m^3 for Athens. The Athens station is an urban traffic station where consumption of O_3 due to NO emission is expected. The values for Cassaccia were 42 µg/m^3 in 2008-2009 and 51 µg/m^3 in 2005-2006. The reason for difference is, however, unknown.

The distribution is quite good but slightly uneven between ~ 50 and 80 µg/m^3 with three stations (45, 33 and 14) at high values from 80.1 to 84.8 µg/m^3. The low values are mostly observed in the big cities and highest values in the south or alpine area.

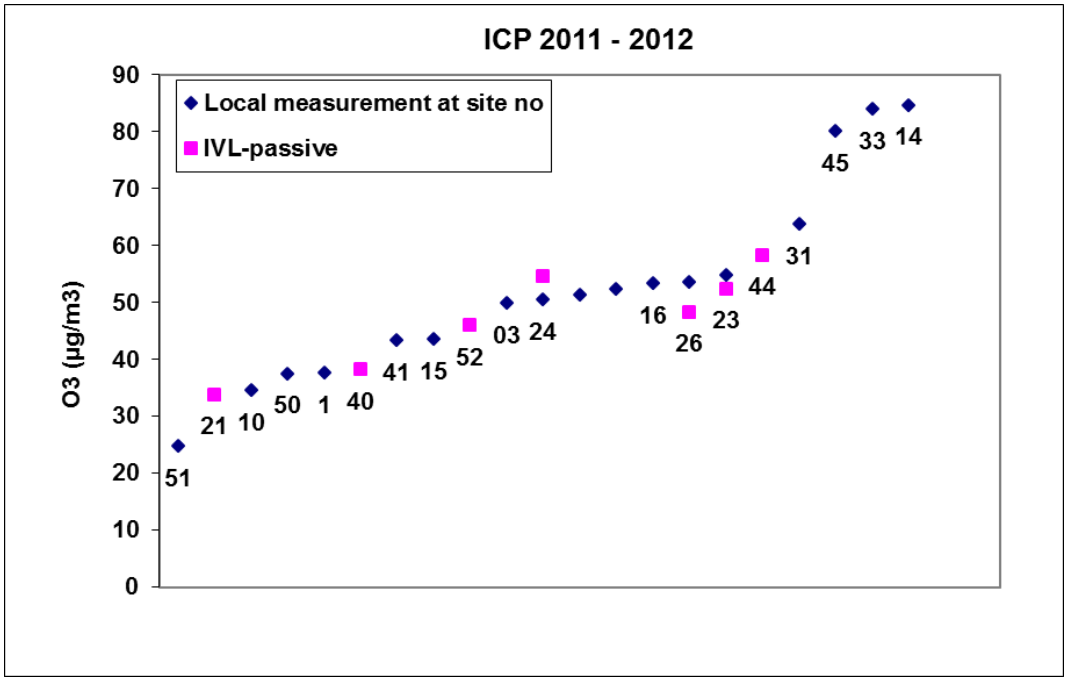


Figure 3: The spread in the measured yearly mean values for O_3 concentrations at the test sites for the test period in ICP Materials.

In Figure 4 the spread for HNO_3 concentrations, measured by IVL samplers, and in addition a separate location measurement at station no. 23, are shown. The figure shows yearly average values from tri-monthly sampling in a position sheltered from rain. Only three of the four Italian stations (no. 13-16) reported HNO_3 results and are thus included. The last tri-monthly period is missing in the result for Sofia (no. 54). The values range from 1.1 µg/m^3 in Venice (no. 16) and Athens (no. 51) down to 0.07 µg/m^3 for Svanvik (no. 44). The spread is good and similar to the 2008-2009 and 2005-2006 periods, but with a fewer higher values than in 2008-2009.

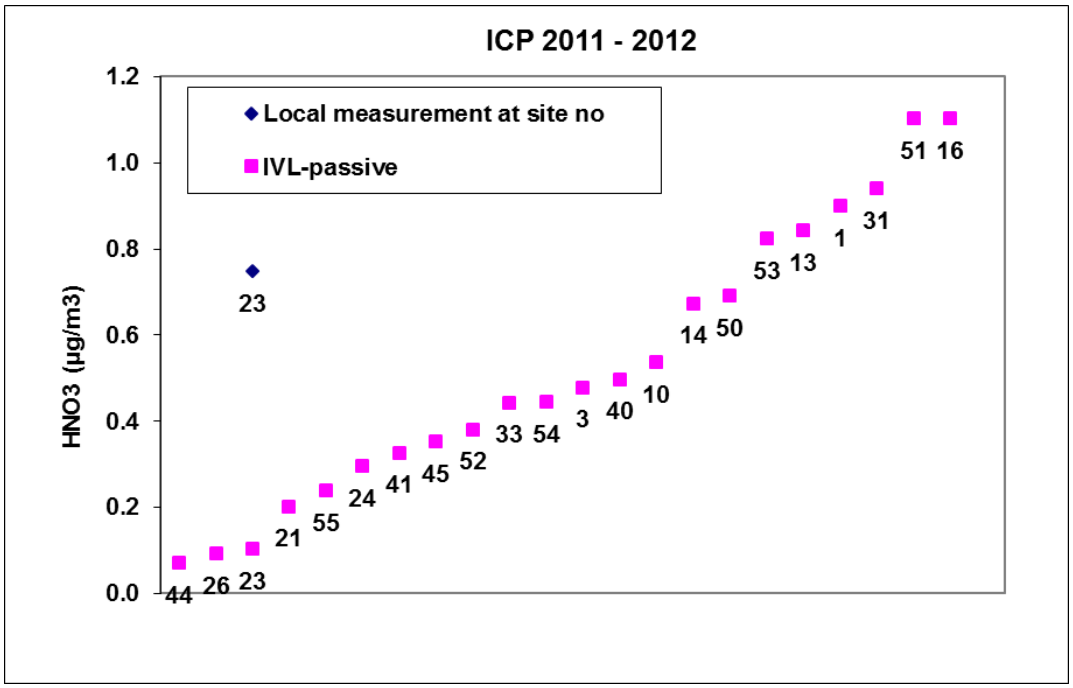


Figure 4: The spread in the measured yearly mean HNO_3 values for the test sites for the test period for ICP Materials.

In Figure 5 the spread for pH in the test period is shown. The pH values range from 6.32 for the Madrid station down to 4.82 in Prague. The highest values are observed in cities in southern and central Europe, the low values at northern and the Czech stations. There is a striking decrease in the pH for the Czech stations in 2011-2012 (no.1, Prague: 4.8, no.3, Kopisty: 5.0) as compared to 2008-2009 (Prague: 6.1, Kopisty: 6.0) and 2005-2006 (Prague: 5.7, Kopisty: 5.9). The spread is good but slightly less than for the 2008-2009 period.

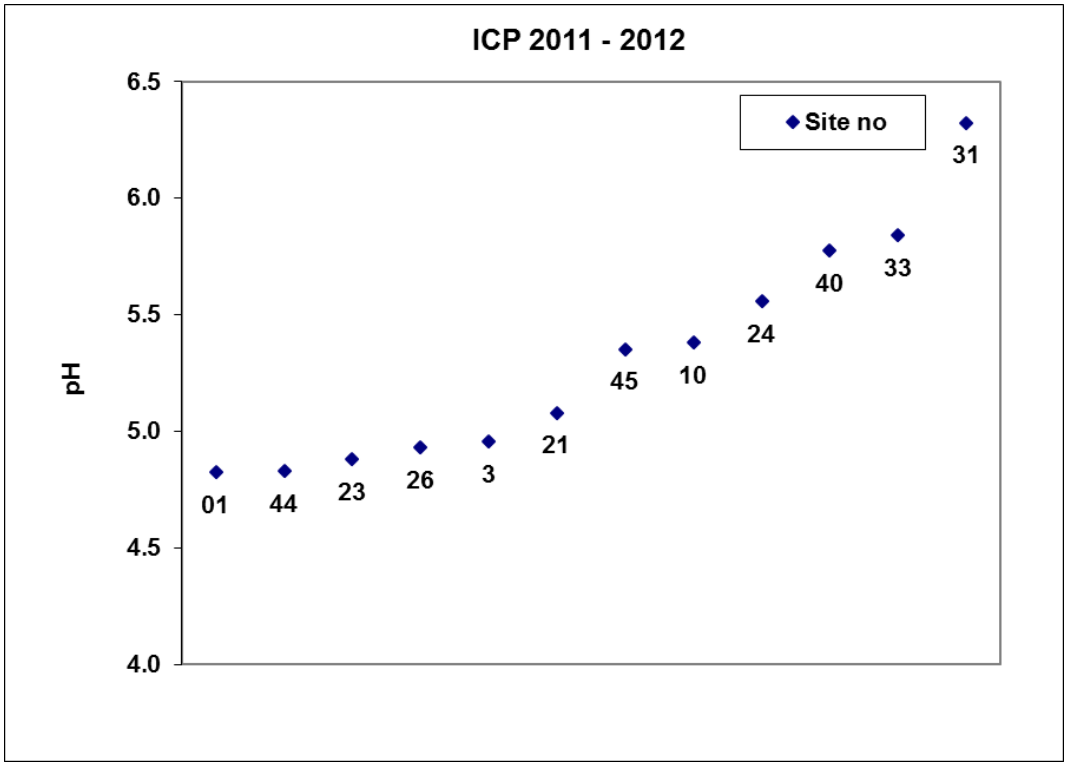


Figure 5: The spread in the measured yearly mean pH values at the test sites for the test period in ICP Materials.

In Figure 6 the spread for temperature in the test period is shown. The yearly average temperature ranges from 18.5˚C in Athens down to -0.5˚C for the Svanvik station. The temperature database covers the spread expected to be found over most of Europe.

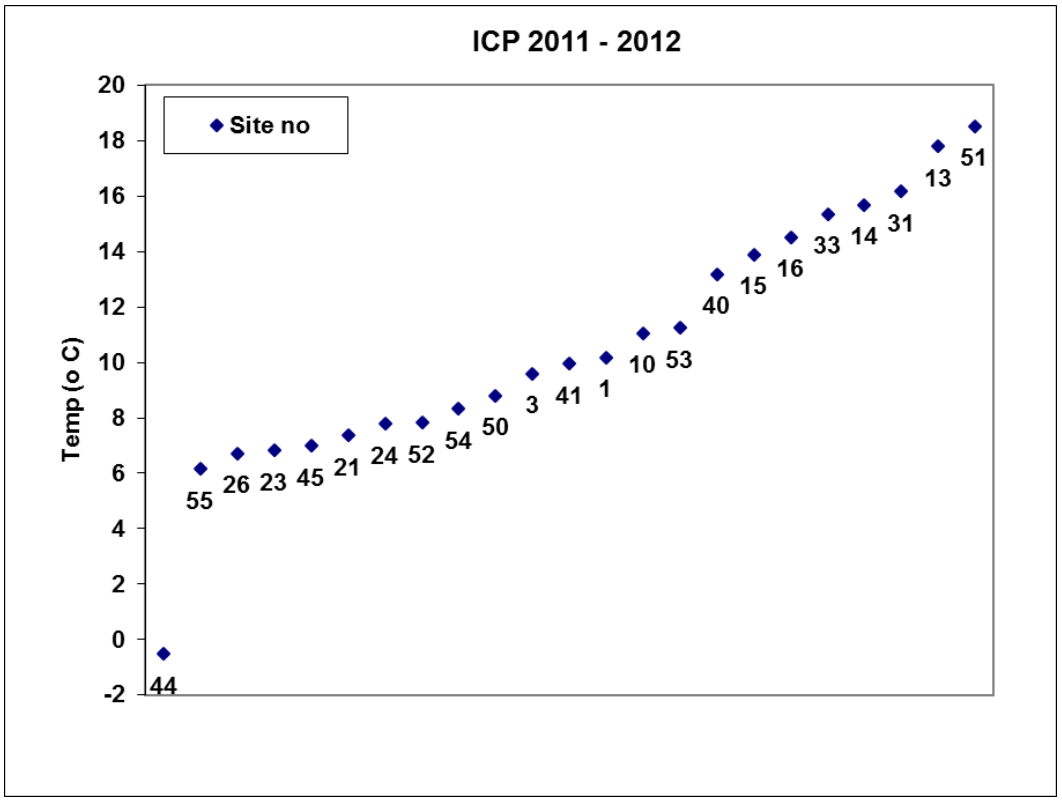


Figure 6: The spread in the measured yearly mean values for temperature at the test sites for the test period for ICP Materials.

In Figure 7 the spread for relative humidity in the test period is shown. The yearly average RH ranges from 86 % in Aspvreten down to 42 % for the Madrid station. The spread is quite good and the RH database covers the spread expected to be found over Europe.

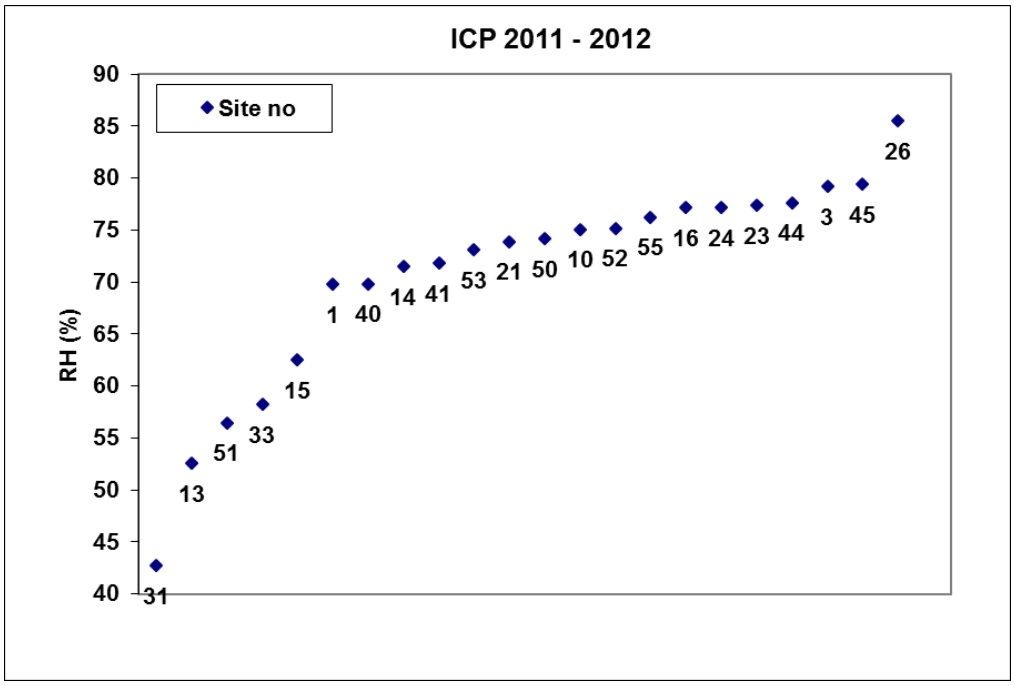


Figure 7: The spread in the measured yearly mean values for relative humidity at the test sites for the test period for ICP Materials.

In Figure 8 the spread for mm precipitation in the test period is shown. The spread is from 1543.8 mm at Birkenes (no. 23) down to 283 mm in Madrid (no. 31). The spread is good but with considerably higher values for two stations, Birkenes and then Chaumont. It is expected that stations on the European west coast can have considerably higher average yearly precipitation amount, but this area is not well represented.

