ACID DEPOSITION MONITORING NETWORK IN EAST ASIA (EANET)

FIRST MEETING OF THE EXPERT GROUP ON REVISION OF THE TECHNICAL MANUALS FOR DRY DEPOSITION FLUX ESTIMATION AND AIR CONCENTRATION MONITORING (Internet meeting, 23 April 2020)

AGENDA

April 23

Thailand, Vietnam: 08:00-08:05, China: 09:00-09:05, Japan, Korea: 10:00-10:05

1. Introductory remarks, Introduction of members, Adoption of agenda — All Members and NC

Thailand, Vietnam: 08:05-08:15, China: 09:05-09:15, Japan, Korea: 10:05-10:15

2. Introduction on technical manuals for Dry Deposition Flux Estimation and Air Concentration Monitoring — NC

Thailand, Vietnam: 08:15-9:45, China: 09:15-10:45, Japan, Korea: 10:15-11:45

3. Review on the current Technical Manual for Air Concentration Monitoring in East Asia — All Members NC

(NC will explain revision points and comments for each Chapter as follows. Then, the participants will hold discussions.)
Chapter 1 Introduction: Dr. Minoura
Chapter 2 Monitoring design: Dr. Minoura
Chapter 3 Automatic monitoring: Dr. Yuba
Chapter 4 Manual monitoring: Dr. Huo
Chapter 5 Maintenance: Dr. Sato
Chapter 6 Data reporting and validation: Dr. Sato
Chapter 7 Quality Control and Quality Assurance: Dr. Sato
Chapter 8 Conclusions: Dr. Sato

Thailand, Vietnam: 09:45-10:55, China: 10:45-11:55, Japan, Korea: 11:45-12:55

4. Review on the current Technical Manual on Dry Deposition Flux Estimation in East Asia — All Members NC

(NC will explain revision points and comments for each Chapter as follows. Then, the participants will hold discussions.)
Chapter 1 Introduction: Dr. Minoura
Chapter 2 Fundamental items for dry deposition flux estimation: Dr. Minoura
Chapter 3 Data reporting: Dr. Sato
Chapter 4 Methodology for dry deposition flux estimation in EANET: Dr. Sato
Chapter 5 Future direction of dry deposition flux estimation: Dr. Sato
Appendix 1-3: Dr. Sato

Thailand, Vietnam: 10:55-11:00, China: 11:55-12:00, Japan, Korea: 12:55-13:00

5. Next steps and schedule — All Members and NC

Thailand, Vietnam: 11:00, China: 12:00, Japan, Korea: 13:00
Closing

MEETING MINUTES

I. Introductory remarks, Introduction of members, Adoption of agenda

Dr. Patcharawadee Suwanathada, the Chairperson of the Expert Group on revision of the Technical Manuals for Dry Deposition Flux Estimation and Air Concentration Monitoring (EGRTM) welcomed the members of the EGRTM to the internet meeting. The EGRTM members and the Secretariat, established by the Network Center for EANET (NC), introduced by themselves. The Chairperson explained the Provisional Agenda of 1st meeting, and the EGRTM members agreed with the Agenda as proposed.

II. Introduction on technical manuals for Dry Deposition Flux Estimation and Air Concentration Monitoring

The NC explained the background and purpose of the 1st meeting. The outcomes of previous meeting of the Task Force on Monitoring for Dry Deposition (TFMDD) and the establishment of the EGRTM and recent dry deposition and air concertation data were introduced. The major points are shown as follows.

i) This meeting will review the current Technical Manuals attached to the comments and revisions by the NC. The outcome from the 1st meeting of EG will be reported to SAC and then IG.
ii) Revision of the technical manuals is one of the 7 activities shown in the Strategy Paper on Future Direction of Monitoring for Dry Deposition of the EANET (2016-2020). The 4th meeting of TFMDD gave some comments and suggestions to revise the technical manuals.
iii) Currently, the spatial coverage of dry deposition flux is not enough. The number of air concentration monitoring stations in EANET is increasing, but it is still not enough especially for Ozone and $PM_{2.5}$ monitoring. It is necessary to expand the coverage for estimation of dry deposition flux and regional assessment of air pollution level.

