

The Tenth Senior Technical Managers' Meeting  
of the Acid Deposition Monitoring Network in East Asia  
26-28 August 2009, Pathumthani, Thailand

## **Progress Report on Revision of the Technical Manual on Wet Deposition Monitoring**

Secretariat of the Expert Group  
on Revision of the Technical Manual  
on Wet Deposition Monitoring

### **I. Background**

1. The Ninth Session of the Intergovernmental Meeting (IG9) held in November 2007 in Vientiane, Lao PDR approved the establishment of the Expert Group on Revision of Technical Manual on Wet Deposition Monitoring together with other Task Forces and Expert Groups based on the recommendation of the Seventh Session of the Scientific Advisory Committee (SAC7). The task forces and expert groups have enabled more effective implementation of the scientific activities of the Strategy on EANET Development (2006-2010) in collaboration with the Network Center (NC) and the Secretariat of the Acid Deposition Monitoring Network in East Asia (EANET).
2. SAC7 appointed Prof. Hiroshi Hara as the Chairperson of the Expert Group and the NC for EANET as the secretariat.

### **II. Activities**

#### **II-1. First meeting of the Expert Group**

3. The NC, as the secretariat, consulted the chairperson of the Expert Group on other experts to be invited as members and made arrangements for the first meeting in 2008.
4. The first meeting was held on 2-3 October 2008 at the Acid Deposition and Oxidant Research Center (ADORC) in Japan.

#### **II-2. Terms of reference (TOR) of the Expert Group**

5. The first meeting decided to recommend the following TOR for the consideration of SAC.
  - To identify the technical and administrative problems encountered in the EANET operation since the beginning of the preparatory-phase operation

- To evaluate differences in the measurement techniques of other regional monitoring programs and modify the current EANET procedures if necessary for comparability of the measurements
- To discuss advances in the measurement techniques in long-term monitoring and intensive studies, and modify such techniques in an appropriate manner for the EANET Technical Manual
- To produce a revised Technical Manual on Wet Deposition Monitoring for EANET

### II-3. Members

6. The members of the Expert Group are as follows:

Prof. Hiroshi Hara (Chairperson)	Tokyo University of Agriculture and Technology, Japan
Mr. Izumi Noguchi	Hokkaido Institute of Environmental Sciences, Japan
Dr. Tsuyoshi Ohizumi	Environmental Management Division, Department of Civic and Environmental Affairs, Niigata Prefectural Government, Japan
Ms. Bulgan Tumendemberel	Mongolia
Dr. Joon Young Ahn	National Institute of Environmental Research, Republic of Korea
Dr. Hathairatana Garivait	Environmental Research and Training Center, Thailand
Dr. Dave MacTavish	Science and Technology Branch, Environment Canada
Ms. Leong Chow Peng	Malaysia
Mr. Shinji Nakayama	ADORC

### II-4. Major decisions at the first meeting of the Expert Group

7. The major discussions of the first meeting for revision of the technical manual are summarized as follows:
- The revised manual should, as far as possible, harmonize with procedures in the WMO Manual for the GAW Precipitation Chemistry Programme and EMEP manual for sampling and analysis.
  - The recommended procedures for siting of sites should apply to the other monitoring activities of EANET
  - The revised Technical Manual shall contain more precise information regarding snow sampling as requested by the Task Force on Monitoring Instrumentation
  - The revised Technical Manual shall include a list of useful websites in the Appendix
  - In view of the importance of meteorological data for assessment of acid deposition, the

meeting agreed that the revised Technical Manual shall further stress the importance of the measurements, the need to follow the WMO siting criteria for the meteorological instruments and the importance of regular calibration

- The current presentation of the Data Quality Objectives (DQOs) for EANET could be further improved and decided to follow the format of the WMO Data Quality Objectives for GAW
  - The importance of preparation of SOPs for all elements of operation by the national monitoring centers should be stressed. The NC was requested to compile the SOPs of all countries and make them available to all countries
  - It was decided to include additional items on determination of  $\text{HCO}_3$ , fluoride, nitrite, phosphate and organic acids in the analytical methods, new QA/QC items namely data validation, inter-laboratory comparison program and meta data, and include an appendix with suggestions for improvement based on the inter-laboratory comparison results and a list of suppliers and manufacturers.
9. A draft Table of Contents (revised) was prepared as the guide for the revision of the contents of the manual. Lead authors and Members to revise each chapter were assigned by the Chairperson.
10. It was concluded that more research activities are needed to identify ways to improve wet deposition monitoring. The research results will be useful for formulating better procedures for analysis or modification of the present criteria for ion balance. The research projects proposed are:
- I.  $\text{HCO}_3$  Index experiment
  - II. An inter-comparison project for field operations (reference method)
  - III. Organic acids