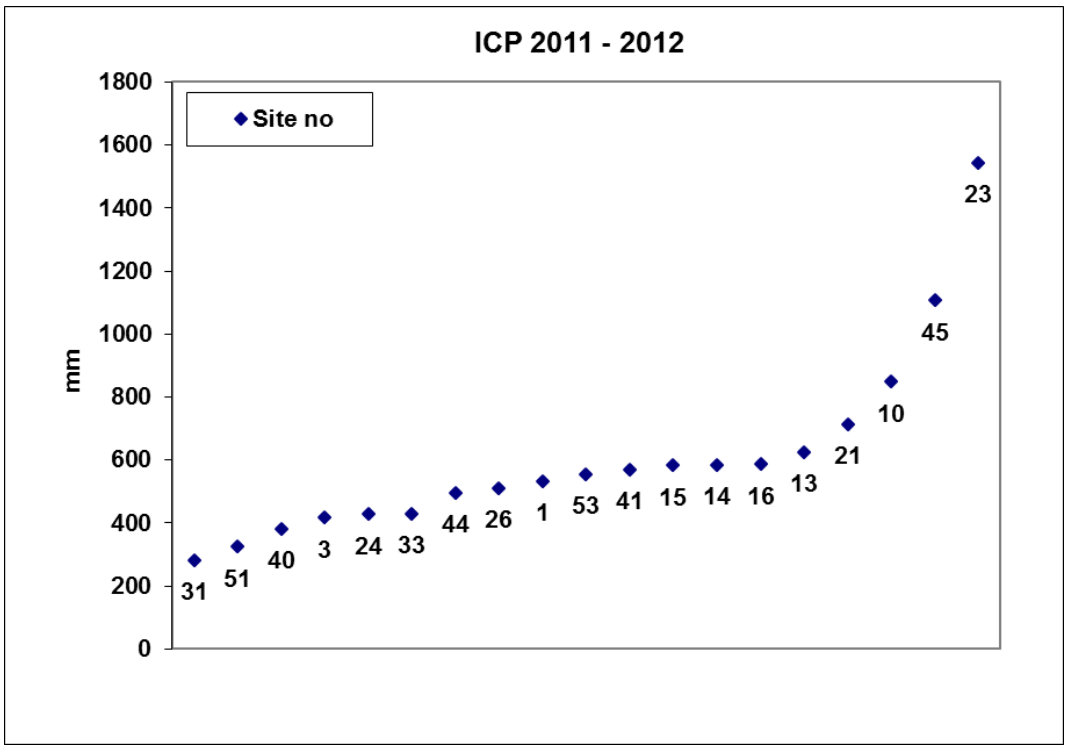


Figure 8: The spread in the measured yearly values for the total precipitation amount at the test sites for the test period for ICP Materials.

Figure 9 gives the yearly annual results from the measurements of particles. Values are shown for PM10 (µg/m^3) from local measurements at the stations and for yearly averages of particle deposition (µg/cm2month) from tri- and four(Italian stations)-monthly sampling by using of IVL passive particle deposition samplers exposed in a situation shielded from rain. From the station in St. Petersburg (55), Chaumont (45), Madrid (31) and Prague (1) the annual average is taken form three measured of four periods. For the stations of Katowice (50) and Sofia (54) the annual average is taken form two measured of four periods.

The PM_{10} values range from 57.8 µg/m^3 in Katowice to 7.1 µg/m^3 at Aspvreten. The particle deposition values range from 82 µg/cm2month in Berlin to 4.0 µg/cm2month in Aspvreten. The spread is good except one station, Berlin, with much higher particle deposition. The range in the deposition is lower than in 2008-2009, excepting Berlin. The station which measured the highest value in 2008-2009, Athens. No. 51 (94.3 µg/cm2month), measured a lower value of 23.6 µg/cm2month in 2011-2012.

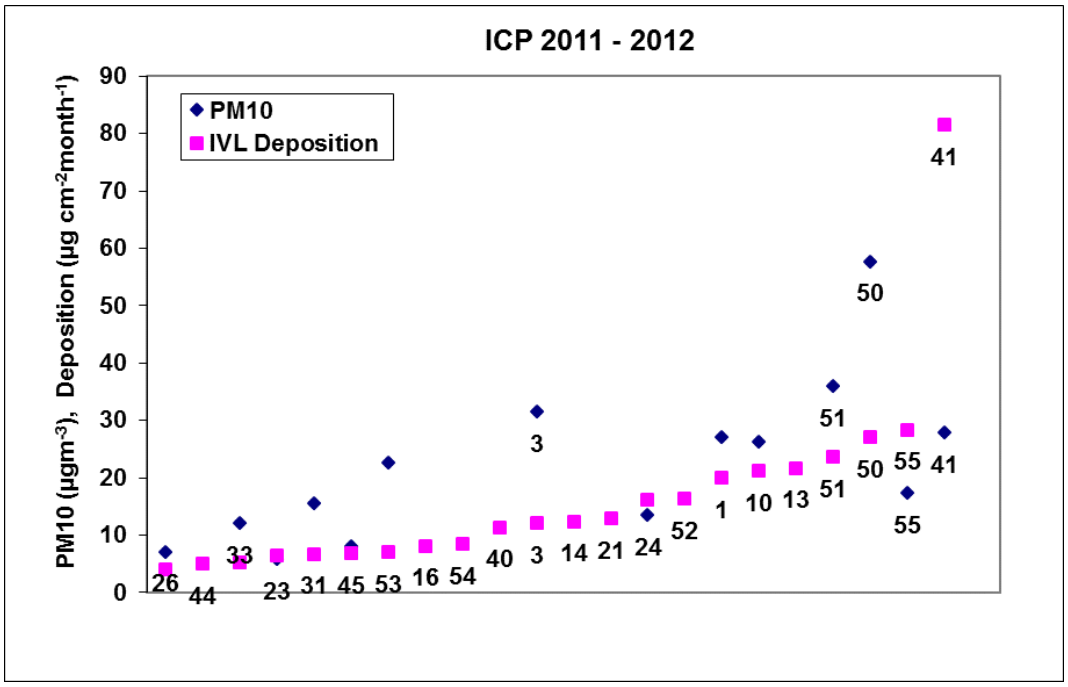


Figure 9: The spread in the measured yearly mean values for PM10-concentration (blue diamonds) and particle deposition (red squares) and at the test sites for the test period for ICP Materials.

Caution should be used in the interpretation of the optionally sampled PM_{10} data as the distance from the sampling station to the exposure site for the materials and other environmental measurements is unspecified. Some information about the locations for the PM_{10} measurements is available in Tidblad and Gordon (2012).

The Figures 10 to 14 show the spread in the concentration values measured for the gases NH_3, HCOOH, CH_3COOH, HCL and HF, respectively, with IVL passive samplers.

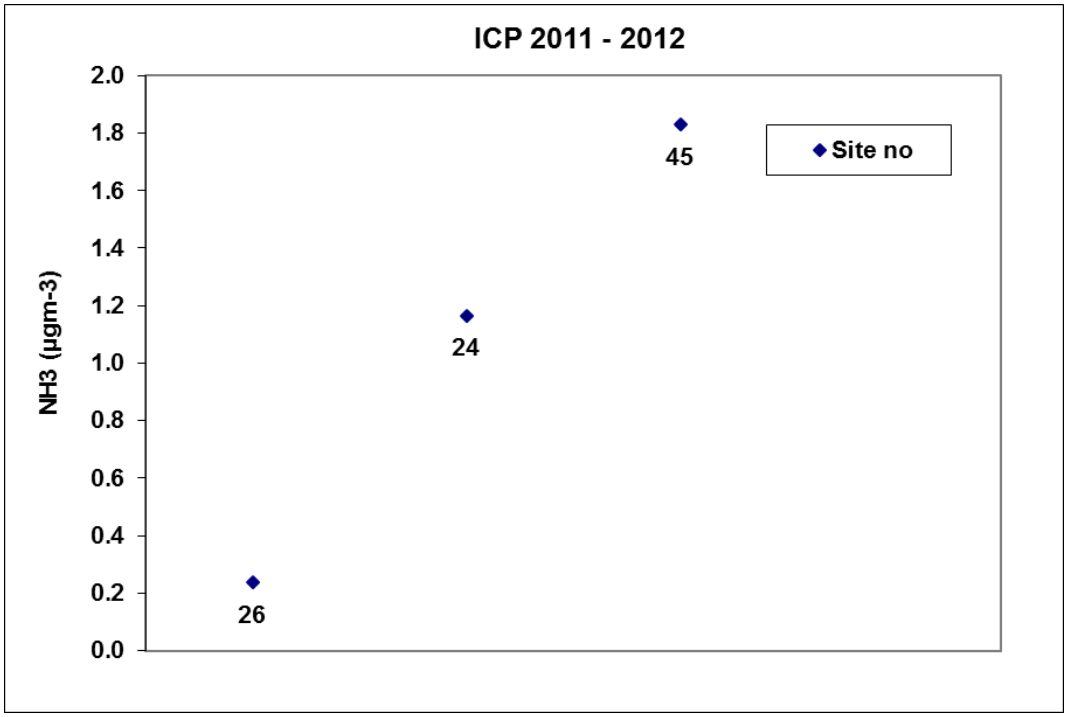


Figure 10: The spread in the measured yearly mean values for NH_3 concentration at the test sites for the test period for ICP Materials.

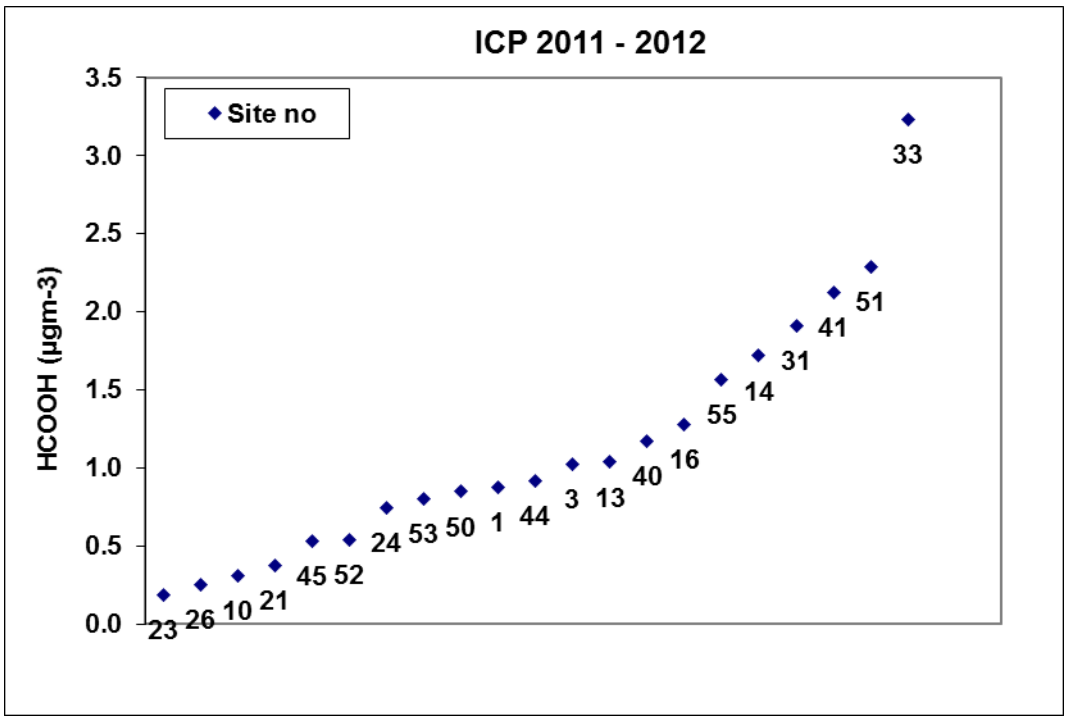


Figure 11: The spread in the measured yearly mean values for HCOOH concentration at the test sites for the test period for ICP Materials.

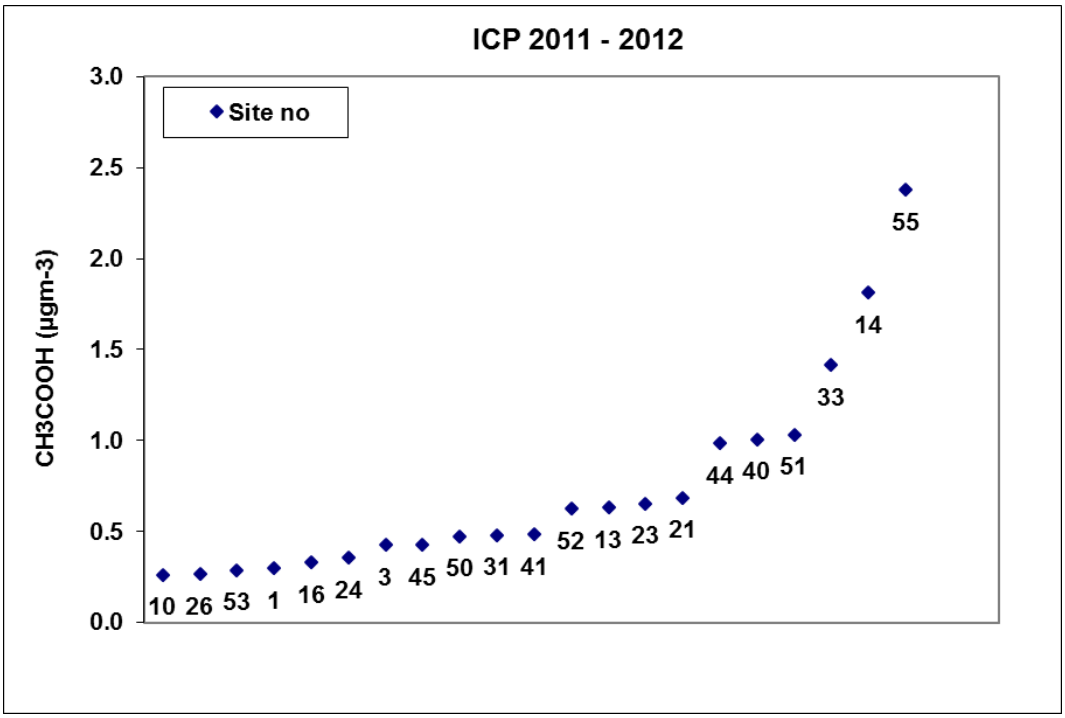


Figure 12: The spread in the measured yearly mean values for CH_3COOH concentration at the test sites for the test period for ICP Materials.

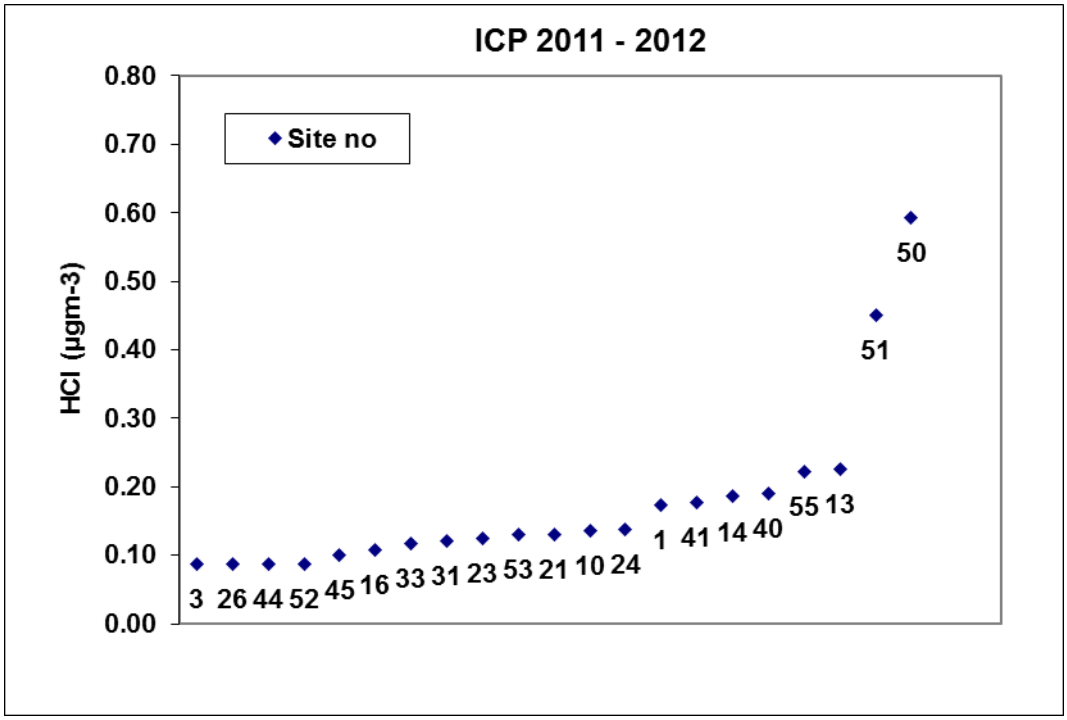


Figure 13: The spread in the measured yearly mean values for HCL concentration at the test sites for the test period for ICP Materials.

