

Minutes of the expert meeting on mercury model comparison

(22-23 April, 2004. EMEP / MSC-E, Moscow, Russia)

1. Introduction

The main objectives of the meeting were to discuss the results of the third stage of mercury model intercomparison study, to work out a plan for preparation of a report on the third stage, to discuss possible directions of future cooperation, and progress in preparation of scientific publications. The meeting was held at the premises of Meteorological Synthesizing Centre - East of EMEP (Moscow, Russia, April 22-23, 2004). It was attended by 10 experts from Germany, Bulgaria, Canada, the USA, Sweden and Russia. The list of participants is given in Appendix I. The meeting was chaired by Gerhard Petersen (GKSS, Germany) and Alexey Ryaboshapko (EMEP/MSC-E). The participants regretted that Jesper Christensen (Denmark) and David Lee (the UK) could not attend the meeting.

2. Opening of the meeting and adoption of the agenda.

The meeting was welcomed by Sergey Dutchak, EMEP/MSC-E director. He presented an overview of the recent development in heavy metals modelling, and particularly – mercury. It was stressed that the CLRTAP Protocol on Heavy Metals entered into force by the end of 2003. He mentioned growing interest to the problems of mercury in the environment displayed by many countries and international organizations. The key role of mercury transport modelling on regional and global scales was underlined. It is widely recognized now that the mercury model comparison study takes on special significance. It provides an objective judgement on reliability of the modelling results and contributes to better understanding of HM atmospheric transport and their behaviours in the environment.

The representative of MSC-E Alexey Ryaboshapko presented a provisional agenda of the meeting. It was discussed and adopted (see Appendix II).

3. Stage III of mercury model intercomparison

Alexey Ryaboshapko presented a draft version of the progress report on the third stage. Consideration of the parameters to be calculated and available results of the calculations have revealed that the modelling groups are at different phases of the study fulfilment.

A.Ryaboshapko informed the participants about some problems connected with the measurement data and suggested to consider some values of mercury concentrations in air and in precipitation as possible sampling/analytical outliers. The expert agreed to exclude these values from the comparison data set. It was also recommended to MSC-E to discuss the problem of outliers and reliability of all measurement data with the EMEP Chemical Coordinating Center (CCC).

The meeting paid a special attention to the problem of precipitation amount determination, because errors in precipitation measurements could lead to significant uncertainty of wet deposition flux assessment. It was recommended to ask the EMEP/CCC to provide the MSC-E with the most reliable set of the data on precipitation amounts.

A.Ryaboshapko requested the participants to update descriptions of individual models in order to include them into the chapter of the report devoted to the comparisons of models with the measurements. The meeting agreed to provide MSC-E with them by the end of May 2004.

A.Ryaboshapko suggested a common template to present the primary results of the calculations for all modelling groups. The data obtained by ADOM model were used as an example to fill the template. To submit the results it was agreed to use the proposed template. It was also stressed that the values of mercury concentrations in precipitation should be calculated as mean-weighted quantity (according to precipitation amount). The modelling results were suggested to present as maps of concentrations / depositions for European continent. The agreed list of output parameters is given in Appendix III.

The meeting considered a content of the progress report. It was recommended to include into the report a short abstract to motivate the work and the main tasks of the third stage. The agreed content of the progress report is reproduced in Appendix IV.

Gerhard Petersen, Russell Bullock, Dimiter Syrakov, Ashu Dastur, Mark Cohen, Iliia Ilyin and Oleg Travnikov presented their results of the modelling within the third stage and their plans to complete the work. The timetable to prepare the progress report as well as the final report was considered in depth. Taking into account the fact that some modelling groups possess restricted possibilities to fulfil the comparison program the participants decided to formulate a minimum program of the calculations, which should be carried out by all modelling groups. The minimum program and the full program of the calculations are shown in Appendix V.

John Munthe gave an analysis of reliability of the results of observations. He noted that in some cases the uncertainty of the measurements could be very high. The participants recognized the necessity of providing quantification of the uncertainties. John Munthe was requested to include the presented analysis into the chapter on measurements.