## II-5. Schedule

11. The Expert Group agreed on the following schedule:

<u>2-3 October 2008</u>	First meeting of the EG to identify problems and find solutions
<u>15-17 October 2008</u>	Chair of EG reports to SAC8
<u>October to December 2008</u>	Discussion of the comments from SAC and IG (if any) will be distributed to the EG members by the NC Preparation of the document draft by EG members Compilation of the first draft of the revised Technical Manual
<u>January to March 2009</u>	Circulation of the first draft to members Review of the first draft of the revised Technical Manual

<u>March to August 2009</u>	Revision of the draft revised Technical Manual
<u>1-2 October 2009</u>	Second meeting of the expert group to finalize the draft revised Technical Manual
<u>Autumn 2009</u>	Submission of the draft revised Technical Manual by the Chair to SAC9 for comments
<u>Autumn 2010</u>	Submission of the final draft of the revised Technical Manual by the Chair to SAC10 for adoption

### **III. Recommendations to SAC8**

12. The Eighth Session of the Scientific Advisory Committee (SAC8) was invited to consider the report on the activities of the Expert Group and endorse the following:
  - i) The TOR of the Expert Group
  - ii) Membership of the Expert Group
  - iii) The draft Table of Contents of the proposed revised Technical Manual on Wet Deposition Monitoring attached as Annex
13. SAC8 was invited to note the recommendation of the expert group to carry out the following research activities:
  - HCO<sub>3</sub> Index experiment
  - An inter-comparison project for field operations (reference method)
  - Organic acids

### **IV. Discussion at SAC8**

14. Major comments and discussion include the following:
  - To revise the first bullet of the draft TOR, to “To identify the technical and administrative problems associated with wet deposition monitoring encountered in the EANET operation since the beginning of the preparatory-phase operation”
  - It was suggested that the revised Technical Manual should include some guidelines to review the evaluation methods for quantities with low data completeness.
15. SAC8 noted the recommendation of the Expert Group to carry out the following research activities:
  - i) Theoretical and experimental development of the method for assessing hydrogen carbonate
  - ii) A field inter-comparison with a specific reference sampler
  - iii) Determination of organic acids for improving the ion balance and evaluation of major

compounds to control the acidity

16. SAC8 approved the draft table of contents of the Technical Manual on Wet Deposition Monitoring (revised) and requested the Expert Group to further develop the manual.

**V. Discussion at IG10**

17. At the Tenth Session of the Intergovernmental Meeting (IG10) held in November 2008, the TOR was approved as the following contents:
  - To identify the technical and administrative problems associated with wet deposition monitoring encountered in the EANET operation since the beginning of the preparatory-phase operation
  - To evaluate differences in the measurement techniques of other regional monitoring programs and modify the current EANET procedures if necessary for comparability of the measurements
  - To discuss advances in the measurement techniques in long-term monitoring and intensive studies, and modify such techniques in an appropriate manner for the EANET Technical Manual
  - To produce a revised Technical Manual on Wet Deposition Monitoring

**Annex**

Technical Manual on Wet Deposition Monitoring  
Draft Table of Contents (Revised)

1. Introduction (Philosophy) (*Prof. Hiroshi Hara, Dr. Dave Mactavish*)
  - 1.1 Background
  - 1.2 Objectives of wet deposition monitoring
  - 1.3 Outline of the manual for monitoring wet deposition
  
2. Siting (*Prof. Hiroshi Hara, Mr. Izumi Noguchi*)
  - 2.1 Monitoring sites
    - Clarify difference between urban, rural and remote sites (ref WMO)
    - 2.1.1 Siting the sampling equipment
      - Site relocation
    - 2.1.2 Minimum distance to emission and contamination sources
    - 2.1.3 Local criteria
  - 2.2 Monitoring frequency and measurement parameters
    - 2.2.1 Monitoring frequency
    - 2.2.2 Measurement parameter
      - Review monitoring frequency – weekly measurements, common sampling day
  
3. Sampling (*Dr. Tsuyoshi Ohizumi, Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel*)
  - 3.1 Introduction
  - 3.2 Precipitation sampling
    - 3.2.1 Facilities at the site
    - 3.2.2 Sample collection instruments
  - 3.3 Snow sampling
    - Review techniques for snow sampling
  
4. Site Operation (*Mr. Izumi Noguchi, Dr. Tsuyoshi Ohizumi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait, Prof. Hiroshi Hara*)
  - 4.1 Collection of samples
    - 4.1.1 Measurement of precipitation amount
    - 4.1.2 Sample Preservation
      - Refrigeration, Use of biocides
      - Review use of biocides (*Prof. Hiroshi Hara, Dr. Tsuyoshi Ohizumi,*)