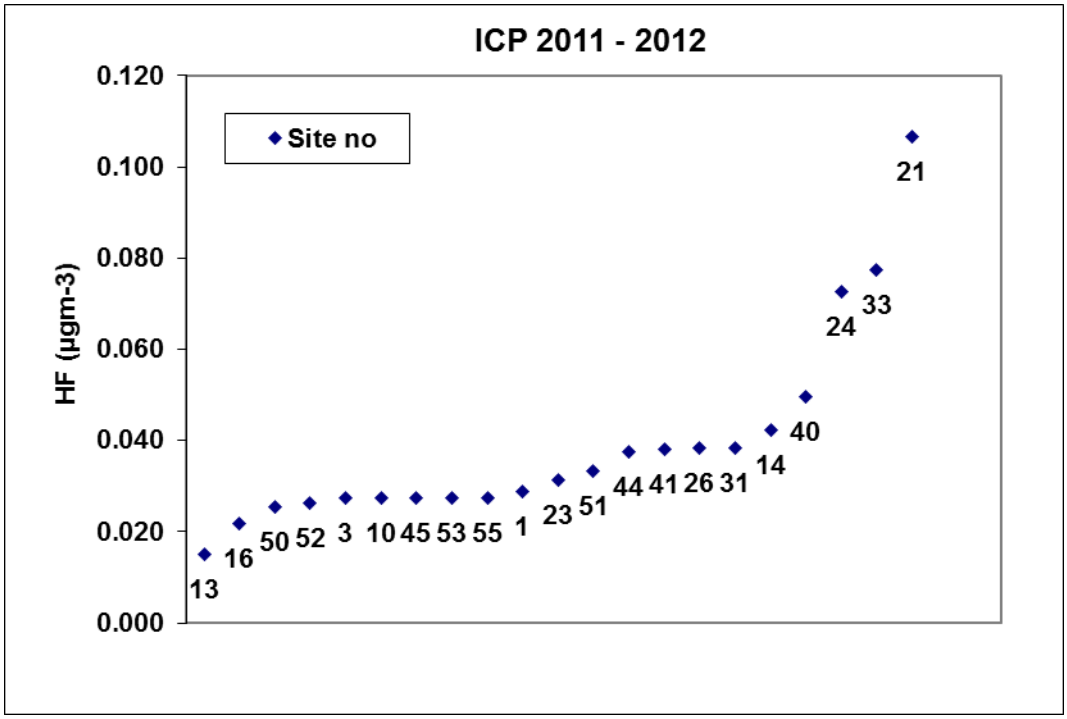


Figure 14: The spread in the measured yearly mean values for HF concentration at the test sites for the test period for ICP Materials.

9 Conclusions

The database obtained during the trend exposure period 2011-2012 has comparable regularity and quality as for the previous years of the ICP Materials programme. Sites belonging to the national surveillance programmes and EMEP have the best regularity. Some of the urban sites have a lower regularity.

The irregularity is highest for the precipitation measurements. Precipitation quality is often not measured and is missing from ten of the stations.

Except for the precipitation quality data the data coverage is good with only few values missing. The spread in the data for the different environmental parameters is sufficient for statistical dose response analyses. The number of sites included in statistical treatment can be changed depending of the selection of parameters for the analyses.

10 References

Ferm, M. (1999) A sensitive diffusional sampler. Göteborg, Swedish Environmental Research Institute (IVL Report B-1020).

Grøntoft, T., Arnesen, K. and Ferm, M. (2011) International co-operative programme on materials, including historic and cultural monuments. Trend exposure programme 2008 – 2009. Environmental data report October 2008 to December 2009. Report No. 67. Kjeller (NILU OR 23/2011).

Grøntoft, T., Arnesen, K. and Ferm, M. (2007) International co-operative programme on materials, including historic and cultural monuments. Trend exposure programme 2005 – 2006. Environmental data report. Report No. 52. Kjeller (NILU OR 26/2007).

Henriksen, J.F., Arnesen, K. and Ferm, M. (2004) International co-operative programme on materials, including historic and cultural monuments and contract EVK4-CT-2001-00044 MULTI-ASSESS. Environmental data report. Report No. 50. Kjeller (NILU OR 73/2004).

Henriksen, J.F. and Arnesen, K. (2003) International co-operative programme on materials, including historic and cultural monuments. Final environmental data report November 1997 to October 2001. Report no. 41. Kjeller (NILU OR 39/2003).

Henriksen, J.F. and Arnesen, K. (2000) International co-operative programme on effects on materials, including historic and cultural monuments. Report no. 34. Environmental data report, September 1995 to October 1998. Kjeller (NILU OR 15/2000).

Henriksen, J.F., Dahlback, A., Arnesen, K., Elvedal, U. and Rode, A. (1997) International co-operative programme on effects on materials, including historic and cultural monuments. Report no. 21. Final environmental data report, September 1987 to August 1995. Kjeller (NILU OR 39/97).

SCI (2005) UN/ECE International co-operative programme on effects on materials, including historic and cultural monuments. Technical manual for the trend exposure programme. Draft. Stockholm, Swedish Corrosion Institute.

Tidblad, J. and Gordon, A. (2012) International co-operative programme on materials, including historic and cultural monuments. Report no. 69. Technical manual for the trend exposure programme 2011-2012. Kista, Swerea KIMAB AB.

Appendix A

Monthly values for the test sites for the exposure period

Table A.1: Mandatory data including measurement with IVL samplers. The time for mounting and demounting of the IVL samplers are noted. Empty cells indicate that values are not available (n.a.) Measured zero values are reported as "0".

			Mandatory																			
	Sampling		Climate											Precipitation					Particles			
	Period		Temp	IVL-Temp	RH	SO2	IVL-passive SO2 (Tri- or four-monthly value put in for last month)	NO2	IVL-passive NO2 (Tri- or four-monthly value put in for last month)	O3	IVL-passive O3 (Tri- or four-monthly value put in for last month)	HNO3	IVL-passive HNO3 (Tri- or four-monthly value put in for last month)	Amount	H+	SO42-	NO3-	Cl-	IVL-passive sampler Particle depositon (Tri- or four-monthly value put in for last month)		
Site no	Year	Month	°C	°C	%	µg/m^3	µg/m^3	µg/m^2	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	mm	pH	mgS/l	mgN/l	mgCl/l	µg/cm^{2}month	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
01	2011	10	9.2		79	3.4		28.6						43	6.1	3.8	8.5	15.0			
01	2011	11	3.5		85	6.7		44.8		11				0.6							
01	2011	12	3.9		77	1.1		37.2		26				34.1	4.9	5.6	21.1	16.7			
01	2012	1	1.9		75	10.1	2.1	33.0		30				43.2	3.8	2.5	25.4	14.1			SO2: 20.01.2012 12:00
01	2012	2	-3.4	1	72	12.2		46.6		25			0.2	14.3	4.9	10.1	27.5	24.1	6	18.10.2011 11:15	14.02.2012 12:00
01	2012	3	7.4		63	8.4		50.1		33				9.4	5.4	19.0	19.7	20.8			
01	2012	4	9.9		60	9.6		39.9		49				36.5	6.7	3.9	10.8	10.7			
01	2012	5	16.4	5	58	6.0	3.9	33.9		59			0.8	72.0	7.3	18.9	12.4	15.5		20.01.2012 12:00	15.05.2012 12:00
01	2012	6	18.7		65	1.8		36.0		53				67.6	5.4	4.3	20.4	12.5			
01	2012	7	19.7		68	5.3		46.0		50				97.5	6.1	4.0	5.8	12.0			
01	2012	8	20.4	12	62	7.9	1.6	49.2		50			1.5	72.4	6.0	5.4	8.5	11.5	15	15.05.2012 12:00	15.08.2012 12:00
01	2012	9	14.7		73	4.5		67.2		29				43.5	5.9	5.1	7.7	11.5			
01	2012	10	8.4		82	6.5	2.1	84.5		18			1.2	42.2	6.4	3.3	6.6	11.5	55	15.08.2012 12:00	13.10.2012 12:00

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
03	2011	10	8.7		86	16.6		44.4		59				14.5	4.8	11.1	7.6	15.5			
03	2011	11	3.3		94	17.5		33.8		16				0.5	4.6	473.3	56.0	102.4			
03	2011	12	3.0		88	13.8		30.9		34				3.1	5.6	5.1	5.8	13.2			
03	2012	1	2.0	0	82	18.2	10.6	32.3		44			0.2	53.8	5.7	4.3	6.5	11.7	6	19.10.2011 12:00	20.01.2012 12:00
03	2012	2	-3.0		78	24.7		24.8		37				16.1	4.5	9.1	11.4	12.3			
03	2012	3	6.5		74	25.3		29.8		46				6.7	4.7	24.7	15.8	14.5			
03	2012	4	9.6		68	19.6		27.5		65				24.5	5.8	11.5	14.7	10.8			
03	2012	5	15.7	5	67	15.5	13.5	23.5		72			0.5	37.8	4.2	14.2	19.6	11.9	14	20.01.2012 12:00	09.05.2012 12:00
03	2012	6	17.8		74	14.9		14.9		64				53.5	5.6	11.0	22.3	11.6			
03	2012	7	18.9		80	15.5		23.5		61				110.9	5.2	6.6	18.0	11.5			
03	2012	8	19.1	12	76	14.9	12.7	14.9		59			0.7	68.3	7.5	3.0	7.3	14.4	15	09.05.2012 12:00	10.08.2012 12:00
03	2012	9	13.7		83	31.7		23.1		42				27.1	4.9	2.1	7.3	8.9			
03	2012	10	7.8		87	10.3	13.0	21.6		27				25.3	4.6	4.9	8.0	12.9	12	10.08.2012 12:00	22.10.2012 12:00

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
10	2011	10	11.3		83	10.0		29.0		19				78.10	5.5	10.2	4.9	4.4			
10	2011	11	7.5		82	11.0		35.0		8				3.7	5.2	2.4	0.6	0.7			
10	2011	12	6.2		82	18.0		28.0		28				130.3	4.8	13.1	6.4	10.0			
10	2012	1	4.5	8	81	11.0	10.2	31.0		26			0.3	127.9	5.8	0.8	0.4	5.8	20	04.10.2011 10:48	04.01.2012 16:00
10	2012	2	0.6		75	5.0		34.0		22				23.2	6.1	3.0	1.6	4.1			
10	2012	3	9.2		71	10.0		30.0		32				16.7	5.9	1.0	0.5	0.6			
10	2012	4	9.5	10	70	15.0	5.9	25.0		50			0.2	63.2	5.7	1.7	1.2	1.0	30	04.01.2012 16:00	11.04.2012 20:00
10	2012	5	15.6		67	5.0		23.0		57				70.3	6.1	1.3	1.2	1.1			
10	2012	6	15.9		74	11.0		22.0		46				107	5.7	0.9	0.6	0.6			
10	2012	7	18.2	13	72	5.0	7.5	22.0		50			0.8	140.7	5.5	0.9	0.4	0.5	18	11.04.2012 20:00	11.07.2012 20:30
10	2012	8	19.9		68	5.0		25.0		49				41.1	6.1	1.0	0.8	0.7			
10	2012	9	14.3		77	5.0		29.0		28				47.2	5.6	1.4	0.7	1.9			
10	2012	10	10.7	15	80	12.0	7.1	29.0		21			0.9	78.2	5.1	0.8	0.3	1.0	15	11.07.2012 20:30	07.10.2012 16:00
10	2012	11	7.3		83	11.0		34.0		17				32.8	5.8	1.2	0.5	1.5			

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
13	2011	12	9.4		56			78.0		25				36.8							
13	2012	1	6.7		51			85.0		14				108.6							
13	2012	2	15.0		58			68.0		36				4.4							
13	2012	3	15.9		43			71.0		56				75.6						Assumed:	
13	2012	4	19.0	13	54		1.3	54.0		67			0.5	73.4					20	30.11.2011 11:30	05.04.2012 10:50
13	2012	5	25.4		48			58.0		72				0.2							
13	2012	6	27.7		37			58.0		73				6							
13	2012	7	28.1	23	37		1.1	58.0		73			1.2	23.6					30	05.04.2012 10:50	10.07.2012 10:15
13	2012	8	22.7		42			51.0		81				66.6							
13	2012	9	19.3		61			52.0		53				86.4							
13	2012	10	15.2		68			62.0		38				67.2							
13	2012	11	9.2		76			65.0		28				76.6							
13	2012	12	7.2	25	69		0.8	61.0		23			0.9	97.4					18	10.07.2012 10:15	04.12.2012 10:30

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
14	2011	12	7.0		75	1.0		11.0		63				84							
14	2012	1	7.0		69	1.0		14.0		62				20.8							
14	2012	2	4.0		74	2.0		10.0		78				39							
14	2012	3	12.3		67	1.0		10.0		94											
14	2012	4	13.3		79	1.0	1.0	10.0	9.8	93			0.4	56.4					9	25.11.2011 10:30	04.04.2012 11:00
14	2012	5	17.0		71	1.0		8.0		101				70.4							
14	2012	6	23.5		61	1.0		11.0		101				2							
14	2012	7	26.1		58	1.0	0.8	9.0	4.0	101			0.6	1.6					20	04.04.2012 11:00	04.07.2012 14:00
14	2012	8	26.6		59	1.0		9.0		107				0							
14	2012	9	21.1		76	1.0		8.0		86				10.8							
14	2012	10	17.0		84	1.0		11.0		73				169.8							
14	2012	11	13.3		85	1.0		12.0		58				130.2							
14	2012	12	7.3		80	1.0	0.7	12.0	5.8	65			1.0	82					11	04.07.2012 14:00	05.12.2012 10:30

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
15	2011	12	5.5		69	4.1		62.8		4				4.2							
15	2012	1	3.7		66	3.6		50.6		9				17.6							
15	2012	2	1.9		61	4.7		55.9		18				10.2							
15	2012	3	12.1		52	2.8		39.9		37				11.8							
15	2012	4	11.6		70	0.9		20.0		49				101.2							
15	2012	5	16.7		59	0.9		16.6		70				84.8							
15	2012	6	21.8		57	1.0		13.4		80				77.8							
15	2012	7	23.4		52	1.3		11.5		86				25.0							
15	2012	8	25.3		49	1.2		19.4		93				20.8							
15	2012	9	19.8		64	0.9		30.1		49				84.2							
15	2012	10	14.8		75	2.4		33.9		21				42.4							
15	2012	11	10.3		78	3.0		37.0		7				103.0							
15	2012	12	4.3		65	4.7		44.6		8				4.8							

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
16	2011	12	5.8		85	2.0		62.0		6				27							
16	2012	1	2.9		82	3.0		58.0		11				4							
16	2012	2	2.8		71	2.0		45.0		30				27.8							
16	2012	3	11.9		72	2.0		38.0		52				2.4							
16	2012	4	12.7	8	79	1.0	2.2	19.0		73			0.4	81.6					6	01.12.2011 11:00	04.04.2012 15:30
16	2012	5	18.2		73	2.0		20.0		86				72.2							
16	2012	6	23.1		75	2.0		17.0		94				29.4							
16	2012	7	25.1	21	71	2.0	4.0	22.0		94			1.6	12					11	04.04.2012 15:30	04.07.2012 12:00
16	2012	8	25.4		71	2.0		18.0		96				19.6							
16	2012	9	20.3		77	1.0		25.0		54				126							
16	2012	10	15.1		84	1.0		27.0		33				110							
16	2012	11	11.0		86	1.0		38.0		12				76							
16	2012	12	3.3	22	87	2.0	2.4	52.0		4			1.3	44.6					8	04.07.2012 12:00	13.12.2012 10:00

