

# CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

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

### Minutes of the 28<sup>th</sup> Meeting of the Programme Task Force

April 18-20, 2012, Oasis Hotel, Athens, Greece

Prepared by the Main Research Centre  
Swerea KIMAB AB, Sweden

The twenty-eight meeting of the Programme Task Force of the International Co-operative Programme on the Effects on Materials including Historic and Cultural Monuments was held in Athens, Greece, on April 18-20, 2012. The meeting was organized by the University of Athens Climate Research Group.

The meeting was attended by representatives from the following Parties to the Convention on Long-Range Transboundary Air Pollution: Czech Republic, France, Germany, Greece, Norway, Poland, Russia, Spain, Sweden and Switzerland.

#### 1. Opening of the meeting

*Prof. Costas Varotsos*, Director of the Dept. of Environmental Physics and Meteorology, Faculty of Physics, University of Athens, welcomed the meeting to Athens. *Costas Varotsos* presented the aim of the co-operative programme, starting from the time of Horatius (65 B.C. – 8 A.D) with pollution from smoke and Xenophon (434-359 B.C.) and Lucretios (98-55 B.C.) mentioning harmful smoke in lead mines, leading up to the presently planned air quality monitoring campaign by the Athens University investigating effects of extensive construction works at the old airport.

*Costas Varotsos* presented Mr. Costas Kokoris, the mayor of the municipality of Glyfada. *Costas Kokoris*, having a scientific background in mineralogy, welcomed the meeting participants, mentioning possible corrosion effects from the earlier mentioned construction works in combination with the sea-breeze effect from the Saronic Gulf, and opened the meeting.

*Johan Tidblad* thanked *Costas Varotsos* for the hospitality of the University of Athens, and for inviting the mayor of Glyfada. *Johan Tidblad* welcomed the participants, especially *Aurélie Verney-Carron* being new in the group.

#### 2. Information from the local organizers

*Costas Varotsos* provided practical information, inviting everyone to the meeting.

#### 3. Approval of the Draft Agenda

*Johan Tidblad* presented the draft agenda, mentioning the documents to be discussed. The draft agenda was approved.

#### 4. Introduction

The participants of the meeting gave a brief presentation of themselves.

## 5. Discussion of the 2011 Work plan including cycle of reporting

*Johan Tidblad* presented the 2011 reports for discussions.

- a) ICP Materials Report No 66: Trends in pollution, corrosion and soiling 1987-2009 (*Johan Tidblad*).

The report from the latest trend exposure (coming in three year cycles) was discussed. The report includes more extensive pollution analyses than previous reports. The complete set of data is given as annexes.

*Costas Varostos* noted that the oxidizing capacity of the atmosphere, basically the sum of O<sub>3</sub> and NO<sub>2</sub>, is more or less stable until the 2000 analyses, followed by a decrease. He would like to see error bars in order to evaluate the reliability of this observation. For future revisions, it was suggested to include a paragraph on oxidizing capacity, possibly a comparison between summer and winter data to account for seasonal variations.

- b) ICP Materials Report No 67: Environmental data report, October 2009 to December 2009 (*Terje Grøntoft*).

The report is mainly reporting of data, all data included as appendices. A material overview, description of the measuring programme, formulas for calculating pollution data from measurement data etc. are given and a short description of data existing from individual sites.

Availability of data was discussed, to check for possibilities to fill existing gaps:

For Germany, *Stefan Brüggerhoff* reported that amounts of anions and cations in precipitation will be recalculated due incorrect calculations. *Stefan Simon* reported difficulties in obtaining measurement data from Berlin. There is yet no solution for pH-measurements, pH has to be measured immediately to avoid effects of calcareous soil.

For some periods, there is no precipitation data for Spain. This is due to insufficient amounts of rain, or no rain at all. From lack of funding, measurements of optional parameters may be reduced at the Madrid site.

For Paris there will be no chemical analysis for February, March and April this year due to lack of rain. pH and conductivity has been prioritized.