III. Review on the current Technical Manual for Air Concentration Monitoring in East Asia

The NC has revised and put some comments on the Technical Manual for Air Concentration Monitoring and explained the main points chapter-by-chapter, and then the contents were reviewed. Major revision points and discussions are summarized below. If there are other comments, the EGRTM members and the NC will discuss on the email basis.

Chapter 1 Introduction

[Major revision points]
i) The preface should be revised after revising other chapters.
ii) The priority of monitoring chemical species in EANET should be discussed to reclassify the category. $PM_{2.5}$ categorized in the second priority should be considered following the description of the Strategy Paper.
iii) Introduction of $PM_{2.5}$ monitoring using impactor on the filter pack can be added in chapter 4.

[Major discussions]
i) $PM_{2.5}$ should be the first priority because $PM_{2.5}$ becomes important species in many regions or countries. It was clarified that the classification of priority has already been deleted in the current Strategy Paper. The species should be listed in one group as same as the Strategy Paper.

ii) The words of “First priority” and “Second priority” should be changed to “Priority” and “Optional”, respectively.
iii) The contents of technical manuals should follow the Guidelines for Acid Deposition Monitoring in East Asia, not the Strategy Paper. It was pointed out that the Guidelines has not been revised since it was prepared at the beginning of EANET (March 2000). The Guidelines need to update at first, and then the technical manual should be revised following the Guidelines.
iv) The particulate component should be described regarding the size of particle ($PM_{2.5}$ or PM_{10}). It was pointed out that there is no particle size classifier in EANET monitoring and only TSP monitoring is conducted. Chemical composition measurement of PM_{10} and $PM_{2.5}$ monitoring is the future direction.
v) The particle size of the particulate component monitoring different by countries. The inlet of filter pack method should be described in detail. The particle of monitoring chemical components assumes to be TSP because a filter pack with open face inlet is installed in EANET monitoring stations. The difference of the particle size in filter pack method could be put in the footnote.

Chapter 2 Monitoring design

[Major revision points]
i) In the explanation of the monitoring station, the example photos of the monitoring stations are added. Stand-alone type (shelter or enclosure type) is added as the new category of the type of the monitoring station.
ii) The recommended UPS type is described in detail. We recommended to install UPS with double conversion on-line.
iii) Cautions for setting temperature inside the monitoring station or enclosures to prevent dew are added. Safety management such as leakage of rainwater should also be described.

[Major discussions]
i) The references should be added, if necessary. Especially, the referred website address in the documents should be checked if it is active or not.
ii) The site description should be simplified and referred to the wet deposition monitoring manual because some parts are duplicated.
iii) The word of wet deposition is more appropriate than acid deposition shown in the current technical manual. The description of wet deposition should be consistent with other EANET manuals.
iv) The measurement of the dry deposition is recommended to conduct at the same site of wet deposition monitoring site as described in the Guideline.
v) In Table 2.1, NOx needs to be changed to NO and NO2. The description of NO, NO2 and NOx should be consistent in this manual. A collection procedure for automatic monitoring data at the monitoring site can be added.
vi) The frequency of cleaning the particle matter sampling tube should be described in the maintenance part. For example, the frequency of cleaning is depended on the situation of each monitoring site, but the sampling tube should be cleaned especially after dust pollution.