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
21	2011	10	7.6		81			36.0						33.9	5.0	0.6	0.7	2.5			
21	2011	11	4.6		88			36.0						17.59	5.1	1.6	1.6	5.7			
21	2011	12	0.8		82			40.4						68.67	5.3	0.4	0.3	4.7			
21	2012	1	-2.4	5	82		0.7	38.6			19		0.1	24.09	5.4	0.3	0.3	4.2	16	06.10.2011 13:00	02.01.2012 13:30
21	2012	2	-2.2		77			50.7						4.77	5.4	2.1	1.7	30.7			
21	2012	3	5.6		63			28.2						6.185	5.9	3.0	2.1	31.3			
21	2012	4	4.9	1	63		0.8				30		0.1	64.54	5.6	0.4	0.6	0.6	17	02.01.2012 13:30	02.04.2012 13:20
21	2012	5	12.3		59									60.32	5.7	0.4	0.4	0.5			
21	2012	6	13.7		67			21.1						114.8	5.0	0.3	0.3	0.9		SO2 missing	
21	2012	7	16.4	10	75			16.8			55		0.4	153.3	4.9	0.2	0.2	0.3	16	02.04.2012 13:30	02.07.2012 13:00
21	2012	8	16.1		76			18.1						84.7	4.7	0.3	0.4	0.4			
21	2012	9	11.1		74			17.3						81.8	5.7	0.1	0.0	0.6			
21	2012	10		13			0.4				32		0.2						4	02.07.2012 13:00	11.10.2012 13:30

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
23	2011	10	7.6		82	0.4		1.7		43		0.63		99.8	4.5	0.7	0.6	3.3			
23	2011	11	5.2		90	0.1		2.6		31		0.42		86.1	4.4	1.0	1.0	5.7			
23	2011	12	0.8		86	0.0		1.1		50		0.56		226.3	5.0	0.5	0.2	9.1			
23	2012	1	-1.1	10	86	0.2	0.2	1.4		47	42	0.74	0.1	159.2	4.8	0.5	0.2	5.1	8	11.10.2011 13:30	11.01.2012 16:30
23	2012	2	-1.2		79	0.3		1.5		60		0.98		27.42	4.5	0.6	0.8	5.8			
23	2012	3	5.5		69	0.1		1.5		63		0.43		30.73	6.0	0.2	0.4	2.4			
23	2012	4	3.9	2	71	0.2	0.1	1.5		71	62	0.641	0.1	166.1	4.9	0.4	0.7	0.9	4	11.01.2012 16:30	11.04.2012 18:00
23	2012	5	10.8		64	0.3		1.0		68		1.25		76.4	5.1	0.3	0.6	1.1			
23	2012	6	11.5		73	0.2		1.1		58		0.60		203.4	5.0	0.3	0.3	1.2			
23	2012	7	14.5	17	74	0.1	0.2	0.9		58	63	1.38	0.2	85.06	5.0	0.3	0.3	0.4	5	11.04.2012 18:00	11.07.2012 16:40
23	2012	8	14.3		77	0.2		0.6		57		1.02		179.8	5.3	0.3	0.4	0.7			
23	2012	9	10.1		78	0.1		0.5		54		0.33		203.4	5.0	0.2	0.2	1.4			
23	2012	10		11			0.1				43		0.1						8	11.07.2012 16:40	13.10.2012 06:00

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
24	2011	10	8.5		83	Annual averages								26.6	a from a nearby station "Kaan						
24	2011	11	5.9		88									4.8	5.9	0.5	0.7	2.4			
24	2011	12	2.4		86	0.8		10.0		55				41.6	6.0	0.2	0.3	0.8			
24	2012	1	-0.9	-1	85		0.5		13.5		42.1		0.2	21.2	5.2	0.2	0.2	0.9	10	14.10.2011 11:00	31.01.2012 09:00
24	2012	2	-3.0		80									18.8	5.3	0.3	0.4	0.5			
24	2012	3	4.3		69									11.6	5.7	0.4	0.5	0.9			
24	2012	4	4.5		72									36	5.7	0.2	0.2	0.2			
24	2012	5	11.7	0	58		0.8		9.8		66.2		0.2	7.4	6.5	0.5	0.4	0.5	18	31.01.2012 09:00	15.05.2012 10:30
24	2012	6	13.4		74									96.8	5.2	0.1	0.2	0.2			
24	2012	7	17.6		72									44.8	5.7	0.2	0.2	0.2			
24	2012	8	16.7	17	78		0.6		8.2		64.8		0.6	85	5.9	0.2	0.2	0.2	13	15.05.2012 10:30	22.08.2012 13:30
24	2012	9	12.2		81									33.6	6.6	0.3	0.3	0.3			
24	2012	10	6.9	12	85		0.3		11.6		45.9		0.2	41.8	5.1	0.2	0.3	0.4	29	22.08.2012 13:30	15.10.2012 13:00
24	2012	11																			
24	2012	12				0.9		12.0		49											

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
26	2011	10	7.2		91	Annual averages								55	5.0	0.3	0.3	0.6			
26	2011	11	4.7		95									8	5.0	0.3	0.4	1.1			
26	2011	12	1.7		93	0.4		1.9		57				53	4.9	0.2	0.3	1.3			
26	2012	1	-1.5		91									51.5	4.9	0.2	0.3	0.9			
26	2012	2	-4.8	-1	88				2.2		41.0		0.1	41.3	4.7	0.1	0.3	0.5	2	17.10.2011 11:00	01.02.2012 11:30
26	2012	3	3.6		73									12.9	5.1	0.1	0.2	0.5			
26	2012	4	3.6		82									53.1	4.9	0.3	0.4	0.4			
26	2012	5	10.3	0	74				2.15		59.4		0.1	27.3	5.3	0.4	0.4	0.2	6	01.02.2012 11:30	02.05.2012 13:30
26	2012	6	12.6		82									53.1	5.0	0.2	0.2	0.3			
26	2012	7	16.5		82									34.4	4.8	0.2	0.3	0.4			
26	2012	8	15.4	16	86				1.1		56.4		0.1	46.2	5.2	0.3	0.4	0.3	3	02.05.2012 13:30	06.08.2012 11:30
26	2012	9	11.4		89									75	4.9	0.3	0.4	0.4			
26	2012	10	5.7	12	92				1.33		36.7		0.0	53.1	4.9	0.3	0.4	0.4	5	06.08.2012 11:30	18.10.2012 11:00
26	2012	11	3.8		96																
26	2012	12	-4.0		97	0.4		2.0		53											

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
31	2011	10	17.0		51	0.6		41.0		60				19	6.4	0.3	0.2	0.8			
31	2011	11	15.0		82	0.7		37.0		44				61	6.3	0.2	0.2	0.6			
31	2011	12				0.6		46.0		40				6	6.3	0.5	0.6	0.3			
31	2012	1	6.0	16	57	0.7	0.5	63.0		26			0.6	8	6.2	0.8	0.7	0.7	7	03.10.2011 12:00	10.01.2012 12:00
31	2012	2	6.0		36	0.6		33.0		49				6	6.2	0.4	0.5	0.6			
31	2012	3	11.0		32	0.6		38.0		57				25	6.5	0.1	0.2	0.2			
31	2012	4	11.0	13	64	0.6	0.7	25.0		86			0.6	76	6.6	0.2	0.3	0.4	6	10.01.2012 12:00	10.04.2012 12:00
31	2012	5	18.0		40	0.6		26.0		66				27	6.5	0.1	0.1	0.3			
31	2012	6	23.0		27	0.6		22.0		78				0							
31	2012	7	25.0	23	22	0.6	0.3	10.0		92			1.0	0					7	10.04.2012 12:00	12.07.2012 12:00
31	2012	8	26.0		21	0.6		19.0		87				0							
31	2012	9	20.0		38	0.6		22.0		80				55	6.0	0.2	0.2	0.5			
31	2012	10		31			0.4						1.6							12.07.2012 12:00	01.10.2012 12:00

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
33	2011	10	22.5		55	0.4		3.9		89				63.4	5.8	0.1	0.1	0.3			
33	2011	11	15.0		86	0.2		3.3		66				65.6	5.8	0.2	0.1	0.7			
33	2011	12	7.8		77	0.2		3.4		64				14.1	5.8	0.1	0.1	0.3			
33	2012	1	6.2	10	75	0.3	0.3	4.7		63		0		8.2	6.0	0.7	0.6	0.3	6	05.10.2011 12:00	03.01.2012 12:00
33	2012	2	4.0		55	0.5		5.6		81				5.4	6.3	0.4	0.6	0.3			
33	2012	3	9.6		55	0.5		3.9		93				30.2	6.0	0.3	0.5	0.5			
33	2012	4	8.1	13	78	0.2	0.3	1.7		89		0		73.4	5.9	0.2	0.2	0.4	3	03.01.2012 12:00	04.04.2012 12:00
33	2012	5	17.8		59	0.7		1.6		92				56.8	5.7	0.1	0.1	0.4			
33	2012	6	22.6		41	0.4		1.6		87				0.4	6.3	1.0	1.6	0.9			
33	2012	7	25.2	23	34	0.5	0.3	2.7		99		0		12.6	6.7	1.1	0.9	0.7	6	04.04.2012 12:00	04.07.2012 12:00
33	2012	8	25.9		33	0.6		2.1		99				0							
33	2012	9	19.7		51	0.5		4.9		86				99.5	6.0	0.1	0.1	0.2			
33	2012	10		31			0.3					1							6	04.07.2012 12:00	01.10.2012 12:00

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
40	2011	10	12.2		74									23	5.5	0.6	0.4	2.2			
40	2011	11	10.7		83									22.4	5.8	0.2	0.2	0.2			
40	2011	12	8.4		81									71.4	5.8	0.4	0.3	2.6			
40	2012	1	7.7	13	76		1.1		33.3		28		0.3	22	6.4	1.5	0.9	10.0	7	07.10.2011 17:00	03.01.2012 17:34
40	2012	2	3.6		68									6.4	6.5						
40	2012	3	11.9		65									15	6.7	1.4	1.0	2.8			
40	2012	4	10.4	15	70		2.2		36.9		25		0.2	6.4	6.3	1.0	0.9	2.0	16	03.01.2012 17:35	02.04.2012 15:50
40	2012	5	16.8		66									46	6.1	0.5	0.6	0.3			
40	2012	6	17.8		71									55.8	5.8	0.4	0.4	0.7			
40	2012	7	19.9	18	63		1.8		19.8		53		0.7	66.8	5.4	0.2	0.2	0.3	11	02.04.2012 16:00	29.06.2012 10:30
40	2012	8	21.9		57									4.2	5.8*	0.4	0.6	1.7			
40	2012	9	16.9		65									42.6	6.3	0.4	0.4	1.0			
40	2012	10		23			1.2		17.8		48		0.9						11	29.06.2012 10:42	01.10.2012 14:20

*pH measured with ph paper (précision ±0.4 units) because of very low amount of precipitations which prevented the Ion chromatography analysis

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
41	2011	10	9.7		79	2.0		48.0		25				37.5		3.6	4.4	0.8			
41	2011	11	4.4		84	3.0		52.0		12				0.4		7.9	9.9	1.3			
41	2011	12	4.4		82	3.0		36.0		30				78.6		1.5	3.1	0.6			
41	2012	1	1.9	7	80	4.0	1.5	41.0		31			0.2	57.2		2.1	3.8	1.3	21	29.09.2011 11:45	05.01.2012 12:45
41	2012	2	-1.7		76	4.0		43.0		38				35.4		3.2	5.8	1.7			
41	2012	3	7.7		67	3.0		44.0		46				7.8		3.0	8.1	1.3			
41	2012	4	9.5	9	61	3.0	2.0	43.0		60			0.2	28.2		2.1	2.7	0.6	271	05.01.2012 12:45	29.03.2012 09:00
41	2012	5	15.3		59	3.0		42.0		71				44.3		2.4	1.6	0.4			
41	2012	6	16.0		67	2.0		42.0		59				92.3		1.8	1.2	0.1			
41	2012	7	18.5	15	70	2.0	1.1	43.0		58			0.4	121.8		2.4	1.0	0.1	27	29.03.2012 09:00	03.07.2012 09:40
41	2012	8	18.9		67	2.0		42.0		53				39.5		2.6	1.8	0.2			
41	2012	9	14.9		69	2.0		48.0		38				26.9		1.7	2.0	0.3			
41	2012	10	9.4	18	77	3.0	0.9	47.0		23			0.5	35.3		2.0	2.9	0.6	28	03.07.2012 09:50	01.10.2012 12:30

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
44	2011	10	3.5		85	1.9		0.9						55.76	4.9	0.1	0.4	0.2			
44	2011	11	-2.0		86	3.6		1.7						14.01	4.9	0.4	0.1	2.0			
44	2011	12	-3.0		85	5.3		1.7						14.52	4.5	0.5	0.4	0.8			
44	2012	1	-12.0	-4	82	15.7	4.8	2.6			56.50		0.1	15.86	4.9	0.4	0.1	1.8	2	13.10.2011 12:35	09.01.2012 11:47
44	2012	2	-13.1		79	3.7		1.9						4.68	4.8	0.4	0.4	1.3			
44	2012	3	-5.0		76	6.5		1.0						4.62	4.8	0.7	0.3	8.3			
44	2012	4		-12		6.7	4.3	1.0			75.80		0.1	11.02	4.4	1.5	0.3	10.2	2	09.01.2012 11:47	23.04.2012 12:40
44	2012	5	5.7		62	6.3		0.6						19.43	4.9	0.7	0.2	0.2			
44	2012	6	9.1		71	9.4		0.9						159.68	4.8	0.3	0.0	0.8	10	23.04.2012 12:40	11.06.2012
44	2012	7	12.1	12	74	6.6	4.9	1.0			62.90		0.1	61.34	4.7	0.5	0.1	0.6	11	.04/11.06.2012 12:	09.07.2012 12:30
44	2012	8				12.7								31.88	5.0	0.2	0.0	0.1			
44	2012	9				10.2		0.9						104.52	5.0	0.3	0.1	0.2			
44	2012	10					3.3				38.30		0.0						6	09.07.2012 12:30	01.10.2012 12:00

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
45	2011	10	7.7		84			6.6		67				80.60	5.3	0.1	0.2	0.2			
45	2011	11	6.6		68			6.6		71				38.70	5.4	0.1	0.1	0.1			
45	2011	12	0.6		90			3.3		67				193.40	5.2	0.1	0.1	0.2			
45	2012	1	-1.0		89		0.2	5.5		61			0.2	104.30	4.9	0.1	0.2	0.5		11.10.2011 10:30	11.01.2012 10:30
45	2012	2	-6.2		79			10.8		69				24.80	4.7	0.2	0.3	0.3			
45	2012	3	5.8		66			10.3		85				18.40	5.8	0.2	0.4	0.1			
45	2012	4	4.8	1	81		0.8	6.0		89			0.5	109.50	5.6	0.2	0.3	0.1	5	11.01.2012 10:30	11.04.2012 10:00
45	2012	5	10.4		75			4.1		100				80.60	5.8	0.2	0.2	0.1			
45	2012	6	13.6		82			3.5		86				114.50	5.6	0.2	0.2	0.1			
45	2012	7	14.2	21	78		0.3	3.1		88			0.4	126.80	5.7	0.2	0.2	0.1	10	11.04.2012 10:15	11.07.2012 10:00
45	2012	8	16.0		77			4.0		98				116.20	5.8	0.2	0.3	0.1			
45	2012	9	11.1		85			5.4		82				100.20	5.9	0.2	0.2	0.1			
45	2012	10		20			0.3						0.3						6	11.07.2012 10:00	10.10.2012 10:30

