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Discussion on the estimation methods of the dry deposition in EANET

1.　Background

The deposition process of gaseous and particulate matters in the atmosphere is divided into "wet deposition" and "dry deposition". In order to evaluate the ecological impact caused by the acid deposition, it is required to monitor both of the wet and dry depositions for the same period. The wet deposition can be observed easily by collecting and analyzing rainfall. On the other hand, further verification is still required for the measurement methods of the dry deposition because the dry deposition process is affected by a character of the depositing matters, surface properties and the meteorological conditions. In this context, the method for routine monitoring of the dry deposition has not been established yet in EANET. In the present state for the dry deposition monitoring in EANET, the measurement of gases and particles concentrations in the atmosphere which are necessary parameters for the estimation of the dry depositions has been implemented in advance.

2.　Estimation methods for the dry deposition

Measurement technique for the dry depositions can be divided mainly into direct measurement and inferential method. Fundamentally, the deposition should be monitored directly. However, the direct measurement represented by the Gradient Method is not appropriate for a routine monitoring in the network because it requires prohibitive cost and skilled works. In recent years, a surrogate surface measurement method is suggested because of its inexpensive cost and simple method. However a few problems remain for the surrogate surface method like a usage in heavy-rain regions and a similarity with real surfaces. Throughfall measurement is relatively a simple method in the direct measurement. However it is suitable only for a forested area.

On the other hand, the inferential method can calculate the dry deposition flux by reproducing the deposition process from a simple resistance model. In addition, the inferential method does not require the special equipments but can calculate the flux from the concentration in the atmosphere and the meteorological factors which can be obtained routinely. As an example, many kinds of researches regarding the inferential method have been reported in Europe and U.S. In particular Clean Air Status and Trends Network (CASTNET), U.S. EPA, has adopted the inferential method for the estimation of the dry deposition as its formal method.

3.   Review of existing activities for the dry deposition monitoring

Direct Measurement

> Gradient Method   - EANET Joint Research in Thailand, etc

> Throughfall Measurement   - ICP Forest, ICP-IM, etc

> Surrogate Surface Measurement   - New Technique

Inferential Method   - EANET Joint Research in Thailand

                                  - CASTNET in U.S.

                                  - EMEP (as a module in Chemical Transport Model)

4.   Discussion on applicable methods for the dry deposition in EANET

The establishment of the regular estimation method for the dry deposition is still a pending issue and second edition of "Strategy Paper for Future Direction of Dry Deposition Monitoring of EANET" which was endorsed in SAC5 (2005, Niigata) suggests its early establishment as well as further extension of the air concentration monitoring which can provide useful information for health effects. In consideration of the present circumstances, it is suggested that the inferential method is one of the most appropriate methods in order to implement the routine monitoring based on the same level of monitoring technique in EANET. However it is surely required to develop the resistance model which uses the most appropriate parameterization for various regions in EANET.

For EANET which contains various seasonal and land use categories, it is mentioned in the Strategy Paper that the parameterizations developed in Europe and U.S. cannot be adapted without modifications. Thus, the effectiveness of existing inferential methods to EANET should be verified based on the comparison with the results of the direct measurement at some representative sites. It is possible from the comparison to tune the parameterizations to those for each representative site and apply the tuned parameterizations to a similar type of site suitably. Also existing results of previous researches regarding the parameterizations in East Asia should be reflected to our monitoring network.

5.   Procedure for the establishment of the estimation methods for dry deposition.

Step1.   Discussion on the modification of inferential method to be applicable for EANET by a Task Force on Dry Deposition Monitoring

Step2.   Preparation of the Guide line for the estimation of the dry deposition by a Task Force on Dry Deposition Monitoring

Step3.   Discussion on the method to disclose the estimated results by SAC (Data Report, Periodic Report, etc)