MINUTES OF THE WORKSHOP
"THE USE OF RECEPTOR MODELS IN THE SOURCE APPORTIONMENT OF AIR POLLUTANTS"
ISPRA 4th – 5th NOVEMBER 2010

Introduction

The workshop organised by the European Reference Laboratory for Air Pollution (JRC-IES-TAQ-ERLAP) took place on 4th and 5th November 2010 in Ispra. Its objective was to launch the European intercomparison exercise for receptor modelling of air pollutants. The workshop was attended by more than 40 experts coming from 14 different countries.
The opening speech was given by the director of the Institute for Environment and Sustainability (IES), Leen Hordijk, and the introduction was made by the Head of the new Unit Climate Change and Air Pollution, Frank Raes. Two keynotes were presented by the special guest Prof. Philip K. Hopke from Clarkson University (New York State, US): "Historical perspective of Receptor Models and their role in the US air quality regulations" and "The nature of currently available tools".

The workshop was structured in four sessions

- An EU perspective for Source Apportionment using Receptor Models - learning from US experiences (chair C. A. Belis)
- Critical comparison of methodologies (chair P. K. Hopke)
- First steps towards an EU harmonised approach (chair A. Borowiak)
- Source Apportionment of PM with advanced spectrometry (chair S. Galmarini)

Summary of the presentations

In the first session the relevance of the initiative in the framework of the Air Quality Directive (AQD) was discussed. Emile De Saeger in representation of DG ENV underlined the interest of the Commission in the harmonisation of model tools in support of the implementation of the cited AQD. As an example he mentioned the lack of comparability of the many different approaches used for source apportionment in the requests for postponement of attainment for PM in 2009. E. De Saeger informed participants about the intention to set up a line for funding model intercomparison initiatives in the framework of Life plus financial instrument. He also stressed the need of technical guidelines that could be useful in the revision of AQD that will take place in 2013.
Stefano Galmarini introduced the Forum for Air Quality Modelling in Europe (FAIRMODE). He presented its structure and functioning. He mentioned the importance of the output of the intercomparison we're launching for the working group on natural sources and source apportionment which will contribute to drafting guidelines for the use of models for the AQD.

Claudio Belis presented the outline of the intercomparison process and described the preparatory work carried out by JRC. He claimed this initiative has to be considered in connection with both the network of Air Quality Reference Laboratories (AQUILA) and the mentioned forum on modelling (FAIRMODE).
In session 2 and 4 experts from many research groups: R. Harrison(Univ. Birmingham), R. Vechi (Univ. Milan), M. Karl (NILU), O. Favez (INERIS), U. Quass (IUTA), F. Amato (IDAEA), S. Carbone and M. Vestenius (FMI), Andre Prevot (PSI), B. Larsen, C. Belis & S. Gilardoni (JRC), presented the most recent source apportionment studies using receptor modelling in Europe. This gave the participants the chance to have an outlook on the different type of models and approaches actually used in the UE including the advanced spectrometric techniques.
In session 3 there was a presentation on the technical aspects of the intercomparison followed by a discussion on the methodology to be used with particular emphasis on: the kind of database, uncertainty estimation and expression, the methodology for evaluation and comparison of results, and QA/QC procedures.

Debate on the contribution of Receptor Models to the implementation of AQD

There was a general agreement on the potentials of receptor modelling for source identification that at present can rely on a number of ready-to-use tools with low to medium computer intensity requirements. In addition, perspectives of further improvements in their performance are granted by the availability of advanced tools. So far, they have been used to solve specific problems by processing additional input data (meteorology, trajectories, known sources, etc.) opening the way for future standardized applications for routine use.
Receptor model outputs, like those of other kinds of models, may be influenced by the competence of the operator. This can be reduced to a minimum by setting up detailed guidelines and well adjusted QA/QC protocols. So far receptor models have been used mainly on particulate matter and to a lower extent to VOCs. The extension of their application to other kinds of pollutants (gaseous pollutants, air parcel, etc.) should be further investigated.
Indeed, the revision of the AQD can be considered as an opportunity for receptor models taking into account the envisaged increasing relevance of models in air quality management. The activity of this group of experts will provide elements to evaluate the capabilities of receptor models and to solve or keep under control their limitations. Documenting the performance of receptor models using an intercomparison exercise will further dignify this type of instrument to a) be on equal terms with Chemical Transport Models-based source apportionment, b) provide an independent reference frame for the validation of emission inventories.
Receptor models have good prospects in the study of the impact of pollutants on health. Available studies suggest that combining source identification with toxicological data is an effective approach to identify cost efficient mitigation measures.

Discussion on the Intercomparison of Receptor Models

JRC described the methodology for the evaluation of the database pursuant to ISO 13527 and presented a critical discussion of the techniques for estimating the input data uncertainty. A sketch was also proposed of a QA/QC protocol that will serve as the basis for a guideline on the use of receptor models for the implementation of AQD.

One of the most critical points for the intercomparison is the availability of real world databases. In Europe, unlike the US, there are few long-term PM chemical composition time series suitable for receptor modelling. During the workshop four candidate databases were presented that could be used for the intercomparison. The number of samples and parameters is variable but in principle at least two of them (one from central Europe and one from the Mediterranean area) fit the minimum requirements. The main limitation remains the availability of a detailed emission inventory with local source profiles.