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
50	2011	10	8.5		84	13.0		34.0		76											
50	2011	11	2.8		85	23.0		45.0		14											
50	2011	12	2.2		67	18.0		31.0		22											
50	2012	1	-1.0		84	18.0	12.9	29.0		27			0.5							20.10.2011 12:00	20.01.2012 12:00
50	2012	2	-6.9		83	42.0		46.0		24											
50	2012	3	4.8		76	13.0	18.0	34.0		32			0.6								
50	2012	4	9.8	7	72	11.0		29.0		46									34	18.01.2012 11:00	19.04.2012 11:00
50	2012	5	15.2		64	10.0		24.0		58											
50	2012	6	17.5		62	6.0		21.0		62											
50	2012	7	19.8	24	72	8.0	4.5	25.0		58			1.0						20	19.04.2012 11:30	19.07.2012 11:00
50	2012	8	18.8		69	15.0		32.0		52											
50	2012	9	14.2		75	14.0		30.0		35										HNO3:Start 2012-04-19 acc. to protocol	
50	2012	10	8.5		81	16.0	4.6	35.0		21			0.7							19.07.2012 11:00	29.10.2012 06:00
50	2012	11	5.9		85	21.0		37.0		11											

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
51	2011	10	17.0		62			29.6		25				42.1							
51	2011	11	11.6		65			40.9		17				1.0							
51	2011	12	11.6		70			44.8		9				88.9							
51	2012	1	7.3	10	65		5.0	47.8		14			0.5	29.6					17	03.10.2011 11:00	05.01.2012 10:10
51	2012	2	8.8		70			59.3		26				94.9							
51	2012	3	12.6		62			66.5		24				11.9							
51	2012	4	17.3	12	58		5.0	52.9		29			0.3	32.2					28	05.01.2012 10:30	24.04.2012 08:45
51	2012	5	21.5		54			49.1		22				15.3							
51	2012	6	28.0		41			50.6		27				0.0							
51	2012	7	31.0	26	39		3.8	58.7		28			1.8	0.0					29	24.04.2012 08:48	23.07.2012 08:55
51	2012	8	30.1		39			51.9		49				0.4							
51	2012	9	25.5		53			56.4		27				8.3							
51	2012	10	22.1	27	63		2.9	54.5		19			1.9	7.7					20	23.07.2012 09:03	23.10.2012 09:40
51	2012	11	16.5		71			50.1		16				87.2							

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
52	2011	10	9.0		79																
52	2011	11	5.0		85																
52	2011	12	2.0		86																
52	2012	1	-2.0	6	84		0.4		18.72		26.20		0.1						9	20.10.2011 12:00	28.01.2012 09:59
52	2012	2	-8.0		79																
52	2012	3	2.0		77																
52	2012	4	7.0	4	61		1.9		25.37		51.90		0.6						19	28.01.2012 09:59	20.04.2012 09:55
52	2012	5	13.0		64																
52	2012	6	15.0		66																
52	2012	7	20.0		70																
52	2012	8	17.0	16	74		0.7		14.15		59.90		0.5							20.04.2012 10:01	01.08.2012 10:03
52	2012	9	14.0		77																
52	2012	10		11			0.9		20.06				0.3						29	01.08.2012 10:15	26.10.2012 10:10

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
53	2011	10	10.0		83	3.0		28.0		34				73.00							
53	2011	11	3.5		90	5.0		36.0		20				0.00							
53	2011	12	3.9		81	3.0		25.0		29				18.00							
53	2012	1	2.6		76	5.0		16.0		42				91.00						HNO3: sampler lost	
53	2012	2	-2.2		73	12.0	3.0	21.0		47				26.00					4	07.11.2011 14:00	09.02.2012 15:00
53	2012	3	8.5		68	2.0		25.0		52				27.00							
53	2012	4	11.0		67	2.0		21.0		62				27.00						HNO3:Exposed 6 days later as clips broke	
53	2012	5	17.1	8	63	2.0	2.0	15.0		79		0.70		38.00					11	15.02.2012 14:00	11.05.2012 11:00
53	2012	6	20.6		68	2.0		14.0		70				68.00							
53	2012	7	21.6		70	1.0		12.0		69				131.00							
53	2012	8	21.7	17	66	2.0	0.9	19.0		73		0.95		40.00					8	11.05.2012 11:00	10.08.2012 14:00
53	2012	9	16.7		73	2.0		20.0		55				45.00							
53	2012	10	10.1		82	2.0		27.0		30				44.00							
53	2012	11	6.9		86	2.0	1.0	29.0		20				20.00					5	10.08.2012 14:00	08.11.2012 14:00
53	2012	12	0.8		85	2.0		31.0		23				52.00							

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
54	2011	10																			
54	2011	11																			
54	2011	12																		Only HNO3 sampler available	
54	2012	1		3									0.5						7	17.10.2011 12:00	17.01.2012 12:00
54	2012	2																			
54	2012	3																		Only HNO3 sampler available	
54	2012	4		5									0.7							17.01.2012 12:00	17.04.2012 12:00
54	2012	5																			
54	2012	6																		Only HNO3 sampler available	
54	2012	7		17									0.2						10	17.04.2012 12:00	17.07.2012 12:00
54	2012	8																			
54	2012	9																			
54	2012	10																			

Site no	Year	Month	Temp (°C)	IVL-Temp (°C)	RH (%)	SO2 (µg/m3)	IVL-SO2 (µg/m3)	NO2 (µg/m3)	IVL-NO2 (µg/m3)	O3 (µg/m3)	IVL-O3 (µg/m3)	HNO3 (µg/m3)	IVL-HNO3 (µg/m3)	Prec. (mm)	pH	SO42- (mgS/l)	NO3- (mgN/l)	Cl- (mgCl/l)	IVL-Particle depositon (µg/ cm2mont)	Date for mounting of IVL passive samplers	Date for demounting of IVL passive samplers
55	2011	10	7.1		71			21.5													
55	2011	11	3.1		75			27.2													
55	2011	12	1.4		79			34.0													
55	2012	1	-5.2	16	80	2.3		42.0				0.10							29	01.10.2011 12:00	11.01.2012 12:00
55	2012	2	-11.0					56.0													
55	2012	3	-1.1					47.0													
55	2012	4	4.8	8		6.6		46.0				0.32								11.01.2012 12:00	09.04.2012 12:00
55	2012	5	12.4					35.7													
55	2012	6	14.4					29.1													
55	2012	7	19.3	17		1.6		28.3				0.28							46	09.04.2012 12:00	06.07.2012 12:00
55	2012	8	16.1					25.9													
55	2012	9	12.4					27.9													
55	2012	10	5.9	19		1.7		32.8				0.27							11	06.07.2012 12:00	06.10.2012 12:00
55	2012	11	2.1					31.5													

Table A.2: Optional data

			Optional						
	Sampling		Precipitation						Particles
	period		Conductivity	NH4+	Na+	Ca2+	Mg2+	K+	PM10
Site no	Year	Month	mS/cm	mgN/l	mgNa/l	mgCa/l	mgMg/l	mgK/l	µg/m^3
01	2011	10	22						28
01	2011	11							50
01	2011	12	74						13
01	2012	1	123						21
01	2012	2	134						44
01	2012	3	172						34
01	2012	4	56						23
01	2012	5	48						25
01	2012	6	23						18
01	2012	7	15						21
01	2012	8	26						23
01	2012	9	23						26
01	2012	10	22						23

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
03	2011	10	77						33
03	2011	11	727						62
03	2011	12	43						17
03	2012	1	41						22
03	2012	2	75						41
03	2012	3	184						36
03	2012	4	89						27
03	2012	5	81						30
03	2012	6	39						25
03	2012	7	24						28
03	2012	8	67						32
03	2012	9	53						25
03	2012	10	59						32

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
10	2011	10	27	2.60	2.87	6.01	1.03	0.22	24
10	2011	11	24	0.59	0.40	1.03	0.20	0.09	48
10	2011	12	25	3.52	5.06	3.82	0.97	0.31	17
10	2012	1	35	0.53	2.04	1.05	1.04	0.18	30
10	2012	2	55	3.87	1.51	2.17	1.03	0.19	38
10	2012	3	24	1.11	0.20	2.78	0.97	0.19	39
10	2012	4	37	2.19	0.26	3.88	0.98	0.23	23
10	2012	5	32	1.55	0.45	2.89	1.00	0.28	23
10	2012	6	20	1.02	0.15	1.18	0.82	0.18	17
10	2012	7	16	0.16	0.07	0.69	0.31	0.09	16
10	2012	8	25	0.28	0.19	1.37	0.26	0.21	19
10	2012	9	41	0.78	0.89	1.57	0.09	0.35	20
10	2012	10	18	0.29	0.36	0.66	0.09	0.14	23
10	2012	11	29	0.93	0.67	1.22	0.08	0.61	26

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
13	2011	12							
13	2012	1							
13	2012	2							
13	2012	3							
13	2012	4							
13	2012	5							
13	2012	6							
13	2012	7							
13	2012	8							
13	2012	9							
13	2012	10							
13	2012	11							
13	2012	12							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
14	2011	12							
14	2012	1							
14	2012	2							
14	2012	3							
14	2012	4							
14	2012	5							
14	2012	6							
14	2012	7							
14	2012	8							
14	2012	9							
14	2012	10							
14	2012	11							
14	2012	12							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
15	2011	12							
15	2012	1							
15	2012	2							
15	2012	3							
15	2012	4							
15	2012	5							
15	2012	6							
15	2012	7							
15	2012	8							
15	2012	9							
15	2012	10							
15	2012	11							
15	2012	12							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
16	2011	12							
16	2012	1							
16	2012	2							
16	2012	3							
16	2012	4							
16	2012	5							
16	2012	6							
16	2012	7							
16	2012	8							
16	2012	9							
16	2012	10							
16	2012	11							
16	2012	12							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
21	2011	10	24	0.73	1.39	0.41	0.19	0.14	
21	2011	11	54	1.61	3.30	1.53	0.46	0.39	
21	2011	12	26	0.36	2.67	0.35	0.33	0.19	
21	2012	1	23	0.35	2.60	0.25	0.19	0.11	
21	2012	2	144	2.35	18.79	2.37	0.72	0.52	
21	2012	3	68	0.36	21.16	13.00	1.48	1.35	
21	2012	4	18	0.71	0.35	0.52	0.08	0.12	
21	2012	5	12	0.44	0.31	0.44	0.08	0.18	
21	2012	6	13	0.23	0.55	0.31	0.11	0.08	
21	2012	7	9	0.06	0.16	0.13	0.04	0.04	
21	2012	8	14	0.11	0.29	0.28	0.06	0.08	
21	2012	9	6	-0.01	0.31	0.25	0.06	0.19	
21	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
23	2011	10	33	0.51	1.78	0.14	0.22	0.16	10
23	2011	11	49	0.98	3.25	0.21	0.40	0.22	9
23	2011	12	46	0.16	4.99	0.23	0.63	0.24	4
23	2012	1	30	0.21	2.95	0.14	0.34	0.11	5
23	2012	2	42	0.44	3.31	0.21	0.40	0.17	5
23	2012	3	14	0.72	1.58	0.24	0.07	0.75	8
23	2012	4	18	0.76	0.54	0.25	0.06	0.06	7
23	2012	5	23	0.41	0.63	0.42	0.07	0.07	8
23	2012	6	15	0.25	0.75	0.31	0.10	0.07	3
23	2012	7	14	0.22	0.29	0.26	0.05	0.08	2
23	2012	8	14	0.53	0.45	0.18	0.05	0.06	5
23	2012	9	11	0.15	0.86	0.18	0.12	0.07	4
23	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
24	2011	10							averages
24	2011	11							
24	2011	12							15
24	2012	1							
24	2012	2							
24	2012	3							
24	2012	4							
24	2012	5							
24	2012	6							
24	2012	7							
24	2012	8							
24	2012	9							
24	2012	10							
24	2012	11							
24	2012	12							13

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
26	2011	10							Annual averages
26	2011	11							
26	2011	12							
26	2012	1							
26	2012	2							
26	2012	3							
26	2012	4							
26	2012	5							
26	2012	6							
26	2012	7							
26	2012	8							
26	2012	9							
26	2012	10							
26	2012	11							
26	2012	12							7

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
31	2011	10	13	0.49	0.71	0.79	0.16	0.15	17
31	2011	11	9	0.37	0.36	0.50	0.08	0.03	16
31	2011	12	14	0.55	0.22	0.97	0.13	0.06	18
31	2012	1	19	0.67	0.37	1.35	0.16	0.11	19
31	2012	2	14	0.40	0.44	0.89	0.10	0.08	11
31	2012	3	7	0.46	0.06	0.21	0.02	0.03	15
31	2012	4	11	0.65	0.23	0.42	0.04	0.16	7
31	2012	5	5	0.34	0.31	0.37	0.04	0.04	13
31	2012	6							17
31	2012	7							16
31	2012	8							23
31	2012	9	12	0.17	0.32	0.83	0.09	0.12	14
31	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
33	2011	10	5	0.04	0.16	0.32	0.04	0.04	15
33	2011	11	8	0.15	0.40	0.41	0.07	0.04	6
33	2011	12	11	0.21	0.14	0.29	0.03	0.13	5
33	2012	1	16	1.02	0.12	0.65	0.06	0.14	8
33	2012	2	16	1.10	0.04	0.21	0.03	0.07	9
33	2012	3	13	0.62	0.10	0.71	0.06	0.19	10
33	2012	4	7	0.26	0.16	0.27	0.04	0.06	5
33	2012	5	6	0.10	0.26	0.22	0.04	0.05	12
33	2012	6	38						16
33	2012	7	44	0.96	0.59	5.49	0.32	0.34	16
33	2012	8							29
33	2012	9	5	0.14	0.10	0.30	0.03	0.04	14
33	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
40	2011	10	24	0.42	1.32	1.22	0.19	0.10	
40	2011	11	20	0.31	0.09	0.24	0.02	0.16	
40	2011	12	22	0.42	1.50	0.68	0.21	0.10	
40	2012	1	70	0.78	5.53	3.64	0.74	0.33	
40	2012	2	149						
40	2012	3	48	1.84	1.69	2.74	0.24	0.21	
40	2012	4	39	0.98	1.18	3.11	0.23	0.19	
40	2012	5	21	0.96	0.26	0.98	0.06	0.11	
40	2012	6	19	0.63	0.45	1.19	0.09	0.10	
40	2012	7	12	0.48	0.18	0.54	0.04	0.09	
40	2012	8		3.94	0.98	2.03	0.18	0.33	
40	2012	9	21	0.44	0.60	2.02	0.12	0.13	
40	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
41	2011	10		2.39	0.45	0.37	0.07	0.22	30
41	2011	11		6.13	0.38	0.41	0.07	0.25	54
41	2011	12		1.13	0.47	0.18	0.05	0.10	16
41	2012	1		1.58	0.80	0.29	0.07	0.16	26
41	2012	2		2.68	0.94	0.36	0.09	0.18	31
41	2012	3		3.45	0.73	0.61	0.12	0.11	35
41	2012	4		1.22	0.41	0.60	0.07	0.12	26
41	2012	5		1.00	0.37	0.45	0.07	0.10	24
41	2012	6		0.81	0.30	0.27	0.08	0.14	21
41	2012	7		0.82	0.22	0.32	0.05	0.11	22
41	2012	8		1.02	0.40	0.37	0.07	0.13	26
41	2012	9		0.59	0.51	0.47	0.09	0.12	24
41	2012	10		1.01	0.46	0.49	0.08	0.19	27

