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on Acid Deposition Monitoring Network in East Asia
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Consideration of recommendation on the estimation methods for dry deposition flux in EANET

Network Center for 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 rain and snow fall. 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. Expected outcomes for dry deposition fluxes in the Strategy on EANET Development

According to the framework described in the second edition of “Strategy Paper for Future Direction of Dry Deposition Monitoring of EANET” which was endorsed in SAC5 (2005, Niigata), the following activities are included in “Strategy on EANET Development (2006-2010)” which was endorsed in IG8 (2006, Viet Nam) as expected outcomes for the estimation of dry deposition flux;

- *Development and application of monitoring methods for dry deposition considering current country-specific monitoring methodology*
 - Technical Manual for dry deposition fluxes estimation prepared by Task Force on Dry Deposition Monitoring (2008-2010)
 - Estimation of dry deposition fluxes at the selected monitoring sites (2009-2010)

3. Estimation methods for dry deposition fluxes

Further verification is still required for the measurement methods of dry deposition flux because the dry deposition process is affected by a character of the depositing matters, surface properties and the

meteorological conditions. Measurement technique for dry deposition flux can be divided mainly into direct measurement and inferential method. 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. On the other hand, the inferential method does not require the special equipments but can calculate the flux from the multiplication between air concentration and dry deposition velocity (V_d) which is calculated by some parameters like meteorological factors, land use types and seasonal categories.

Inferential method can output dry deposition flux without high cost and skilled measurements and the second edition of Strategy Paper for Future Direction of Dry Deposition Monitoring of EANET recommends its application in EANET. However, inferential methods have been mainly developed in U.S. and Europe and validation survey should be undertaken in advance of Asian application. In addition, every necessary meteorological factor has not been monitored at many sites in the current states of EANET. Thus, as a case study, NC presented example estimation of dry deposition flux of SO_2 at SAC6 by means of a meteorological simulation model outputs. Figure 2 shows the estimated annual amount of SO_2 dry deposition, annual amount of $nss-SO_4^{2-}$ wet deposition and annual precipitation in 2004 at EANET sites.

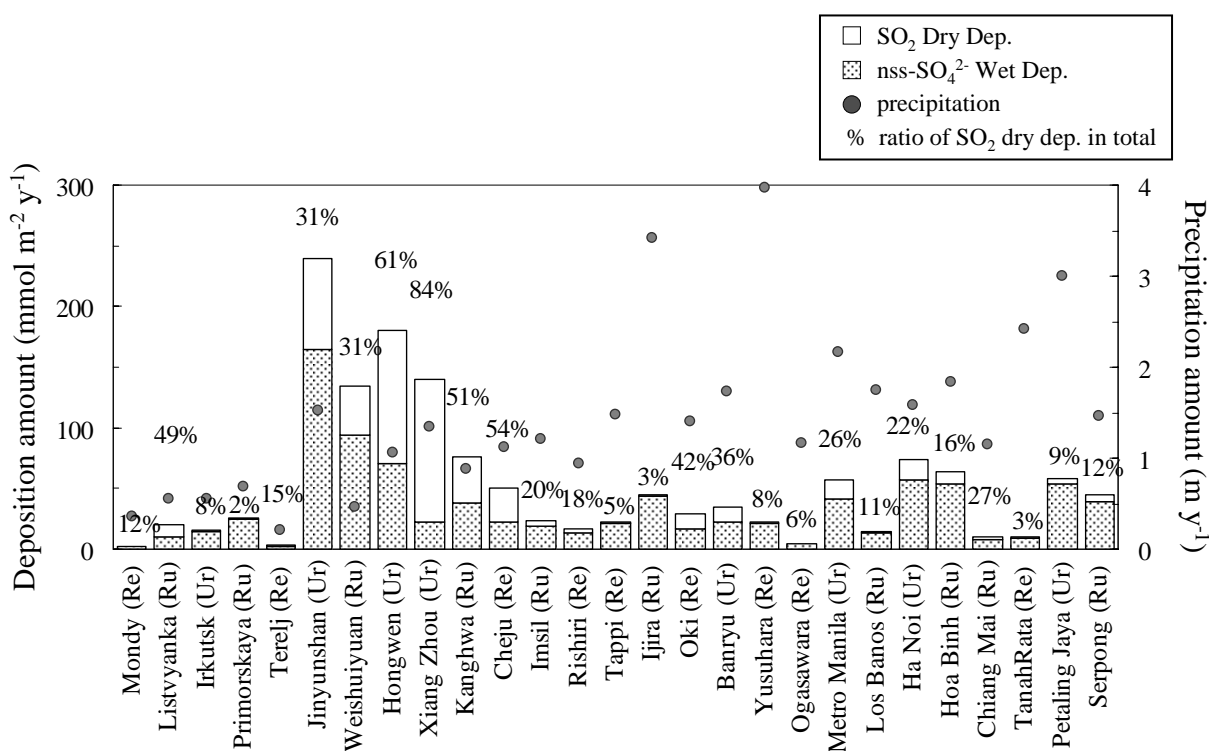


Figure 2 Estimated annual amount of SO_2 dry deposition, annual amount of $nss-SO_4^{2-}$ wet deposition and annual precipitation in 2004 at EANET sites.

In order to evaluate the ecological impact caused by the acid deposition, it is essential to estimate both of the wet and dry depositions. Though each country recognizes that dry deposition flux must be evaluated in EANET, there are various opinion among countries. For example, (1) dry deposition flux should be estimated by each country freely, (2) we want to use dry deposition velocity (V_d) that was obtained by our direct measurement survey, and (3) simple direct measurements like throughfall measurement and surrogate surface measurement method can also be applied. At this moment, it seems to be important to grasp the approximate amount of dry deposition and its estimation should be implemented in a hurry by using any kinds of estimation method. If we get different results of estimated dry deposition amount, comparison study can be suggested and ecological impact should be evaluated according to minimum/ensemble/maximum deposition amount.

4. Issues to be discussed in SAC and Task Force on Dry Deposition Monitoring

Enhancement of meteorological measurement (temperature, wind speed and direction, relative humidity and solar radiation) should be required for every site. Also followings are issues to be discussed in SAC and Task Force on Dry Deposition Monitoring for the present;

1. Clarification of the member of Task Force on Dry Deposition Monitoring
2. Discussion on publication method of dry deposition fluxes
 - every year by Data Report by each country
 - every 5-year by Periodic Report by experts
3. Review of existing researches of direct measurement and inferential method
4. Selection of monitoring sites where the estimation by inferential method or direct measurements should be implemented
5. Validation of inferential method by using direct measurement results obtained in and outside of EANET
6. Consideration of the contents of Technical Manual for dry deposition fluxes estimation
7. Discussion on the future direction for the estimation of dry deposition flux after 2010
8. Consideration of the establishment of **Ad Hoc Expert Group under TF** to conduct above tasks