Chaumont (Switzerland) precipitation data for the winter are for snow, being difficult to compare with data for rain since snow is more affected by wind.

There have been no regular pH measurements in Athens, the plan is to include regular pH measurements in the future.

There is some uncertainty concerning the calculations for the Latvian data.

The situation for Poland is not known, should be checked.

*Terje* will check availability of Austrian data.

The reason for lack of Bulgarian chloride data is not known, *Terje Grøntoft* will investigate the matter.

*Terje Grøntoft* showed a plot over the variation of data between sites:

*Johan Tidblad* encouraged everyone to try and provide pH data. Details on how to properly perform pH measurements were requested.

Comments to the report: Results from Athens is missing in Figure 6 (temperature data). It should be checked that missing data is noted as empty boxes in the tables. HNO<sub>3</sub> data for France is missing in the table.

An updated version of the report will be posted on the project web site.

- c) ICP Materials Report No 68: Pilot study on inventory and condition of stock of materials at risk at United Nations Educational, Scientific and Cultural Organization (UNESCO) cultural heritage sites. Part I Methodology (*Johan Tidblad* in the absence of Stefan Doytchinov).

The first part of the report concern methodology, followed by information on five UNESCO sites. Comments to the report are as follows.

Parthenon in Athens (contribution by Costas Varotsos): There were problems with calculating the area of the facades, approximations of the geometry were used instead. Updated surface area figures will be included in the next report.

Facades in the centre of Paris (*Tiziana Lombardo*): The report should be corrected for incorrect pdf-conversion of French letters and missing text in the figure 9 caption. The text may further be too general, e.g. not differentiating between different types of buildings.

The National Library of Prague (*Katerina Kreislova*): Some data is missing in the report and the text for the different sites is not harmonized.

The new museum in Berlin (*Stefan Simon*): Typing errors should be corrected and the photo of Fig 33 exchanged (wrong building). Some data is missing in the report and the text for the different sites is not harmonized.

Royal Crescent in Bath: *Stefan Doytchinov* should check with Tim Yates for possible errors.

A corrected report will be posted on the project web page. Additional data will be included in the next report in the series. A Word version of the next report should be circulated in due time, to facilitate correction of errors.

## 6. Information from WGE and common work plan items 2012

*Johan Tidblad* presented information from WGE and the 2012 Workplan for the implementation of the Convention.

- a) Action plan to the Long-term Strategy of the Convention; contribution to the review of the Convention by an ad-hoc Expert Group.

The executive body of the Convention has made a mandate to an ad-hoc group of experts to make a review of the Convention. The review will be conducted during this year, possibly resulting in large changes for the ICPs.

- b) “Joint” website of the scientific part of the Convention (EMEP+WGE).

There is a new WGE-chairman, Peringe Grennfelt, earlier active in the EMEP-programme. We may further be asked to cooperate more with EMEP in the future.

- c) Consistent presentation of EMEP and WGE data in a geographical information system (GIS).

The EMEP-grid was earlier decreased from 150x150 to 50x50 km and further decrease is discussed. A change of projection to the normal longitude/latitude system is also suggested.

- d) Country reports and contact lists.

Country reports can serve a purpose to co-ordinate Convention activities within a country. All participants provided a short report on the current level of co-ordination:

Since about 3 years there is a national ICP meeting in Germany, a 2-day meeting to exchange knowledge, information on activities and to bring the groups together (*Stefan Brüggerhoff*).

Some exchange of information exist in France, *Tiziana Lombardo* has invited members of other ICPs to workshops etc.

There are no common meetings in Sweden. *Johan Tidblad*, attending general meetings, knows of other activities in the country.

In Greece there is an increasing gap between the scientists and policy makers and there are no common meetings.

In Norway there are no organized meetings. Other persons at NILU are however active in other IPCs, making some interaction possible.

There is moderate exchange of information in Poland. The main work is performed by the Ministry of the Environment while ICP materials activities belong to the Ministry of Trades. Some common meetings do exist.