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
44	2011	10	**9**	**0.16**	**0.11**	**0.14**	**0.03**	**0.05**	
44	2011	11	15	0.05	1.07	0.10	0.16	0.06	
44	2011	12	22	0.08	0.47	0.12	0.10	0.03	
44	2012	1	16	0.04	1.05	0.11	0.15	0.09	
44	2012	2	18	0.15	0.94	0.32	0.10	0.25	
44	2012	3	23	0.14	2.27	0.27	0.26	0.29	
44	2012	4	43	0.12	2.57	0.29	0.35	0.13	
44	2012	5	15	0.34	0.16	0.19	0.05	0.05	
44	2012	6	11	0.03	0.47	0.06	0.08	0.04	
44	2012	7	25	0.11	0.44	0.22	0.09	0.16	
44	2012	8	9	0.03	0.07	0.04	0.03	0.04	
44	2012	9	8	0.13	0.12	0.09	0.03	0.09	
44	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
45	2011	10	5	0.17	0.08	0.08	0.01	0.05	9
45	2011	11	4	0.11	0.04	0.09	0.01	0.05	5
45	2011	12	5	0.06	0.10	0.05	0.01	0.02	2
45	2012	1	10	0.12	0.29	0.04	0.03	0.02	3
45	2012	2	12	0.18	0.15	0.06	0.01	0.01	13
45	2012	3	8	0.55	0.08	0.18	0.01	0.03	15
45	2012	4	7	0.40	0.05	0.16	0.01	0.02	6
45	2012	5	7	0.28	0.08	0.29	0.02	0.03	7
45	2012	6	7	0.22	0.06	0.41	0.03	0.04	9
45	2012	7	7	0.31	0.05	0.28	0.02	0.04	8
45	2012	8	8	0.30	0.08	0.51	0.04	0.04	11
45	2012	9	6	0.35	0.08	0.19	0.02	0.06	8
45	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
50	2011	10							61
50	2011	11							116
50	2011	12							47
50	2012	1							54
50	2012	2							138
50	2012	3							75
50	2012	4							44
50	2012	5							37
50	2012	6							28
50	2012	7							29
50	2012	8							38
50	2012	9							38
50	2012	10							49
50	2012	11							65

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
51	2011	10							41
51	2011	11							54
51	2011	12							52
51	2012	1							41
51	2012	2							33
51	2012	3							40
51	2012	4							32
51	2012	5							27
51	2012	6							24
51	2012	7							31
51	2012	8							30
51	2012	9							27
51	2012	10							28
51	2012	11							27

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
52	2011	10							
52	2011	11							
52	2011	12							
52	2012	1							
52	2012	2							
52	2012	3							
52	2012	4							
52	2012	5							
52	2012	6							
52	2012	7							
52	2012	8							
52	2012	9							
52	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
53	2011	10							25
53	2011	11							51
53	2011	12							16
53	2012	1							21
53	2012	2							34
53	2012	3							25
53	2012	4							19
53	2012	5							18
53	2012	6							15
53	2012	7							16
53	2012	8							16
53	2012	9							17
53	2012	10							23
53	2012	11							29
53	2012	11							24

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
54	2011	10							
54	2011	11							
54	2011	12							
54	2012	1							
54	2012	2							
54	2012	3							
54	2012	4							
54	2012	5							
54	2012	6							
54	2012	7							
54	2012	8							
54	2012	9							
54	2012	10							

Site no	Year	Month	Conductivity (mS/cm)	NH4+ (mgN/l)	Na+ (mgNa/l)	Ca2+ (mgCa/l)	Mg2+ (mgMg/l)	K+ (mgK/l)	PM10 (µg/m3)
55	2011	10							20
55	2011	11							18
55	2011	12							9
55	2012	1							21
55	2012	2							31
55	2012	3							19
55	2012	4							16
55	2012	5							12
55	2012	6							20
55	2012	7							12
55	2012	8							11
55	2012	9							18
55	2012	10							14
55	2012	11							32

Appendix B

Annual average values for the test sites for the exposure period.

Table B.1: Mandatory data including measurement with IVL samplers (grey cells)

		Mandatory															
		Climate		Gases								Precipitation					Particles
	Sampling period	Temp	RH	SO_2	IVL-passive SO_2	NO_2	IVL-passive NO_2	O_3	IVL-passive O_3	HNO_3	IVL-passive HNO_3	Amount	H+	SO_4 2-	NO_3-	Cl-	IVL passive sampler. Three- or four-monthly avarages,
Site no	Year	^{o} C	%	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	mm	pH	mgS/l	mgN/l	mgCl/l	(µg/cm2 month)
01	11/12	10.2	70	6.4	2.4	42.7		38			0.90	534	4.82	6.71	13.00	13.51	20.0
03	11/12	9.6	79	19.0	12.4	27.0		50			0.48	417	4.96	8.06	13.87	12.18	12.0
10	11/12	11.1	75	9.3	7.7	27.8		35			0.54	849	5.38	3.81	1.95	3.38	21.2
13	11/12	17.8	53		1.1	63.3		51			0.84	625					21.7
14	11/12	15.7	71	1.1	0.8	10.3	6.6	85			0.67	585					12.4
15	11/12	13.9	63	2.2		32.6		44				583					
16	11/12	14.5	77	1.8	2.9	32.4		53			1.10	588					8.2
21	11/12	7.4	74		0.6	30.3			34		0.20	715	5.08	0.36	0.37	1.74	12.9
23	11/12	6.8	77	0.2	0.2	1.3		55	53	0.75	0.10	1544	4.88	0.40	0.41	3.15	6.3
24	11/12	7.8	77	0.9	0.5	11.5	10.8	51	55		0.30	428	5.56	0.19	0.23	0.34	16.1
26	11/12	6.7	86	0.4	0.3	2.0	1.7	54	48		0.09	511	4.93	0.23	0.31	0.55	3.9
31	11/12	16.2	43	0.6	0.5	31.8		64			0.94	283	6.32	0.23	0.26	0.46	6.7
33	11/12	15.4	58	0.4	0.3	3.3		84			0.44	430	5.84	0.19	0.19	0.40	5.3
40	11/12	13.2	70		1.6		27.0		38		0.50	382	5.77	0.51	0.43	1.67	11.4
41	11/12	10.0	72	2.8	1.4	43.7		43			0.33	570		2.24	2.46	0.50	81.5
44	11/12	-0.5	78	7.4	4.3	1.3			58		0.07	497	4.83	0.36	0.12	0.87	5.0
45	11/12	7.0	79		0.4	5.8		80			0.35	1108	5.35	0.15	0.19	0.17	6.8
50	11/12	8.8	74	16.2	10.0	31.8		38			0.69						27.1
51	11/12	18.5	56		4.2	50.7		25			1.10	325					23.6
52	11/12	7.8	75		1.0		19.6		46		0.38						16.3
53	11/12	11.3	73	3.3	1.7	20.9		52			0.82	555					7.0
54	11/12										0.45						8.4
55	11/12	6.1	76		3.1	35.0					0.24						28.4

[1] SO_2, NO_2 and O_3 values based on annual averages. [2] Temperature and RH values from data in nine months. [3] RH value from data in four months.

Table B.2: Optional data

			Optional						
			Precipitation						Particles
		Sampling period	Cond	NH4+	Na+	Ca_2+	Mg_2+	K+	PM_{10}
	Site no	Year	µS/cm	mgN/l	mgNa/l	mgCa/l	mgMg/l	mgK/l	µg/m^3
	01	11/12	44.4						27
	03	11/12	53.4						31
	10	11/12	27.8	1.49	1.54	2.36	0.78	0.21	26
	13	11/12							
	14	11/12							
	15	11/12							
	16	11/12							
	21	11/12	16.3	0.30	1.05	0.45	0.13	0.13	
	23	11/12	24.7	0.38	1.79	0.22	0.22	0.13	6
1	24	11/12							14
1	26	11/12							7
	31	11/12	10.3	0.43	0.31	0.57	0.07	0.10	16
	33	11/12	8.3	0.23	0.20	0.49	0.05	0.07	12
	40	11/12	25.5	0.64	0.98	1.22	0.15	0.13	
	41	11/12		1.23	0.44	0.33	0.07	0.13	28
	44	11/12	13.6	0.09	0.42	0.11	0.07	0.07	
	45	11/12	6.6	0.23	0.09	0.21	0.02	0.03	8
	50	11/12							58
	51	11/12							36
	52	11/12							
	53	11/12							23
	54	11/12							
	55	11/12							17

[1] PM10 values based on annual averages

Table B.3: Reported start dates for exposures

No	Name	Country	Rack Coordinates	Start date	End date 1 year
01	Prague	Czech Republic	+50°06'20.8", 14°26'51.8"	2011-10-18	2012-10-13
03	Kopisty	Czech Republic	+50°32'39.4", 13°37'24.4"	2011-10-19	2012-10-22
10	Bottrop	Germany	+51°31'33.0", 06°58'37.4"	2011-10-04	2012-10-07
13	Rome	Italy	+41°54'20.0", 12°31'02.3"	2011-11-22	2012-12-04
14	Casaccia	Italy	+42°02'26.5", 12°18'09.5"	2011-11-25	2012-12-05
15	Milan	Italy	+45°28'42.7", 09°13'49.8"	2011-11-29	2012-12-11
16	Venice	Italy	+45°29'13.1", 12°13'20.6"	2011-12-01	2012-12-13
21	Oslo	Norway	+59°55'11.2", 10°41'23.2"	2011-10-06	2012-10-11
23	Birkenes	Norway	+58°23'20.5", 08°15'04.5"	2011-10-11	2012-10-16
24	Stockholm	Sweden	+59°19'00.3", 18°03'24.2"	2011-10-14	2012-10-15
26	Aspvreten	Sweden	+58°48'24.0", 17°22'25.0"	2011-10-17	2012-10-18
31	Madrid	Spain	+40°27'26.5", -03°51'54.7"	2011-10-03	2012-10-10
33	Toledo	Spain	+39°32'31.8", -04°20'26.7"	2011-10-05	2012-10-01
40	Paris	France	+48°51'49.1", 02°20'40.4"	2011-10-07	2012-10-01
41	Berlin	Germany	+52°30'59.6", 13°17'02.1"	2011-09-29	2012-10-01
44	Svanvik	Norway	+69°27'18.5", 30°02'27.5"	2011-10-13	2012-10-18
45	Chaumont	Switzerland	+47°02'58.3", 06°58'45.2"	2011-10-11	2012-10-10
50	Katowice	Poland	+50°15'52.5", 18°58'30.3"	2011-10-20	2012-10-29
51	Athens	Greece	+37°59'17.6", 23°43'39.6"	2011-10-03	2012-10-03
52	Riga	Latvia	+56°56'49.7", 24°06'16.9"	2011-10-20	2012-10-26
53	Vienna	Austria	+48°14'56.0", 16°21'24.6"	2011-11-07	2012-11-08
54	Sofia	Bulgaria	+42°39'42.0", 23°21'18.0"	2011-10-17	
55	St Petersburg	Russian Federation	+59°59'31.9", +30°21'4.6"	2011-10-11	2012-10-10

Table B.4: Months included in the calculation of the annual averages

Site no	Year	Months include in annual average	comment
1	11/12	Oct-Sep	
3	11/12	Oct-Sep	
10	11/12	Oct-Sep	
13	11/12	Dec-Nov	
14	11/12	Dec-Nov	
15	11/12	Dec-Nov	
16	11/12	Dec-Nov	
21	11/12	Oct-Sep	
23	11/12	Oct-Sep	
24	11/12	Oct-Sep	
26	11/12	Nov-Oct	
31	11/12	Oct-Sep	
33	11/12	Oct-Sep	
40	11/12	Oct-Sep	
41	11/12	Oct-Sep	
44	11/12	Oct-Sep	
45	11/12	Oct-Sep	
50	11/12	Nov-Oct	
51	11/12	Oct-Sep	
52	11/12	Oct-Sep	Data are missing for Oct. 2012
53	11/12	Nov-Oct	
55	11/12	Oct-Sep	

Appendix C

Tri and four-monthly mean values for passive gas sampling and particle deposition on IVL samplers in a position sheltered from rain.

Table C.1: Particle deposition on IVL passive samplers sheltered from rain. Tri- and four-monthly samples (µg cm^{-2} $month^{-1}$).

station	start	stop	days	mass	Cl^-	NO_3^-	SO_4^{2-}	NH_4^+	Ca^{2+}	Mg^{2+}	Na^+	K^+	note
				µg cm^{-2} $month^{-1}$									
ICP - 1 Prague	18.10.2011	14.02.2012	119	6	0.25	0.38	0.35	0.06	0.20	0.01	0.20	0.02	sampler removed within another project
ICP - 1 Prague													
ICP - 1 Prague	15.05.2012	15.08.2012	92	15									
ICP - 1 Prague	15.08.2012	13.10.2012	59	55									
ICP - 3 Kopisty	19.10.2011	20.01.2012	93	6									
ICP - 3 Kopisty	20.01.2012	09.05.2012	110	14									
ICP - 3 Kopisty	09.05.2012	10.08.2012	93	15									
ICP - 3 Kopisty	10.08.2012	22.10.2012	73	12									
ICP - 10 Bottrop	04.10.2011	04.01.2012	92	20	1.48	0.24	1.84	0.13	0.44	0.15	0.92	0.10	
ICP - 10 Bottrop	04.01.2012	11.04.2012	98	30	1.52	0.55	3.27	0.28	0.83	0.19	1.25	0.11	
ICP - 10 Bottrop	11.04.2012	11.07.2012	91	18	0.06	0.46	0.78	0.04	0.38	0.04	0.12	0.06	
ICP - 10 Bottrop	11.07.2012	07.10.2012	88	15	0.13	0.37	0.83	0.04	0.39	0.05	0.15	0.07	
ICP - 13 Rome	30.11.2011	05.04.2012	127	20									only start month not date was given
ICP - 13 Rome	05.04.2012	10.07.2012	96	30									
ICP - 13 Rome	10.07.2012	04.12.2012	147	18									
ICP - 14 Casaccia	25.11.2011	04.04.2012	131	9									
ICP - 14 Casaccia	04.04.2012	04.07.2012	91	20									
ICP - 14 Casaccia	04.07.2012	05.12.2012	154	11									
ICP - 16 Venice	01.12.2011	04.04.2012	125	6									
ICP - 16 Venice	04.04.2012	04.07.2012	91	11									
ICP - 16 Venice	04.07.2012	13.12.2012	162	8									
ICP - 21 Oslo	06.10.2011	02.01.2012	88	16									
ICP - 21 Oslo	02.01.2012	02.04.2012	91	17									
ICP - 21 Oslo	02.04.2012	02.07.2012	91	16									
ICP - 21 Oslo	02.07.2012	11.10.2012	101	4									

station	start	stop	days	mass	Cl^-	NO_3^-	SO_4^{2-}	NH_4^+	Ca^{2+}	Mg^{2+}	Na^+	K^+	note
				$\mu g\ cm^{-2}\ month^{-1}$									
ICP - 23 Birkenes	11.10.2011	11.01.2012	92	8									
ICP - 23 Birkenes	11.01.2012	11.04.2012	91	4									
ICP - 23 Birkenes	11.04.2012	11.07.2012	91	5									
ICP - 23 Birkenes	11.07.2012	13.10.2012	94	8									
ICP - 24 Stockholm, Söder	14.10.2011	31.01.2012	109	10									
ICP - 24 Stockholm, Söder	31.01.2012	15.05.2012	105	18									
ICP - 24 Stockholm, Söder	15.05.2012	22.08.2012	99	13									
ICP - 24 Stockholm, Söder	22.08.2012	15.10.2012	54	29									
ICP - 26 Aspvreten	17.10.2011	01.02.2012	107	2									
ICP - 26 Aspvreten	01.02.2012	02.05.2012	91	6									
ICP - 26 Aspvreten	02.05.2012	06.08.2012	96	3									
ICP - 26 Aspvreten	06.08.2012	18.10.2012	73	5									moisture on filter
ICP - 31 Madrid	03.10.2011	10.01.2012	99	7									
ICP - 31 Madrid	10.01.2012	10.04.2012	91	6									
ICP - 31 Madrid	10.04.2012	12.07.2012	93	7									
ICP - 31 Madrid													
ICP - 33 Toledo	05.10.2011	03.01.2012	90	6									
ICP - 33 Toledo	03.01.2012	04.04.2012	92	3									
ICP - 33 Toledo	04.04.2012	04.07.2012	91	6									
ICP - 33 Toledo	04.07.2012	01.10.2012	89	6									
ICP - 40 Paris	07.10.2011	03.01.2012	88	7									
ICP - 40 Paris	03.01.2012	02.04.2012	90	16									
ICP - 40 Paris	02.04.2012	29.06.2012	88	11									
ICP - 40 Paris	29.06.2012	01.10.2012	94	11									
ICP - 41 Berlin	29.09.2011	05.01.2012	98	21									
ICP - 41 Berlin	05.01.2012	29.03.2012	84	271									
ICP - 41 Berlin	29.03.2012	03.07.2012	96	27									sampler fallen on ground
ICP - 41 Berlin	03.07.2012	01.10.2012	90	28									