5. Sample Handling (*Mr. Izumi Noguchi, Dr. Tsuyoshi Ohizumi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
  - 5.1 Introduction
  - 5.2 Cleaning and preparation of collection vessel
  - 5.3 Transport of the collection vessel to the collector
  - 5.4 Removal and replacement of sample at the collector
  - 5.5 Transportation of sample to the sample handling area
  - 5.6 On-site measurements
  - 5.7 Field blank
  - 5.8 On-site sample preservation
  - 5.9 Sample documentation
  - 5.10 Routine instrument checking and maintenance
  - 5.11 Sample shipment
  
6. Chemical Analysis (*Mr. Izumi Noguchi, Prof. Hiroshi Hara, Dr. Hathairatana Garivait, Ms. Bulgan Tumendemberel, Dr. Joon Young Ahn*)
  - 6.1 Introduction

Para 2 should be modified for HCO<sub>3</sub>, fluoride, nitrite and organic ions  
Laboratory treatment of samples (*Dr. Hathairatana Garivait*)
  - 6.2 Quality of chemicals and water (*Dr. Hathairatana Garivait*)
  - 6.3 Electric conductivity (*Mr. Izumi Noguchi*)
    - 6.3.1 Background
    - 6.3.2 Apparatus
    - 6.3.3 Reagent solution
    - 6.3.4 Calibration (specification of procedure)
    - 6.3.5 Measurement procedure
  - 6.4 pH measurement (*Mr. Izumi Noguchi*)
    - 6.4.1 Background
    - 6.4.2 Apparatus
    - 6.4.3 Reagents and solutions
    - 6.4.4 Calibration of pH meter
    - 6.4.5 Measurement procedure
  - 6.5 Anion determination by ion chromatography (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
    - 6.5.1 Background
    - 6.5.2 Apparatus
    - 6.5.3 Reagents and solutions
    - 6.5.4 Measurement procedure

- 6.6 HCO<sub>3</sub> determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
- 6.6.1 Background
  - 6.6.2 Apparatus
  - 6.6.3 Reagents and solutions
  - 6.6.4 Measurement procedure
- 6.7 Fluoride determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
- 6.7.1 Background
  - 6.7.2 Apparatus
  - 6.7.3 Reagents and solutions
  - 6.7.4 Measurement procedure
- 6.8 Nitrite determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
- 6.8.1 Background
  - 6.8.2 Apparatus
  - 6.8.3 Reagents and solutions
  - 6.8.4 Measurement procedure
- 6.9 Phosphate determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
- 6.9.1 Background
  - 6.9.2 Apparatus
  - 6.9.3 Reagents and solutions
  - 6.9.4 Measurement procedure
- 6.10 Organic acids determination method (*Dr. Joon Young Ahn, Dr. Hathairatana Garivait*)
- 6.10.1 Background
  - 6.10.2 Apparatus
  - 6.10.3 Reagents and solutions
  - 6.10.4 Measurement procedure
- 6.11 Cation determination by ion chromatography (*Dr. Joon Young Ahn*)
- 6.11.1 Background
  - 6.11.2 Apparatus
  - 6.11.3 Reagents and solutions
  - 6.11.4 Measurement procedure
- 6.12 Ammonium ion determination by spectrophotometry (*Dr. Joon Young Ahn*)
- 6.12.1 Background
  - 6.12.2 Apparatus
  - 6.12.3 Reagents and solutions



- 6.12.4 Measurement procedure
- 6.13 Metal determination by atomic absorption/emission spectrometry (*Dr. Joon Young Ahn*)
  - 6.13.1 Background
  - 6.13.2 Apparatus
  - 6.13.3 Calibration
  - 6.13.4 Procedure
- 7. QA/QC (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)
  - 7.1 Classification of data
    - 7.1.1 Reporting data
    - 7.1.2 Controlled data by individual country
  - 7.2 Data checking
    - 7.2.1 Statistical test
    - 7.2.2 Ion balance and conductivity balance check
    - 7.2.3 Data completeness
    - 7.2.4 Analytical precision
  - 7.3 Data flags
  - 7.4 Data Validation
  - 7.5 Inter-laboratory Comparison Program
  - 7.6 Meta Data
- 8. Data Reporting (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)
  - 8.1 Data reporting form
    - 8.1.1 Information about sites, sampling, shipping, laboratory operation
    - 8.1.2 Chemical analysis
    - 8.1.3 Measurement results and flags
- 9. Overall QA/QC (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)
  - 9.1 Introduction
  - 9.2 Data quality assessment
    - 9.2.1 Sampling precision
    - 9.2.2 Quality control of laboratory measurements
  - Table 11.12 acceptable levels should be reviewed, too tight?
  - 9.3 Site performance audit
  - 9.4 Preliminary quality assurance of obtained data sets
  - 9.5 External quality assurance program
  - 9.6 Training

Appendix

Improvement according to the Interlab comparison results (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)

List of suppliers and manufacturers (NC)

List of useful web sites (NC)

- Items underlined shows new items or contents to be reviewed
- Names underlined are the lead authors of each chapter.