In Spain, the Ministry of Environment is responsible of the Convention but the ICPs are based elsewhere. There used to be one meeting per year and distribution of minutes but these activities have stopped after change of staff at the Ministry. There is however still some exchange of information.

In Switzerland there are activities also in other ICPs, but no exchange of information.

Russian activities in other ICPs are likely, but presently not known.

In the Czech Republic, the ICPs are regulated by the ministry of Environment. There was one meeting between ICPs 5 or 6 years ago.

The participants were encouraged to search for ICP meetings in respective country at the Convention web site, where all meeting are listed, to participate in order to learn about activities and to inform about our activities.

- e) Report on the further implementation of the Guidelines on Reporting of Monitoring and Modelling of Air Pollution Effects; Guidance document.

*Johan Tidblad* showed the "guidance document VII on health and environmental improvements" being an important document. There is only one paragraph on pollution, under the health section.

The document includes a table on changes in criteria for each country and scenarios for 2020. Corrosion and pollution is given as areas of exceedance, without differentiating between materials. By participating in this activity, ICP materials are now part of the negotiation process for the revision of the Gothenburg protocol.

- f) Updated report on ex post analysis by the Working Group on Effects;

*Johan Tidblad* showed the draft document “Analysis of the achievements, potential benefits and damages on the environment, materials and health of Gothenburg protocol provisional scenarios”. After presentation of this draft document, the scenarios have however changed.

- g) Impacts report on ideas and actions to enhance the involvement of EECCA/SEE countries in the Eastern Europe, the Caucasus and Central Asia and on cooperation with activities outside the Air convention.

*Nadya Karmanova* informed about Eastern European activities.

A group of EECCA countries is organized by the JSC Scientific Research Institute for Atmospheric Air Protection (St Petersburg). The aim of the group is to intensify activities of Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Uzbekistan, Ukraine and Russia linked to protocols of the Convention: the Protocol on Heavy Metals (1999), the Protocol on Persistent Organic Pollutants (1999) and the Gothenburg Protocol (1999).

It would be good for ICP Materials with participation from this group, language issues may however be an obstacle. The official language of the group is Russian and English but the extent of knowledge in English is not known.

At the next meeting of the group, April 20th, *Nadya Karmanova* will inform about ICP Materials and provide contact information to persons (preferably English speaking) interested in the work of ICP Materials. Focus should be on one or a few countries that are being able to participate in the next trend exposure.

*Johan Tidblad* encouraged *Nadya* to continue the work, to try to invite someone to the next ICP Materials meeting, to find out about possibilities for simultaneous translation and possibilities for funding of participation in ICP Materials meetings and of trend exposures.

*Lech Kwiatkowski* informed about a corrosion conference with participation from researches from the EECCA countries. *Johan Tidblad* asked *Lech* to inform about ICP Materials, *Johan* will send the existing brochure with information on ICP Materials.

## 7. Discussion on the 2012 Work plan

The document ECE/EB.AIR/2011/5: Draft 2012-2013 Workplan for the implementation of the Convention on Long-range Transboundary Air Pollution, section 3.2, was discussed. The following reports cover the topics relevant for ICP Materials:

- a) Updated report (Report No 69) on trends in pollution, corrosion and soiling.

Suggested for this year is to enlarge the section on parameters as compared to previous reports. *Terje Grøntoft* showed templates suggested for the tables of the report. A column stating uncertainty and detection limit and a column on sources and availability of data has been added. *Lena Sjögren* suggested including information on calibration intervals for the instrument/method used.

*Johan Tidblad* discussed the level of details required. Report No 2 includes tables with list of sites, geographical data, type of environment and traffic intensity, site type and distance to instrumentation, methods for air analyses (no detection limit etc.), frequency, sampling period, type of sampling and method of analyses for precipitation analyses. *Johan Tidblad* suggested adding methods of analyses for all measurements, including detection limit, calibration intervals etc.

*Costas Varotsos* emphasized that uncertainty is both accuracy and precision and that both must be taken into account. *Terje Grøntoft* will update the template and distribute to all partners.