station	start	stop	days	mass	Cl^-	NO_3^-	SO_4^{2-}	NH_4^+	Ca^{2+}	Mg^{2+}	Na^+	K^+	note
				$\mu g\ cm^{-2}\ month^{-1}$									
ICP - 44 Svanvik	13.10.2011	09.01.2012	88	2									
ICP - 44 Svanvik	09.01.2012	23.04.2012	105	2									
ICP - 44 Svanvik	23.04.2012	11.06.2012	49	10									
ICP - 44 Svanvik	11.06.2012	09.07.2012	28	11									sampler delivered in bag instead of vial.
ICP - 44 Svanvik	09.07.2012	01.10.2012	84	6									
ICP - 45 Chaumont													
ICP - 45 Chaumont	11.01.2012	11.04.2012	91	5									
ICP - 45 Chaumont	11.04.2012	11.07.2012	91	10									
ICP - 45 Chaumont	11.07.2012	10.10.2012	91	6									
ICP - 50 Katowice													
ICP - 50 Katowice	18.01.2012	19.04.2012	92	34									
ICP - 50 Katowice	19.04.2012	19.07.2012	91	20									
ICP - 50 Katowice													
ICP - 51 Athens	03.10.2011	05.01.2012	94	17									
ICP - 51 Athens	05.01.2012	24.04.2012	110	28									Found on the ground.
ICP - 51 Athens	24.04.2012	23.07.2012	90	29									
ICP - 51 Athens	23.07.2012	23.10.2012	92	20									
ICP - 52 Riga	20.10.2011	28.01.2012	100	9									
ICP - 52 Riga	28.01.2012	20.04.2012	83	19									
ICP - 52 Riga	20.04.2012	01.08.2012	42										sampler missing according to proptocol.
ICP - 52 Riga	01.08.2012	26.10.2012	86	29									
ICP - 53 Vienna	07.11.2011	09.02.2012	94	4	0.09	0.35	0.22	0.02	0.15	0.02	0.10	0.02	
ICP - 53 Vienna	09.02.2012	11.05.2012	92	11	0.03	0.41	0.18	0.01	0.30	0.02	0.05	0.04	small damage on filter
ICP - 53 Vienna	11.05.2012	10.08.2012	91	8	0.02	0.36	0.14	0.02	0.25	0.02	0.02	0.03	
ICP - 53 Vienna	10.08.2012	08.11.2012	90	5	0.02	0.13	0.09	0.01	0.12	0.01	0.02	0.02	
ICP - Sofia	17.10.2011	17.01.2012	92	7									
ICP - Sofia													
ICP - Sofia	17.04.2012	17.07.2012	91	10									
ICP - Sofia													
ICP - 55 St Petersburg	01.10.2011	11.01.2012	102	29	0.66	0.13	0.57	0.02	0.28	0.05	0.41	0.03	
ICP - 55 St Petersburg													
ICP - 55 St Petersburg	09.04.2012	06.07.2012	88	46	0.09	0.56	0.55	0.02	0.51	0.07	0.12	0.09	No protocol
ICP - 55 St Petersburg	06.07.2012	06.10.2012	92	11	0.04	0.12	0.24	0.01	0.18	0.02	0.03	0.03	

Table C.2: Gas concentration measurements with IVL passive samplers sheltered from rain. Tri-and four-monthly samples (µg/m^3)

Station	Start time	End time	Temp C	NO_2 µg/m^3 STP	NH_3 µg/m^3 STP	HNO_3 µg/m^3 STP	O_3 µg/m^3 STP	SO_2 µg/m^3 STP	HCOOH µg/m^3 STP	CH_3COOH µg/m^3 STP	HCl µg/m^3 STP	HF µg/m^3 STP	Remarks
ICP - 1 Prague	18.10.2011 11:15	14.02.2012 12:00	1			0.2							sampler removed within another project
ICP - 1 Prague	18.10.2011 11:15	20.01.2012 12:00						2.1	<0.2	<0.3	<0.2	<0.1	
ICP - 1 Prague	20.01.2012 12:00	15.05.2012 12:00	5			0.8		3.9	0.9	0.5	<0.1	<0.03	
ICP - 1 Prague	15.05.2012 12:00	15.08.2012 12:00	12			1.5		1.6	1.3	0.3	0.2	<0.04	
ICP - 1 Prague	15.08.2012 12:00	13.10.2012 12:00				1.2		2.1	1.2	<0.5	0.3	<0.06	
ICP - 3 Kopisty	19.10.2011 12:00	20.01.2012 12:00	0			0.2		10.6	<0.3	<0.3	<0.2	<0.1	
ICP - 3 Kopisty	20.01.2012 12:00	09.05.2012 12:00	5			0.5		13.5	0.3	<0.3	<0.1	<0.03	
ICP - 3 Kopisty	09.05.2012 12:00	10.08.2012 12:00	12			0.7		12.7	2.7	1.2	<0.2	<0.04	
ICP - 3 Kopisty	10.08.2012 12:00	22.10.2012 12:00						13.0	0.9	<0.4	<0.2	<0.05	
ICP - 10 Bottrop	04.10.2011 10:48	04.01.2012 16:00	8			0.3		10.2	<0.2	<0.3	<0.2	<0.1	
ICP - 10 Bottrop	04.01.2012 16:00	11.04.2012 20:00	10			0.2		5.9	<0.2	<0.3	<0.2	<0.04	
ICP - 10 Bottrop	11.04.2012 20:00	11.07.2012 20:30	13			0.8		7.5	0.7	0.6	<0.2	<0.04	
ICP - 10 Bottrop	11.07.2012 20:30	07.10.2012 16:00	15			0.9		7.1	0.3	<0.3	0.2	<0.04	
ICP - 13 Rome	30.11.2011 11:30	05.04.2012 10:50	13			0.5		1.3	1.3	1.4	0.2	<0.03	start date is missing, assumed date
ICP - 13 Rome	05.04.2012 10:50	10.07.2012 10:15	23			1.2		1.1	1.5	0.4	0.3	<0.04	
ICP - 13 Rome	10.07.2012 10:15	04.12.2012 10:30	25			0.9		0.8	0.3	<0.2	0.2	<0.02	
ICP - 14 Casaccia	25.11.2011 10:30	04.04.2012 11:00		9.8		0.4		1.0	3.4	4.1	0.2	<0.03	
ICP - 14 Casaccia	04.04.2012 11:00	04.07.2012 14:00		4.0		0.6		0.8	1.3	1.2	<0.2	0.10	
ICP - 14 Casaccia	04.07.2012 14:00	05.12.2012 10:30		5.8		1.0		0.7	0.5	0.2	0.2	<0.02	
ICP - 16 Venice	01.12.2011 11:00	04.04.2012 15:30	8			0.4		2.2	1.4	0.4	<0.1	<0.03	
ICP - 16 Venice	04.04.2012 15:30	04.07.2012 12:00	21			1.6		4.0	1.8	<0.3	<0.2	0.04	
ICP - 16 Venice	04.07.2012 12:00	13.12.2012 10:00	22			1.3		2.4	0.7	0.4	0.2	<0.02	
ICP - 21 Oslo	06.10.2011 13:00	02.01.2012 13:30	5			0.1	19	0.7	<0.3	1.4	0.2	<0.1	
ICP - 21 Oslo	02.01.2012 13:30	02.04.2012 13:20	1			0.1	30	0.8	0.6	0.5	<0.2	<0.04	
ICP - 21 Oslo	02.04.2012 13:30	02.07.2012 13:00	10			0.4	55	x	x	x	x	x	x = missing
ICP - 21 Oslo	02.07.2012 13:00	11.10.2012 13:30	13			0.2	32	0.4	0.4	<0.3	<0.1	<0.03	

Station	Start time	End time	Temp C	NO_2 µg/m³ STP	NH_3 µg/m³ STP	HNO_3 µg/m³ STP	O_3 µg/m³ STP	SO_2 µg/m³ STP	HCOOH µg/m³ STP	CH_3COOH µg/m³ STP	HCl µg/m³ STP	HF µg/m³ STP	Remarks
ICP - 23 Birkenes	11.10.2011 13:30	11.01.2012 16:30	10			0.1	42	0.2	<0.2	0.6	0.2	0.07	
ICP - 23 Birkenes	11.01.2012 16:30	11.04.2012 18:00	2			0.1	62	0.1	<0.3	<0.3	<0.2	<0.04	
ICP - 23 Birkenes	11.04.2012 18:00	11.07.2012 16:40	17			0.2	63	0.2	0.4	1.7	<0.2	<0.04	
ICP - 23 Birkenes	11.07.2012 16:40	13.10.2012 06:00	11			0.1	43	0.1	<0.2	<0.3	<0.2	<0.04	
ICP - 24 Stockholm, Söder	14.10.2011 11:00	31.01.2012 09:00	-1	13.5	1.2	0.2	42	0.5	<0.2	<0.3	0.3	<0.1	NH3:not exchanged lid
ICP - 24 Stockholm, Söder	31.01.2012 09:00	15.05.2012 10:30	0	9.8	1.0	0.2	66	0.8	0.5	0.4	<0.1	<0.03	
ICP - 24 Stockholm, Söder	15.05.2012 10:30	22.08.2012 13:30	17	8.2	1.2	0.6	65	0.6	2.2	0.6	<0.1	0.06	
ICP - 24 Stockholm, Söder	22.08.2012 13:30	15.10.2012 13:00	12	11.6	1.2	0.2	46	0.3	<0.4	<0.5	<0.3	<0.07	
ICP - 26 Aspvreten	17.10.2011 11:00	01.02.2012 11:30	-1	2.2	<0.2	0.1	41	0.3	<0.2	<0.3	<0.1	<0.1	NH3:not exchanged lid
ICP - 26 Aspvreten	01.02.2012 11:30	02.05.2012 13:30	0	2.2	0.2	0.1	59	0.3	<0.3	<0.3	<0.2	<0.04	
ICP - 26 Aspvreten	02.05.2012 13:30	06.08.2012 11:30	16	1.1	0.3	0.1	56	0.3	0.6	0.6	<0.2	0.06	
ICP - 26 Aspvreten	06.08.2012 11:30	18.10.2012 11:00	12	1.3	0.3	0.0	37	0.2	<0.3	<0.4	<0.2	<0.05	
ICP - 31 Madrid	03.10.2011 12:00	10.01.2012 12:00	16			0.6		0.5	<0.2	<0.3	<0.2	<0.1	
ICP - 31 Madrid	10.01.2012 12:00	10.04.2012 12:00	13			0.6		0.7	1.0	<0.3	<0.2	<0.04	
ICP - 31 Madrid	10.04.2012 12:00	12.07.2012 12:00	23			1.0		0.3	4.2	1.0	<0.2	0.06	
ICP - 31 Madrid	12.07.2012 12:00	01.10.2012 12:00	31			1.6		0.4	2.3	0.6	0.2	<0.04	
ICP - 33 Toledo	05.10.2011 12:00	03.01.2012 12:00	10			0.4		0.3	<0.3	<0.3	<0.2	<0.1	
ICP - 33 Toledo	03.01.2012 12:00	04.04.2012 12:00	13			0.4		0.3	0.7	0.4	<0.2	<0.04	
ICP - 33 Toledo	04.04.2012 12:00	04.07.2012 12:00	23			0.4		0.3	10.0	4.5	<0.2	0.22	
ICP - 33 Toledo	04.07.2012 12:00	01.10.2012 12:00	31			0.6		0.3	2.1	0.6	0.2	<0.04	
ICP - 40 Paris	07.10.2011 17:00	03.01.2012 17:34	13	33.3		0.3	28	1.1	0.6	<0.3	0.2	<0.1	
ICP - 40 Paris	03.01.2012 17:35	02.04.2012 15:50	15	36.9		0.2	25	2.2	0.6	<0.3	0.2	<0.04	
ICP - 40 Paris	02.04.2012 16:00	29.06.2012 10:30	18	19.8		0.7	53	1.8	2.2	2.4	<0.2	0.07	
ICP - 40 Paris	29.06.2012 10:42	01.10.2012 14:20	23	17.8		0.9	48	1.2	1.3	1.3	0.3	0.05	
ICP - 41 Berlin	29.09.2011 11:45	05.01.2012 12:45	7			0.2		1.5	<0.2	<0.3	<0.2	<0.1	
ICP - 41 Berlin	05.01.2012 12:45	29.03.2012 09:00	9			0.2		2.0	7.1	0.8	0.4	<0.04	
ICP - 41 Berlin	29.03.2012 09:00	03.07.2012 09:40	15			0.4		1.1	0.7	0.6	<0.2	0.06	
ICP - 41 Berlin	03.07.2012 09:50	01.10.2012 12:30	18			0.5		0.9	0.6	0.4	<0.2	<0.04	