An alternative to real world data bases are synthetic databases. They have the advantage of having known source contributions at the receptor that can be used as reference value in the intercomparison. On the other hand, synthetic databases are affected by the uncertainty of the model with which they were created. In addition, the uncertainty of the modelled concentrations is not comparable to the one observed in real world databases.

After discussing different proposals, there was a general agreement on performing the intercomparison using both real-world and synthetic data bases.

The JRC, with the support of experts, will continue the search of other suitable real-world DBs with complementary information and will prepare a synthetic DB for the intercomparison. The use of DBs from US EPA will be considered as well.

The agreed time window for the full cycle of the intercomparison, including evaluation, reporting and a concluding meeting, was 18 months (i.e. concluding not later than June 2012). JRC plans to distribute the databases in the first quarter of 2011.

Participants agreed on the creation of a permanent European forum of discussion on receptor models. For that purpose JRC will create a moderated workspace on the web using a web-based platform provided by the Commission. The presentations of the speakers who give their consent will be made available in this workspace.

Experts wishing to contribute to the drafting of a QA/QC document were invited to express their availability to the JRC staff involved in the coordination of the initiative.

Annex 1 Programme

EUROPEAN INTERCOMPARISON FOR RECEPTOR MODELLING OF AIR POLLUTANTS

Workshop "The Use of Receptor Models in the Source Apportionment of Air Pollutants"
Date: 4-5 November 2010
Venue: European Commission - Joint Research Centre (JRC) Ispra - Italy (Room 2)
Organised by: IES - European Reference Laboratory for Air Pollution (ERLAP)

European Reference Laboratory for Air Pollution

AGENDA

FIRST DAY

start	Title	speaker	speaker affiliation
9:00	Opening speech	Leen Hordijk	JRC - IES Director
9:20	Introduction	Frank Raes	JRC - HoU Climate Change and Air Pollution
Session 1: An EU perspective for Source Apportionment using Receptor Models - learning from US experiences (chairman C. A. Belis)			
9:40	**Keynote**: Historical perspective of Receptor Models and their role in the US air quality regulations	Philip Hopke	Clarkson University (US)
10:40	COFFE BREAK		
11:00	The relevance of source apportionment for the AQD	Emile De Saeger	DG ENV
11:20	Source apportionment and the Forum for Air quality modelling (FAIRMODE)	Stefano Galmarini	JRC
11:40	Harmonisation of source apportionment using Receptor Models in Europe (in collab. with AQUILA)	Claudio Belis	JRC
Session 2: Critical comparison of methodologies (chairman P. K. Hopke)			
12:00	Source apportionment of urban and rural PM using mass closure and CMB model	Roy Harrison	Univ. Birmingham (UK)
12:25	Receptor modelling using APCA and PMF in Italian sites	Roberta Vecchi	Univ. Milan (IT)
12:50	LUNCH IN THE JRC MENSA		
14:20	A nordic study on the source apportionment of domestic wood burning: experiences from an intercomparison of Receptor Models and users	Matthias Karl	NILU (NO)
14:45	Inter-comparisons of aerosol source apportionment models at various French urban sites	Olivier Favez	INERIS (FR)
15:10	Source apportionment of pooled data in German sites	Ulrich Quass	IUTA (DE)
15:35	COFFE BREAK		
16:05	Source apportionment in the Po Valley combining different receptor models	Bo Larsen & Claudio Belis	JRC

16:30	Enhancing PMF by ME to improve source apportionment of atmospheric particles	Fulvio Amato	IDAEA (ES)
16:55	Source apportionment of PAHs in Virolati, SE Finland	Mika Vestenius	FMI (FI)
start	**Title**	**speaker**	**speaker affiliation**
17:20	Discussion and Conclusions of the first day	ALL	
18:00	END OF FIRST DAY		
20:00	DINNER IN RISTORANTE BELVEDERE	ALL	

SECOND DAY

Session 3: First steps towards an EU harmonised approach (chair A. Borowiak)

9:00	**Keynote**: The nature of currently available tools	Philip Hopke	Clarkson University (US)
10:00	The European intercomparison for Receptor Modelling: proposal of methodological approach	Claudio Belis & Michel Gerboles	JRC
10:30	The European intercomparison for Receptor Modelling: discussion	ALL	
11:00	COFFEE BREAK		

Session 4: Source Apportionment of PM with advanced spectrometry (chair S. Galmarini)

11:20	Source apportionment of carbonaceous aerosols in Switzerland	Andre Prevot	PSI (CH)
11:45	Better constraints on sources of carbonaceous aerosols using a combined ^{14}C -- macro tracer analysis in a European rural background site	Stefania Gilardoni	JRC
12:10	Source apportionment of ambient fine particles in Helsinki using AMS	Samara Carbone	FMI (FI)
12:35	Conclusions of the Workshop	ALL	
13:15	LUNCH IN THE JRC MENSA		

JRC EUROPEAN COMMISSION

ies Institute for Environment and Sustainability

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