Dead-line for input to the report was decided to be July 31st 2012, at least a draft version must be ready for the September session of WGE.

- b) Updated report (Report No 70) on the pilot study on inventory and condition of stock of materials at risk at United Nations Educational, Scientific and Cultural Organization (UNESCO) cultural heritage sites (*Johan Tidblad* in the absence of *Stefan Doytchinov*).

The study started last year and will continue in 2012 and 2013.

*Costas Varotsos* showed a presentation prepared by *Stefan Doytchinov*. The main aim of the work presented is to quantify effects of multi pollutants, using pollutant and corrosion results for estimating costs of corrosion. The first report (No 68) has described the sites and methods, this report (No 70) will present stock-at-risk estimates and corrosion effects on five building complexes. External surface areas should be calculated and costs of damage elaborated using environmental data, dose response functions and restoration costs. Difficulties seen include calculations of complicated external surfaces.

*Katerina Kreislova* presented the study on the Klementium (National Library of Prague). The object is large and composed of several buildings and many different materials. It is located in a high traffic area and is presently under reconstruction.

It was suggested to concentrate on effects on surfaces for this years report and on economical aspects in next years report.

A draft version of this years report is required before September 2012 and should be distributed to all contributors in the beginning of August.

- c) Report (Report No 71) on the effect of black carbon on soiling of materials (*Johan Tidblad, Tiziana Lombardo*).

Black carbon has received a lot of interest due to interaction with climatic change. *Johan Tidblad* showed a preliminary list of contents of the report, including measuring methods, relationship with other properties of particulate matter, effects on non-transparent (KIMAB) and transparent (LISA) materials and an economical estimation of soiling. Climatic effects on black carbon are planned to be mentioned in the introduction of report. Biographical research on measurement methods is performed at LISA, also acquiring equipment to measure black carbon.

The absolute deadline for the report is in December 2012, aiming at a preliminary version for the Geneva meeting in September.

## 8. Discussion on the 2013 Work plan

The 2013 work plan is part of an almost fixed 2-year work plan

- a) Updated report on trends in pollution, corrosion and soiling (*Johan Tidblad*);

The technical manual is issued this year; a report on results of the trend exposure will be issued next year. *Johan Tidblad* showed some preliminary results on organic acids. This is the first time anyone measures organic acids outdoors, we do it before the atmospheric scientists. With diffusive samplers, the first results show very low concentrations, close to the detection limit. The highest levels have been found in Oslo, still very low as compared to indoor conditions. *Johan Tidblad* pointed out that results so far are winter results and that the situation may be different in the summer. *Markus Faller* asked if the organic acids are expected to be stable on the passive samplers. *Johan Tidblad* will bring the question forward to IVL.

The final environmental data report will be published in 2014. The 2013 activity should concentrate on collecting data. *Terje Grøntoft* asked everyone to send environmental data soon as possible, including information on measurement methods. *Tiziana Lombardo* needs data from the 10 sites with glass for 2009 and 2011. *Terje Grøntoft* will send out forms and coordinate data collection for the normal trend exposures. One year exposure data for the years in between should be sent directly to *Tiziana Lombardo*, needed for the separate report on soiling.

*Markus Faller* showed a presentation on zinc, comparing Czech samples (standard pre-treatment) and blasted specimens. There is a linear relationship between the two pre-treatment methods; blasted specimens showing higher corrosion rates.

Trend exposure and procedures, primarily needs of improvement, was discussed. At several sites there have been problems with the cover for the Teflon cylinder being lost. The same screw is used for the Teflon cylinder and the lid, resulting in unscrewing of the screw by wind induced vibrations, and loss of the particle sampler and the lid. Another problem with the new sampler holder is difficulties to remove nuts etc. when cold. *Johan Tidblad* will send a message to Martin Ferm (IVL) about the problems with the particle samplers.

*Daniel de la Fuente* reported change of racks at the Toledo site after 25 years.