Station	Start time	End time	Temp C	NO_2 µg/m³ STP	NH_3 µg/m³ STP	HNO_3 µg/m³ STP	O_3 µg/m³ STP	SO_2 µg/m³ STP	HCOOH µg/m³ STP	CH_3COOH µg/m³ STP	HCl µg/m³ STP	HF µg/m³ STP	Remarks
ICP - 44 Svanvik	13.10.2011 12:35	09.01.2012 11:47	-4			0.1	57	4.8	0.6	1.2	<0.2	<0.1	
ICP - 44 Svanvik	09.01.2012 11:47	23.04.2012 12:40	-12			0.1	76	4.3	0.5	0.3	<0.1	<0.04	
ICP - 44 Svanvik	23.04.2012 12:40	09.07.2012 12:30	12			0.1	63	4.9	1.5	1.6	<0.2	0.06	
ICP - 44 Svanvik	09.07.2012 12:30	01.10.2012 12:00				0.0	38	3.3	1.0	0.9	<0.2	<0.04	
ICP - 45 Chaumont	11.10.2011 10:30	11.01.2012 10:30			2.8	0.2		0.2	0.5	0.6	<0.2	<0.1	
ICP - 45 Chaumont	11.01.2012 10:30	11.04.2012 10:00	1		2.2	0.5		0.8	0.9	0.4	<0.2	<0.04	
ICP - 45 Chaumont	11.04.2012 10:15	11.07.2012 10:00	21		1.0	0.4		0.3	0.6	0.6	<0.2	<0.04	NH3:membrane placed inside sampler
ICP - 45 Chaumont	11.07.2012 10:00	10.10.2012 10:30	20		1.3	0.3		0.3	<0.2	<0.3	<0.2	<0.04	NH3:membrane put inside sampler
ICP - 50 Katowice	20.10.2011 12:00	20.01.2012 12:00				0.5		12.9	0.5	<0.3	0.8	<0	
ICP - 50 Katowice	18.01.2012 11:00	19.04.2012 11:00	7			0.6		18.0	0.9	0.9	0.8	0.05	
ICP - 50 Katowice	19.04.2012 11:30	19.07.2012 11:00	24			1.0		4.5	1.5	0.7	0.3	<0.04	
ICP - 50 Katowice	19.07.2012 11:00	29.10.2012 06:00				0.7		4.6	0.5	<0.3	0.4	<0.03	HNO3:Start 2012-04-19 according to protocol
ICP - 51 Athens	03.10.2011 11:00	05.01.2012 10:10	10			0.5		5.0	1.4	1.3	0.5	<0.1	
ICP - 51 Athens	05.01.2012 10:30	24.04.2012 08:45	12			0.3		5.0	1.7	1.2	0.3	0.04	
ICP - 51 Athens	24.04.2012 08:48	23.07.2012 08:55	26			1.8		3.8	4.5	1.5	0.6	<0.04	
ICP - 51 Athens	23.07.2012 09:03	23.10.2012 09:40	27			1.9		2.9	1.5	<0.3	0.4	<0.04	
ICP - 52 Riga	20.10.2011 12:00	28.01.2012 09:59	6	18.7		0.1	26	0.4	<0.2	<0.3	<0.2	<0.1	
ICP - 52 Riga	28.01.2012 09:59	20.04.2012 09:55	4	25.4		0.6	52	1.9	1.0	1.8	<0.2	<0.04	
ICP - 52 Riga	20.04.2012 10:01	01.08.2012 10:03	16	14.2		0.5	60	0.7	0.9	0.4	<0.1	<0.03	
ICP - 52 Riga	01.08.2012 10:15	26.10.2012 10:10	11	20.1		0.3		0.9	<0.3	<0.3	<0.2	<0.04	
ICP - 53 Vienna	07.11.2011 14:00	09.02.2012 15:00						3.0	<0.2	<0.3	0.2	<0.1	HNO3: sampler lost
ICP - 53 Vienna	15.02.2012 14:00	11.05.2012 11:00	8			0.7		2.0	1.2	<0.3	<0.2	<0.04	HNO3:Exposed 6 days later because all metallic clips broke.
ICP - 53 Vienna	11.05.2012 11:00	10.08.2012 14:00	17			0.9		0.9	1.3	0.7	<0.2	<0.04	
ICP - 53 Vienna	10.08.2012 14:00	08.11.2012 14:00						1.0	0.6	<0.3	<0.2	<0.04	
ICP - 55 St Petersburg	01.10.2011 12:00	11.01.2012 12:00	16			0.1		2.3	<0.2	<0.3	<0.1	<0.1	
ICP - 55 St Petersburg	11.01.2012 12:00	09.04.2012 12:00	8			0.3		6.6	4.6	8.7	0.6	<0.04	
ICP - 55 St Petersburg	09.04.2012 12:00	06.07.2012 12:00	17			0.3		1.6	1.5	0.5	<0.2	<0.04	
ICP - 55 St Petersburg	06.07.2012 12:00	06.10.2012 12:00	19			0.3		1.7	<0.2	<0.3	<0.2	<0.04	
ICP - 54Sofia	17.10.2011 12:00	17.01.2012 12:00	3			0.5		x	x	x	x	x	x = missing
ICP - 54Sofia	17.01.2012 12:00	17.04.2012 12:00	5			0.7		x	x	x	x	x	x = missing
ICP - 54Sofia	17.04.2012 12:00	17.07.2012 12:00	17			0.2		x	x	x	x	x	x = missing
ICP - 54Sofia													

Appendix D

Annual average values for particle deposition (pr. month) and for concentrations of NO_2, NH_3, HNO_3, O_3 SO_2, HCOOH, CH3COOH, HCl and HF (pr. year) measured with IVL samplers for the exposure period

Table D.1: Annual average particle deposition (pr month - sheltered from rain)

Station no.	Year	mass	Cl^-	NO_3^-	SO_4^{2-}	NH_4^+	Ca^{2+}	Mg^{2+}	Na^+	K^+
		µg cm^{-2} month^{-1}								
01	11/12	20.0								
03	11/12	12.0								
10	11/12	21.2	0.8	0.4	1.7	0.1	0.5	0.1	0.6	0.1
13	11/12	21.7								
14	11/12	12.4								
15	11/12									
16	11/12	8.2								
21	11/12	12.9								
23	11/12	6.3								
24	11/12	16.1								
26	11/12	3.9								
31	11/12	6.7								
33	11/12	5.3								
40	11/12	11.4								
41	11/12	81.5								
44	11/12	5.0								
45	11/12	6.8								
50	11/12	27.1								
51	11/12	23.6								
52	11/12	16.3								
53	11/12	7.0	0.0	0.3	0.2	0.0	0.2	0.0	0.0	0.0
54	11/12	8.4								
55	11/12	28.4	0.3	0.3	0.5	0.0	0.3	0.0	0.2	0.0

Table D.2: Annual average concentration of gases (µg m^{-3})

Station no.	Year	Temp C	NO_2 µg/m^3 STP	NH_3 µg/m^3 STP	HNO_3 µg/m^3 STP	O_3 µg/m^3 STP	SO_2 µg/m^3 STP	HCOOH µg/m^3 STP	CH_3COOH µg/m^3 STP	HCl µg/m^3 STP	HF µg/m^3 STP
01	11/12	5.8			0.9		2.4	0.9	0.3	0.2	0.0
03	11/12	5.5			0.5		12.4	1.0	0.4	0.1	0.0
10	11/12	11.5			0.5		7.7	0.3	0.3	0.1	0.0
13	11/12	20.2			0.8		1.1	1.0	0.6	0.2	0.0
14	11/12		6.6		0.7		0.8	1.7	1.8	0.2	0.0
15	11/12										
16	11/12	16.9			1.1		2.9	1.3	0.3	0.1	0.0
21	11/12	7.3			0.2	33.9	0.6	0.4	0.7	0.1	0.1
23	11/12	9.9			0.1	52.5	0.2	0.2	0.7	0.1	0.0
24	11/12	7.1	10.8	1.2	0.3	54.8	0.5	0.7	0.4	0.1	0.1
26	11/12	6.7	1.7	0.2	0.1	48.4	0.3	0.3	0.3	0.1	0.0
31	11/12	20.7			0.9		0.5	1.9	0.5	0.1	0.0
33	11/12	19.3			0.4		0.3	3.2	1.4	0.1	0.1
40	11/12	17.3	27.0		0.5	38.3	1.6	1.2	1.0	0.2	0.0
41	11/12	12.0			0.3		1.4	2.1	0.5	0.2	0.0
44	11/12	-1.3			0.1	58.4	4.3	0.9	1.0	0.1	0.0
45	11/12	14.0		1.8	0.4		0.4	0.5	0.4	0.1	0.0
50	11/12	15.5			0.7		10.0	0.8	0.5	0.6	0.0
51	11/12	18.7			1.1		4.2	2.3	1.0	0.5	0.0
52	11/12	8.9	19.6		0.4	46.0	1.0	0.5	0.6	0.1	0.0
53	11/12	12.3			0.8		1.7	0.8	0.3	0.1	0.0
54	11/12	8.3			0.4						
55	11/12	15.0			0.2		3.1	1.6	2.4	0.2	0.0

Appendix E

Data availability

Table E.1: Data availability in % for the months of exposure (Table B.4).

		Mandatory											Optional	
		Climate		Gases (concentration)				Precipitation					Prec.	Particles
		Temp	RH	SO_2	NO_2	O_3	HNO3	Amount	H+	SO42-	NO3-	Cl-	Cond.	PM10
	Station no	availability (%)												
	01	100	100	100	100	92	A	100	100	100	100	100	100	100
	03	100	100	100	100	100	A	100	100	100	100	100	100	100
	10	86	A	83	82	93	A	100	100	100	100	100	100	100
	13	100	100	0	100	98	A	100	0	0	0	0	0	A
	14	100	100	100	98	96	A	92	0	0	0	0	0	A
	15	100	100	100	100	100	0	100	0	0	0	0	0	0
	16	100	100	100	100	100	A	100	0	0	0	0	0	A
	21	A	A	A	83	A	A	96	98	100	100	98	100	A
	23	100	100	99	99	92	99	100	98	99	74	99	98	99
1	24	100	100	100	99	100	A	100	92	92	92	92	0	96
1	26	90	90	100	100	100	A	A	100	100	100	100	0	67
	31	82	81	100	100	100	A	100	75	72	72	72	100	91
	33	99	99	98	98	98	A	100	92	84	84	84	100	98
	40	96	96	A	A	A	A	96	100	100	100	100	100	A
2	41	100	100	98	98	97	A	A	0	32	32	32	0	90
	44	73	73	99	92	A	A	100	100	98	98	98	99	A
	45	100	100	A	97	97	A	98	98	96	96	96	98	99
	50	100	A	100	100	100	A	0	0	0	0	0	0	A
	51	100	100	A	87	99	A	100	0	0	0	0	0	87
	52	A	A	A	A	A	A	0	0	0	0	0	0	A
	53	A	A	99	100	100	A	A	0	0	0	0	0	99
	54	A	0	0	0	0	A	0	0	0	0	0	0	A
3	55	A	A	A	A	0	A	0	0	0	0	0	0	A

A = available. The % availability was not reported, or IVL data. [1]SO_2, NO_2, O_3 and PM10 values are based on annual averages. [2]Conductivity data is not available. For ions in precipitation the availability was 32%. [3] RH value from data in four months.

Appendix F

National contact centres

Member	Role
Mrs Katerina Kreislova SVUOM Ltd. U Mestanského Pivovaru 934 /4 CZ-17000 PRAHA 7 Czech Republic +420 2 20 80 9996 kreislova@svuom.cz	Sub-centre (steel) Test site 1 Test site 3
Mr Stefan Brüggerhoff Fachbereich Denkmalschutz und Materialkunde Deutsches Bergbau – Museum Bochum Herner Straße 45, 44787 Bochum Germany +49 234 968 4032/4031 stefan.brueggerhoff@bergbaumuseum.de	Test site 10
Dr. Pasquale Spezzano ENEA, UTTAMB-ESP Via Angvillarese, 301 00123 – Rome CR Casaccia Italy +39 06 3048 4197 pasquale.spezzano@enea.it Send also information to Mr Augusto Screpanti screpanti@casaccia.enea.it	Co-chair Sub-centre (cultural heritage) Test site 13 Test site 14 Test site 15 Test site 16
Mr Terje Grøntoft NILU - Norwegian Institute for Air Research P.O.Box 100, N-2027 Kjeller Norway +47 63 898 023 teg@nilu.no	Sub-centre (environment) Test site 21 Test site 23 Test site 44
Mr Johan Tidblad Swerea KIMAB AB P. O. Box 55970 SE – 10216 Stockholm Sweden +46 8 674 1733 johan.tidblad@swerea.se	Co-chair Main research centre Test site 24 Test site 26

Member	Role
Mr Tim Yates Building Research Establishment Ltd., BRE Bucknalls Lane, Watford WD25 9XX United Kingdom +44 (0)1923 664 341 yatest@bre.co.uk	Sub-centre (limestone) Test site 27
Mr Daniel de la Fuente CENIM – National Centre for Metallurgical Research Avda Gregorio del Amo 8 28040 Madrid Spain +34 91 553 8900 delafuente@cenim.csic.es Send also information to Mr Jesus Manuel Vega jm.vega@cenim.csic.es	Test site 31 Test site 33
Aurelie Verney-Carron Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA) Université Paris-Est Créteil (UPEC) 61 avenue du Général de Gaulle 94010 Créteil Cedex Tél: + 33 1 45 17 66 08 Fax: + 33 1 45 17 15 64 aurelie.verney@lisa.u-pec.fr	Sub-centre (modern glass) Test site 40

Member	Role
Mr Stefan Simon Rathgen Forschungslabor – Staatliche Museen zu Berlin Schloßstraße 1a, 14059 Berlin Germany +49 30 3267 490 s.simon@smb.spk-berlin.de Send also information to Mrs Sabine Schwerdtfeger s.schwerdtfeger@smb.spk-berlin.de	Test site 41
Mr Markus Faller EMPA - Corrosion and Materials Integrity Ueberlandstrasse 129 CH-8600 Dübendorf Switzerland +41 44 823 4236 markus.faller@empa.ch	Sub-centre (zinc) Test site 45
Mr Lech Kwiatkowski Institute of Precision Mechanics Duchnicka 3 01-796 Warsaw Poland +48 22 5602 846 lech@imp.edu.pl	Test site 50
Mr Costas Varotsos University of Athens, Faculty of Physics, Dept. of Applied Physics, Laboratory of Upper Air. UoAthens Climate Research Group. University Campus, Bldg Phys 5. 15784 Athens,GR +210-7276838 covar@phys.uoa.gr Send also information to Mr Chris Tzanis chtzanis@phys.uoa.gr	Test site 51

Member	Role
Mrs Linda Krage Riga Technical University Faculty of Materials Science and Applied Chemistry Department of Silicate Material Technology Azenes Str. 14/24 Riga LV-1048 Latvia +371 6432 537 linda@ktf.rtu.lv	Test site 52
Mr Manfred Schreiner Institute of Science and Technology in Art Academy of Fine Arts Schillerplatz 3 A-1010 Vienna Austria +43-1 58816-8600 m.schreiner@akbild.ac.at Send also information to Mr Melcher Michael m.melcher@akbild.ac.at	Test site 53
Mr Ivan Grancharov University of Chem. Technology and Metallurgy Bul. Kl. Ohridski 8, Sofia 1756 Bulgaria +359-2-8163249 ivan.gr@uctm.edu	Test site 54
Mrs Nadya Karmanova International cooperation section JSC "SRI Atmosphere" 7, Karbyshev st. St. Petersburg, 194021 Russian Federation +79210981998 karmanva.nadezhda@rambler.ru	Test site 55

Norwegian Institute for Air Research
P.O. Box 100, N-2027 Kjeller, Norway
Associated with CIENS and the
Environmental Research Alliance of Norway
ISO certified according to NS-EN ISO 9001/ISO 14001

REPORT SERIES SCIENTIFIC REPORT	REPORT NO. OR 23/2014	ISBN: 978-82-425-2681-6 (print) 978-82-425-2682-3 (electronic) ISSN: 0807-7207	
DATE 10.06.2014	SIGN.	NO. OF PAGES 76	PRICE NOK 150.-

TITLE

Convention on long-range transboundary air pollution. UN/ECE international co-operative programme on effects on materials, including historic and cultural monuments.

Trend exposure programme 2011 – 2012

Environmental data report
October 2011 to December 201212

PROJECT LEADER

Terje Grøntoft

NILU PROJECT NO.

O-8208

AUTHOR(S)

Terje Grøntoft and Martin Ferm

CLASSIFICATION *

A

CONTRACT REF.

2003/1193 713.9

REPORT PREPARED FOR
Miljødirektoratet
Postboks 5672 Sluppen,
7485 Trondheim

Strømsveien 96,
0663 Oslo

ABSTRACT
This report presents the ICP Materials database for the period October 2011-December 2012. It includes environmental data from the ICP Materials trend exposure programme for 2011 - 2012. The database consists of meteorological data (T and RH), and pollution data as gas concentrations, amounts of ions in precipitation, particle concentration and amount of particle deposition.

NORWEGIAN TITLE

Konvensjonen om langtransporterte luftforurensinger. UN/ECE internasjonale samarbeidsprogram for materialer og bygd kulturarv. Trendeksponeringsprogrammet 2011 – 2012. Miljødata-rapport. Oktober 2011 til Desember 2012.

KEYWORDS		
Air quality	Environmental exposure	Material decompositon

ABSTRACT (in Norwegian)
Denne rapporten presenterer databasen i ICP Materialer for perioden oktober 2011 – desember 2012. Den inkluderer miljødata fra ICP Materialer trend-eksponeringsprogrammet for 2011 – 2012. Databasen består av meteorologiske data (T og RF), og forurensningsdata som gasskonsentrasjoner, mengde ioner i nedbør, partikkelkonsentrasjon og mengde avsatte partikler.

** Classification*
A Unclassified (can be ordered from NILU)
B Restricted distribution
C Classified (not to be distributed)

REFERENCE: O-8208
DATE: MAY 2013
ISBN: 978-82-425-2681-6 (print)
978-82-425-2682-3 (electronic)

NILU is an independent, non profit institution established in 1969. Through its research NILU increases the understanding of climate change, of the composition of the atmosphere, of air quality and of hazardous substances. Based on its research, NILU markets integrated services and products within analyzing, monitoring and consulting. NILU is concerned with increasing public awareness about climate change and environmental pollution.