The participants indicated that the implementation of all calculations would require a lot of efforts, computing time and additional funds. It is assumed to be realistic to prepare the progress report by the beginning of September 2004 on the base of minimum program. The final version of the report can be ready by the end of 2004. The timetable of preparation of the report and obligations of different modelling groups are presented in Appendix VI.

The meeting discussed and accepted the list of the co-authors of the report as well as the list of persons who should be mentioned in acknowledgement.

Mark Cohen presented the first draft of a manuscript on the second stage of the study to publish it in "Atmospheric Environment". The participants agreed to consider the text and to prepare their comments and suggestions. The further preparation of the manuscript should be done by A.Ryaboshapko to whom all comments and suggestions should be sent by the middle of May 2004.

Alexey Ryaboshapko reported on preparation of the extended abstract to be published in proceedings of the International Conference "Mercury as a Global Pollutant". The participants agreed to give their suggestions for improving the text by the middle of May 2004.

The participants discussed possible approaches to include into the modelling schemes any parameterisations of the Arctic mercury depletion. It has been recognized that currently all suggested parameterisations are very conditional. Further efforts are needed to find a proper description of the depletion mechanism. The participants have also considered different approaches to evaluate secondary anthropogenic mercury re-emission using the current models.

Sergey Dutchak informed the participants of a planning EMEP/TFMM workshop on model review (November 2005). The experts were invited to take an active part in preparation for the workshop. They were addressed to be members of a Scientific Committee for developing the workshop program. It was also suggested to hold a preparatory meeting (to be organized by MSC-E in February or March 2005) to discuss strategy of further HM model development and of areas of model applications. Such a meeting can be used also for final discussion of mercury model intercomparison study.

LIST OF PARTICIPANTS

Workshop “Mercury model intercomparison study”

22 – 23 April 2004, EMEP / MSC-E, Moscow, Russia

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Appendix II

Agenda

of the expert meeting on mercury model comparison (Moscow, Russia, April 22-23, 2004)

April 22, 2004

Chairman - A.Ryaboshapko, MSC-E

10:00	Welcoming words	S.Dutchak
10:15	Discussion and adoption of the meeting agenda	A.Ryaboshapko
10:30	Presentation of the draft report on the 3 rd stage of the study	A.Ryaboshapko
11:10	Coffee/tee break	
11:30	Presentation of the modeling results by the participants	G.Petersen
11:50		R.Bullock
12:10		D.Syrakov
12:40		A.Dastoor
13:00		M.Cohen
13:20	Lunch	
14:30	Presentation of the modeling results	I.Ilyin
14:50		O.Travnikov
15:20	Characterization of the measurement data	J.Munthe
15:40	Coffee/tee break	
16:00	Discussion of the result	All
18:00	Closing of the session	
19:00	Dinner on behalf of the Center	

April 23, 2004

Chairman - G.Petersen, GKSS

09:30	Discussion of the text of the report	All
11:10	Coffee/tee break	
11:30	Discussing the joint presentation in Ljubljana	All
12:00	Preparation of the joint article on the 2 nd stage	M.Cohen
12:30	Planning of a joint article on the 3 rd stage	All
13:00	Lunch	
14:10	Discussion of future cooperation	S.Dutchak
16:30	Closing of the meeting	S.Dutchak

Output parameters to be calculated

1. Total gaseous mercury (TGM) concentrations at the site locations, ng/m³
2. Total mercury concentrations in precipitation at the site locations, ng/L
3. Precipitation amounts at the site locations, mm
4. Wet, dry and total depositions at the site locations, g/km²/yr
5. Total deposition over an individual country caused by its own national anthropogenic sources only, kg/month or kg/yr
6. Total deposition over an individual country caused by all possible sources (anthropogenic, natural, re-emission), kg/month or kg/yr
7. Map of distribution of TGM concentrations
8. Map of distribution of mercury concentrations in precipitation
9. Map of distribution of mercury wet deposition
10. Map of distribution of mercury dry deposition
11. Map of distribution of mercury total (wet+dry) deposition
12. Map of distribution of precipitation amounts used

Notes:

1. Average mercury concentrations in precipitations are calculated on mean-weighted basis according to precipitation amounts used.
2. Maps are prepared only for February 1999.
3. Maps are given only for Europe.