*Tiziana Lombardo* reported a complete change of the Paris exposure site due to construction works at the old station, located on the roof of a church. The station has moved to the roof of the university, close to a main road, and all racks have been exchanged. The 4 year glass samples are still at the old site. There is no box for sheltered exposure at the new site.

*Stefan Brüggerhoff* showed photos of the Bottrop station, with new racks.

There are new racks also at the Berlin station (*Stefan Simon*), the racks are however rusty after half a year. An even larger problem is growth and deposition of leafs etc.

Photos of new racks etc. can be included in the technical manual. For St Petersburg, being a new site, a complete description with exact location and photos is required.

- b) Updated report on the UNESCO pilot study; if necessary (*Johan Tidblad* in the absence of *Stefan Doytchinov*)

This point was already discussed; the economic aspects will be included in the 2013 report.

- c) Report on exposure of modern glass 2008-2012 and soiling dose-response functions (*Tiziana Lombardo*)

Reduced haze has been observed for all exposure sites. The 2 and 3 year samples will be reanalysed at the same time, the 4 year samples at a later date. All analyses are expected to be finalized in February 2013. Environmental data for year 1 is available, passive sampling data should be expected in time for elaborating preliminary dose-response functions. *Terje Grøntoft* will send out requests for data, data to be sent to *Tiziana*. A draft report is expected in September and the final version in December 2013.

Some information on black carbon should be included in the report.

- d) 29<sup>th</sup> meeting of the Programme Task Force

Switzerland has volunteered to host the meeting, possibly in Berne. Dates suggested are 17-19 April 2013, subject to confirmation. *Johan Tidblad* asked *Markus Faller* to check possibilities of simultaneous translation, maximum 5 persons are planned to be invited from EECCA countries.

## 9. Medium term work plan (2014-2015)

Ideas and possibilities for common projects were discussed.

*Tiziana Lombardo* has applied for a conservation related soiling project, aiming at preventing soiling. The application was rejected at the second step.

*Katerina Kreislova* has been in contact with companies producing solar panels, consisting of structural metals and glass. Coil coating companies need corrosivity and material corrosion data, there may further be an interest for soiling effects on the output from solar panels. *Terje Grøntoft* suggested exposing solar panels at exposure stations with known environmental conditions. *Lech Kwiatkowski* pointed out that chances could be better if including buildings in a large project, "starting from culturing heritage - going to the bright future". For such a project, energy savings from reduced soiling of facades should be of interest.

There is a huge interest in organic materials in the cultural heritage community (*Tiziana Lombardo*). *Johan Tidblad* pointed out that earlier exposures of polymeric materials showed no correlation with pollution, only temperature. Organic materials would be of interest if we could find materials sensitive to ozone.

Exposures of organic coatings have shown effects of O<sub>3</sub> and NO<sub>2</sub> indoors, while the effect of UV is larger outdoors (*Terje Grøntoft*). Data on UV are however difficult to find, UV index for effects on human skin is useless for materials (*Tiziana Lombardo*). *Costas Varotsos* informed on a meteorological network having access to a local UV network in Greece.

*Katerina Kreislova* informed on projects dealing with road tunnel environments; de-icing salt affecting materials, water, vegetation etc. Effects of de-icing salts could be of interest also outside of tunnels. Effects are seen on stainless steel at the 3-4 floor of buildings close to roads (*Katerina Kreislova*). At other locations, stainless steel balustrades show corrosion after 2-3 years (*Lech Kwiatkowski*). Combined with crevice corrosion, stress corrosion cracking may occur. Calcium and magnesium chlorides added to de-icing salt may increase corrosion rates due to its hygroscopicity (*Markus Faller*). Modern paints with higher amounts of filler to reduce costs, have more voids causing humidity and chlorides to penetrate (*Katerina Kreislova*). The first step in a project on effects of de-icing salts would be the quantification of effects and costs. *Johan Tidblad* will collect project proposals and ideas from the group. To “sell” project ideas to the Convention, pollution must however be involved.