Chapter 3 Automatic monitoring

[Major revision points]
i) Section structures describing respective monitoring instruments are different. The contents were reorganized such as the section of "Principle of the method", " Instrumental setup", and "Calibration".

ii) Some contents such as electric circuit diagrams of SO_2, NOx, and O_3 analyzers should be deleted because they are not useful for local technical staffs. If it is necessary to keep those diagrams, they can be shown in the appendix.
iii) Figures 3.4, 3.7, 3.10, 3.18 should be revised to describe so that the instrumental system is clearer.
iv) The chemical reaction formulas of SO_2 detection has been added. The calibration method of SO_2 monitor is revised as step by step procedures.
v) The summary of chemical reaction formulas of NO and NO_2 detection has been added in the principle part. The description of NO convertor and convention efficiency check has been added.
vi) The O_3 scrubber has been added in the figure of monitor. The description of O_3 calibrator was moved to the calibration section. The zero air and span air are added to the O_3 calibration section.
vii) The order of section for an automatic particulate matter monitoring has been modified. The graph of sampling has been modified.
viii) The description of DOAS is too detailed. Some contents should be moved to the appendix. DOAS is currently used in China and Philippine. The NC will ask the EGRTM member in Philippines and other experts in China and Philippines to review the description of DOAS.
ix) The dark noise (S/N ratio) of the current amp should be shown in the PDA detector section.
x) The meteorology section has not been revised by NC at this moment.

[Major discussions]
i) At the beginning of each section, some general descriptions of monitoring technology need to be shown. Then, specific monitoring techniques should be described. For example, the conventional NOx analyzer obtains NO_2 concentration subtracting NOx to NO concentration. Another system (CAPS etc.) can measure NO_2 concentration directly.
ii) The newly applied methods could be also added in the additional section or appendix.
iii) The popular type of PM_{10} and $PM_{2.5}$ size separators such as Well Impactor Ninety-Six (WINS) and Very Shape Cut Cyclone (VSCC) needs to be described. The description of cutoff efficiency needs to be reconsidered because the different models of cyclone and impactor are used in EANET monitoring stations. It is better to describe both of impactor and cyclone methods.
iv) Some detailed descriptions can be deleted or moved to the appendix to keep providing the information.

Chapter 4 Manual monitoring

[Major revision points]
i) The manual method described in this manual includes filter pack, passive sampler and annular denuder. The denuder method is suggested to move to future method or appendix because the denuder method is not used in EANET sites. Compared with the filter pack method, denuder method can avoid artifacts and measure particulate components and gases separately. This advantage should be described briefly. The EMEP manual which describes the denuder method in detail can be shown as reference.
ii) An example of field notes has been added as Figure 4.2. The description of leak check has been revised including two methods and shown as pictures. The flow chart of impregnated filter preparation and extraction of filter samples are added. The flowchart of filter pack assemble is also recommended to be added.

iii) The section of passive sampler method is suggested to move prior to the section of denuder method. K_2CO_3 filter can be optionally used for the passive sampler to measure SO_2 concentration. Therefore, the optional method should be added in Table 4.6. The flowchart of impregnated filter extraction is shown in Figure 4.8.

[Major discussions]

i) The troubleshooting section is needed in chapter 3, 4 or the QA/QC part. There are some common troubles for each automatic monitors and manual methods.
ii) The section of the denuder should be kept. Nowadays, there is no EANET station applied the denuder method. In the future, we should consider to change the method, because the denuder method has the advantage to avoid the artifact.
iii) The filter pack or other manual sampling is suitable in the place where PM concentration is too low to measure the concentration using the automatic monitors. It should be mentioned at the beginning of chapter 4.
iv) One of the advantages of the manual method is lower concentration can be determined than the automatic method. The DQOs of air pollutant monitoring need to be shown for manual method and automatic method respectively.
v) The sampling period of filter pack in EANET is one week or two weeks. However, it is not suitable in the urban area with very high concentration. There are some comments about the suitable sampling period.
vi) The leak check of filter pack sampling at the station and flow rate calibration needs to be added.
vii) When the start and end of sampling period are recorded, the time difference among EANET countries also should be considered. The monitoring time is followed by the local time in each country.

Chapter 5 Maintenance

[Major revision points]

i) In chapter 5, there is the general information on how to make the SOP. Some contents (ex. Section 5.3 maintenance of automatic monitors) should be moved to chapter 3 and 4.
ii) Examples of field record and maintenance record will be added.
iii) Troubleshooting can be described in this chapter or another section. How to use inter-lab samples as reference material can be added.