CONTENT OF PROGRESS REPORT

1		INTRODUCTION	
2		PROGRAM OF THE THIRD STAGE	
3		THE MEASUREMENT DATA	
4		THE EMISSION DATA	
5		METEOROLOGICAL DATA AND OTHER INPUT INFORMATION	
6		DESCRIPTIONS OF THE PARTICIPATING MODELS AND THE CALCULATION RESULTS	
	6.1	<u>A</u> cid <u>D</u> eposition and <u>O</u> xidants <u>M</u> odel (ADOM)	
	6.2	<u>C</u> ommunity <u>M</u> ulti- <u>S</u> cale <u>A</u> ir <u>Q</u> uality (CMAQ)	
	6.3	<u>G</u> lobal/ <u>R</u> egional <u>A</u> tmospheric <u>H</u> eavy <u>M</u> etals model (GRAHM)	
	6.4	<u>H</u> ybrid <u>S</u> ingle <u>P</u> article <u>L</u> agrangian <u>I</u> ntegrated <u>T</u> rajectory model (HYSPLIT)	
	6.5	<u>E</u> ulerian <u>M</u> odel for <u>A</u> ir <u>P</u> ollution (EMAP)	
	6.6	<u>D</u> anish <u>E</u> ulerian <u>H</u> emispheric <u>M</u> odel (DEHM)	
	6.7	<u>E</u> MEP/ <u>M</u> SCE Heavy Metal model, <u>H</u> g version (MSCE-Hg)	
	6.8	<u>M</u> SCE Heavy Metal model, <u>H</u> g <u>H</u> emispheric version (MSCE-Hg-Hem)	
7		COMPARISON OF INDIVIDUAL MODEL RESULTS AGAINST OBSERVATIONS	
8		COMPARISON OF HG ATMOSPHERIC BALANCES FOR INDIVIDUAL COUNTRIES	
11		CONCLUSIONS	
12		ACKNOWLEDGEMENTS	
13		REFERENCES	
14		APPENDIXES	

Minimum program of calculations:

All output parameters (Appendix III) for February 1999.
Depositions only over Poland for February 1999.

Complete program of calculations:

All output parameters (Appendix III) for each month of 1999.
Depositions over three individual countries (Poland, Italy and UK) for each month of 1999 and annually mean.

Timetable of preparation of the progress report and the final report

Action	Date
Fulfilment of the minimum program by all modelling groups and sending the results to MSC-E *	May 2004
Processing the data and preparation the progress report by MSC-E	June 2004
Fulfilment of the complete program by all modelling groups and sending the results to MSC-E	October 2004
Processing the data and preparation a draft of the final report by MSC-E	December 2004
Discussion and adoption of the final report	February 2005

*) All the modelling groups will send the maps in electronic form and MSC-E will prepare all the maps in common stile.

Obligations of the participants

Russell Bullock: (1) to calculate depositions onto Poland (at least); (2) to cut from the calculated field of the total deposition the depositions individually over Poland (at least).

Gerhard Petersen: (1) to send to MSC-E the monthly values of dry depositions for the site locations (nine locations); (2) to check the values of Hg concentrations in precipitation, wet depositions, total depositions over the countries.

Ashu Dastoor, Mark Cohen, Jesper Christensen: (1) to calculate all parameters needed for all months of 1999 by October 2004; (2) to fulfill the minimum program of the calculations by the end of May 2004.

Dimiter Syrakov: to try to reveal reasons of high variability of TGM; if needed – to recalculate the data.

Iliia Ilyin: to prepare the data for the Progress Report.

Oleg Travnikov: to calculate dry/wet depositions at the site locations and for the countries.

John Munthe: to combine the information on the measurements and to write a 2-3 paragraphs to the report by the end of May 2004.