Polymers sometimes degrade fast, examples being sealants, epoxy coatings, rubber in tires and tubes. To be of interest for ICP materials, polymers selected have to be sensitive to ozone or to other pollutants. Ideas on the matter should be sent to Johan Tidblad.

Ideas for the 2014-2015 work plan include

- Evaluation of samples exposed for more than one year.
- Updated trend report (the UNESCO study will be finalized in 2013).
- New work plan items on stock-at-risk: Stefan Brüggerhoff suggested a case study from a proposed project using dose-response functions for simulating traffic, emission from traffic and attack on stone surfaces, provided the project proposal is accepted.
- Introduction of other pollutants (in this trend exposure we have concentrated on organic acids).

Ideas should be sent to Johan Tidblad or Stefan Doytchinov, depending on the subject.

## 10. Dissemination of results

As a response to the planned review of the Convention as a whole, one important activity that has been identifying by the working group on effects is dissemination of results. Different ways of spreading the results were discussed.

### a) Scientific publications

A lot of publications exist but there is no complete list yet. Last year, an overview paper on activities during 25 years of ICP Materials was published. Partners making publications are urged to insert a reference to ICP Materials in the acknowledgements and to include the web page address.

*Costas Varotsos* suggested that persons using data from any of the ICP Materials exposure stations should acknowledge persons involved in the work at the stations. This would however be possible in cases data from a few sites only are used in which case it was agreed that persons involved in the work at the stations should be asked if they want to be included in the acknowledgement. Otherwise, the acknowledgement should be as short as possible, including a reference to the web page.

*Daniel de la Fuente* suggested join the ICP Materials database with data from other programmes such as ISOCORRAG, RAPIDC etc and that Manuel Morcillo would be willing to undertake such a work. *Johan Tidblad* appreciated the offer, pointing out the need for continuous discussions during the elaboration.

*Lech Kwiatkowski* encouraged everyone to send papers to “Corrosion Protection” (Polish conference with a few English papers).

b) Brochure ICP Materials 25 years

As an example, *Johan Tidblad* showed a 12 page brochure produced by ICP Forest (25 years).

It was discussed whether or not it would be useful with a brochure giving an overview of the activities. *Johan Tidblad* presented the aim of such a brochure, or flyer, being to make the Convention more visible. It should thus not address the scientific community but to environmental agencies etc. *Johan Tidblad* will try and find out the costs of making such a brochure.

c) Workshops and other ways of involving scientists outside ICP Materials

Workshops are a tradition in the work of ICP Materials, a list can be found on the ICP Materials web page. *Stefan Brüggerhoff* suggested a workshop for solar panel companies and others involved in renewal energy, wind mills etc. The workshop should be at a location easily accessible for companies concerned.

*Johan Tidblad* suggested a workshop on mapping, life time estimation etc, *Tiziana Lombardo* suggested to include soiling.

It was decided to try and organize a workshop for companies involved in renewal energy and connected to mapping corrosivity, possibly within the next two years.

d) Web page including possible open access to ICP Materials reports

All reports have now been transferred to pdf-files and are available on request. As soon as possible, they will also be introduced at the web page.

The list of other ICP Materials papers in scientific journals was discussed. It was decided to include only English papers and only those using data from the ICP Materials network, not those that only refers to ICP Materials.

*Johan Tidblad* encouraged the participants to provide additional material for the website. *Terje Grøntoft* suggested that a photo should be put on the front page.

## 11. Financing of the programme

The partners reported on the current and future financial situation:

Sweden: Financing is obtained one year at a time, there are no promises for the next year.

Greece: For the moment there is no financing, due to the economical crisis. Hopes for the future are low.

Poland: There is no financing dedicated to ICP Materials, other sources are used.

Norway: The situation is stable, the same level for the next year is expected.

Germany: There is a low but stable level of financing, covering parts of the costs only.

Spain: There is no financing dedicated to ICP Materials and there are no possibilities for a contract with the Ministry. Other sources are used. The EMEP-stations have financing but not the Madrid station, still offering to measure next year.