Chapter 6 Data reporting and validation

[Major revision points]

i) The data validation and screening will be added in the section of the data treatment protocol.
ii) Examples of how to validate data will be shown in section 6.3.
iii) Flag codes should be consistent with the wet deposition monitoring manual and dry deposition flux estimation manual.
iv) The contents in section 6.4.1 have been already described in QA/QC Guidebook. It will be deleted to avoid the duplication.
v) The data reporting form should be updated.

Chapter 7 Quality Control and Quality Assurance

[Major revision points]

i) Some contents (sections 7.3, 7.7, and, 7.8) of chapter 7 are already described in the QA/QC guidebook. These will be briefly described and refer to the QA/QC guidebook.

ii) The appropriateness of DQO for the detection limit should be considered because the determination of DQO is very important. DQO for LOD shown in table 7.2 should be shown separately depending on the monitoring methods.
iii) The contents in section 7.6 will be moved in chapters 3 and 4.

[Major discussions]
i) In the Table 7.2 the sampling period of PM_{10} and $PM_{2.5}$ needs to be described separately. The detection limit of particulate matter is depended on the particle diameter.
ii) Particulate matter components in table 7.2 should be consistent with chapter 1, if the contents of chapter 1 is revised.
iii) The sampling time is from one day to one week. The detection limits for daily sampling and weekly sampling also needs to be shown in a different line.
iv) EANET set the data completeness should be more than 70%. It is very low. The different completeness is recommended to apply in urban, rural, and remote separately.
v) The data completeness should be set according to the number of the necessary data for the statistical analysis.
vi) The goal of DQO and data completeness should be clear. How to achieve the goal of DQO can be suggested in this chapter. The DQO depends on the monitoring purpose. The objective of EANET monitoring is to estimate the long-term trends.
vii) The DQO for particulate matter components is 0.01 $\mu g/m^3$. It looks too low to achieve the DQO using the current monitoring system, but it is possible to be achieved using the filter pack system in the weekly sampling. DQO of HCl, HNO_3, NH_3 measured by the filter pack system should be the same level of particulate matter components.

Chapter 8 Future issues

[Major revision points]
i) The future direction will be added in the conclusion. For example, the current technique will be reviewed in the conclusion such as the photolytic converter for NOx analyzer which can avoid the artifact from another nitrogen oxides, filter pack with $PM_{2.5}$ impactor, $PM_{2.5}$ component automatic monitor.

IV. Review on the current Technical Manual on Dry Deposition Flux Estimation in East Asia

The NC has revised and put some comments on the Technical Manual on Dry Deposition Flux Estimation and explained the main points chapter-by-chapter, and then the contents were reviewed. Major revision points and discussions are summarized below. If there are other comments, the EGRTM members and the NC will discuss on the email basis.

Chapter 1 Introduction

[Major revision points]
i) There are some minor revisions to correct or clarify wording.

[Major discussions]
i) Currently, the dry deposition flux of $PM_{2.5}$ mass has not been estimated and needs to be considered in the future.

Chapter 2 Fundamental items for dry deposition flux estimation

[Major revision points]

i) Priorities of chemical components are also described in chapter 2. It should follow the Technical Manual for Air Concentration Monitoring.
ii) The relationship between deposition velocity and Ra, Rb, L should be shown in section 2.2.5.
iii) The calculation method for the standard deviation of wind speed should be included.
iv) The description of the atmospheric stability should be treated carefully.

[Major discussions]
i) The dry deposition flux estimation for $PM_{2.5}$ was excluded in this manual because there is currently no hourly meteorological data in many EANET stations. However, recently the information about PM is important in many counties. This sentence of Lines 10-13 in Page 7 should be removed. We should consider to elaborate on the estimation of PM dry deposition flux.
ii) A suitable method to estimate dry deposition flux in EANET countries should be considered. The dry deposition flux estimation using the weather forecast model does not need the meteorological parameters which are not measured in many EANET monitoring stations. If we choose another model, EANET should include the monitoring of the meteorological parameters.
iii) The current technical manual shows the many options in the atmospheric stability, land use, and so on. It is possibly described in the option or appendix.
iv) It is difficult to understand how to use wind direction. It should be described how to use this parameter.

Chapter 3 Data Reporting

[Major revision points]
i) Some contents are already described in the Technical Manual for Air Concentration Monitoring (ex. data check and flag). The contents should be checked and omitted.
ii) Some examples are needed to show how to estimate dry deposition flux in this manual by using the report form.

Chapter 4 Methodology for dry deposition flux estimation in EANET

[Major revision points]
i) This chapter will be revised according to the discussions by the 1st EGRTM meeting. Currently, the dry deposition flux is estimated only in Japan. The calculation of dry deposition flux should be conducted in a wide range of EANET region. The methodology for the dry deposition flux estimation needs to be revised with the consult from Prof. Matsuda.
ii) It is better to describe a practical method for EANET sites using an MS Excel program. The revised methodology should appliy to most EANET sites. Hourly meteorological data is reported less than 20% from EANET sites. The NC currently only estimates dry deposition flux at the Japanese sites. It is important to expand the coverage of dry deposition flux to other EANET sites. The current Excel macro program doesn't work well for some versions of MS Office, so new MS Excel worksheet needs to be developed.

[Major discussions]
i) There are three options to update the current methods, namely, using the current resistance model, updating to the new resistance model, and using the chemical transport model. We should choose the most feasible method considering the situation in EANET countries. It is also recommended to update the new resistance model for estimation of the dry deposition flux of particulate components and gases.

ii) The calculation method shown in this manual is too old. It is based on the research papers in the 1990s. The resistance model should be updated.
iii) There is another method to estimate the dry deposition flux. US uses the combination method of the monitoring and the chemical transport model (CMAQ). Regarding estimation of $PM_{2.5}$ dry deposition flux in US, PM concentrations are used by the open-face filter pack data and PM size are separated according to the chemical species (ex. Sulfate belongs to fine mode, and nitrate is separated into fine and coarse modes). This estimation could also be added in this manual. We should discuss the suitable method of dry deposition flux estimation for the EANET.
iv) If there is difficulty to use the model, the updated resistance model based on the MS Excel file can be provided by Prof. Matsuda. Distribution of the excel file would be better because the preparation of the emission inventory etc. is difficult when we use the CMAQ model.
v) The resistance model for gaseous species should also be updated.
vi) EANET promotes to conduct the estimation of the dry deposition flux in the wide range of the EAENT region. The dry deposition flux is estimated at Japanese monitoring stations in EANET and recorded in the current data report. We should consider a suitable calculation method to achieve the EANET future plan.
vii) The new resistance model would be suitable considering that the meteorological data is available at 30-40% of EANET stations. The hourly meteorological data is obtained at about 15 stations (20% of EANET stations).

Chapter 5 Future direction of dry deposition flux estimation
Appendices I, II and III

[Major revision points]
i) The dry deposition flux estimation for $PM_{2.5}$ and calculation method should be considered based on the recent methods.
ii) The appropriateness of reference height (10 m) should be discussed.
iii) Appendix III describes the MS Excel macro program for the dry deposition velocity calculation provided by the NC. This macro version is old and difficult to operate. The Excel file is better to be updated without macro.

IV. Next Steps and Schedule

i) Based on the discussion at the 1st EG meeting, the NC will revise and circulate the draft of the Technical Manuals by early 2021. The revised draft will be discussed at the 2nd meeting of the Expert Group held on April/May 2021. The 3rd meeting of the Expert Group will be held in April/May 2022 to prepare the final draft.
ii) The outcome of the 1st meeting of the Expert Group will be reported in the 5th meeting of the Task Force for Monitoring on Dry Deposition (7 July, 2020 by an internet meeting) and the 20th Session of Scientific Advisory Committee (September 2020 by an internet meeting).
iii) The minutes of the 1st EGRTM will be sent to the EG members after the meeting by e-mail.
iv) If necessary, an internet meeting can be held again after the NC prepares the second revised draft of the technical manuals.

List of participants

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