France: Conditions are stable with funding for two more years.

Switzerland: The situation is stable with an offer for a four year contract.

Russia: The situation for the next year is unknown.

Czech Republic: There is funding for this year, however reduced compared with the year before. About 50% of the costs are covered; the rest is covered by funds taken from commercial test sites.

## **12. Final remarks and closure of the meeting**

*Johan Tidblad* thanked Costas Varotsos for hosting the meeting and all participants for their contribution and fruitful discussions and closed the meeting.



## **Participant list**

Ms Katerina Kreislova  
SVUOM Ltd.  
U Mestanského pivovaru 934 /4  
CZ-17000 PRAHA 7  
Czech Republic  
+420 2 20 80 9996  
[kreislova@svuom.cz](mailto:kreislova@svuom.cz)

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](mailto:stefan.brueggerhoff@bergbaumuseum.de)

Mr Stefan Simon  
Rathgen Forschungslabor – Staatliche Museen zu Berlin  
Schloßstraße 1a, 14059 Berlin  
Germany  
+49 30 3267 490  
[s.simon@smb.spk-berlin.de](mailto:s.simon@smb.spk-berlin.de)

Ms Tiziana Lombardo  
LISA - Université Paris-Est Créteil Val de Marne  
61, Avenue du Général de Gaulle  
F-94010 Créteil  
France  
+33 1 45 171677  
[Tiziana.lombardo@lisa.u-pec.fr](mailto:Tiziana.lombardo@lisa.u-pec.fr)

Ms Aurélie Verney-Carron  
LISA - Université Paris-Est Créteil Val de Marne  
61, Avenue du Général de Gaulle  
F-94010 Créteil  
France  
+33 1 45 176608  
[Aurelie.verney@lisa.u-pec.fr](mailto:Aurelie.verney@lisa.u-pec.fr)

Mr Costas Varotsos  
UoAthens Climate Research Group  
Faculty of Physics, Division of Environmental Physics and Meteorology  
University of Athens.  
15784 Athens, GR  
Greece  
+30 210-727 6838  
[covar@phys.uoa.gr](mailto:covar@phys.uoa.gr)

Mr John Christodoulakis  
UoAthens Climate Research Group  
Faculty of Physics, Division of Environmental Physics and Meteorology  
University of Athens.  
15784 Athens, GR  
Greece  
[physjohn@yahoo.gr](mailto:physjohn@yahoo.gr)

Mr Terje Grøntoft  
NILU - Norwegian Institute for Air Research  
P.O.Box 100, N-2007 Kjeller  
Norway  
+47 63 898 023  
[teg@nilu.no](mailto:teg@nilu.no)

M. Lech Kwiatkowski  
Institute of precision mechanics  
01-786 Warsaw  
Duchnicka St. 3  
01-796 Warsaw  
Poland  
+48 22 5602 846  
[lech@imp.edu.pl](mailto:lech@imp.edu.pl)

Ms Nadya Karmanova  
International cooperation section  
JSC "SRI Atmosphere"  
7, Karbyshev st.  
St. Petersburg, 194021  
Russian Federation  
+79210981998  
[orep2973031@gmail.com](mailto:orep2973031@gmail.com)

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](mailto:delafuente@cenim.csic.es)

Mr Johan Tidblad  
Swerea KIMAB AB  
P. O. Box 7047  
SE – 16407 Kista  
Sweden  
+46 8 674 1733  
[johan.tidblad@swerea.se](mailto:johan.tidblad@swerea.se)

Ms Lena Sjögren  
P. O. Box 7047  
SE – 16407 Kista  
Sweden  
+46 8 674 1734  
[lena.sjogren@swerea.se](mailto:lana.sjogren@swerea.se)

Mr Markus Faller  
EMPA - Laboratory for Joining Technologies and Corrosion  
Ueberlandstrasse 129  
CH-8600 Dübendorf  
Switzerland  
+41 58 765 4236  
[markus.faller@empa.ch](mailto:markus.faller@empa.ch)